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SOLUBILITY DATA SERIES

Volume 1

HELIUM AND NEON — *Gas Solubilities*

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Foreword

If the knowledge is undigested or simply wrong, more is not better

How to communicate and disseminate numerical data effectively in chemical science and technology has been a problem of serious and growing concern to IUPAC, the International Union of Pure and Applied Chemistry, for the last two decades. The steadily expanding volume of numerical scientific and technological information, the formation of new interdisciplinary areas in which chemistry is a partner, and the links between these and existing traditional subdisciplines in chemistry, along with an increasing number of users, have been considered as urgent aspects of the information problem in general, and of the numerical data problem in particular.

Among the several numerical data projects initiated and operated by various IUPAC commissions, the *Solubility Data Project* is probably one of the most ambitious ones. It is concerned with preparing a comprehensive critical compilation of data on solubilities in all physical systems, of gases, liquids and solids. Both the basic and applied branches of almost all scientific disciplines require a knowledge of solubilities as a function of solvent, temperature and pressure. Solubility data are basic to the fundamental understanding of processes relevant to agronomy, biology, chemistry, geology and oceanography, medicine and pharmacology, and metallurgy and materials science. Knowledge of solubility is very frequently of great importance to such diverse practical applications as drug dosage and drug solubility in biological fluids, anesthesiology, corrosion by dissolution of metals, properties of glasses, ceramics, concretes and coatings, phase relations in the formation of minerals and alloys, the deposits of minerals and radioactive fission products from ocean waters, the composition of ground waters, and the requirements of oxygen and other gases in life support systems.

The widespread relevance of solubility data to many branches and disciplines of science, medicine, technology and engineering, and the difficulty of recovering solubility data from the literature, lead to the proliferation of published data in an ever increasing number of scientific and technical primary sources. The sheer volume of data has overcome the capacity of the classical secondary and tertiary services to respond effectively.

While the proportion of secondary services - of the review article type - is generally increasing due to the rapid growth of all forms of primary literature, the review articles become more limited in scope and more specialized. The disturbing phenomenon is that in some disciplines, certainly in chemistry, authors are reluctant to treat even those limited-in-scope reviews exhaustively. There is a trend to preselect the literature, sometimes under the pretext of reducing it to manageable size. The crucial problem with such preselection - as far as numerical data are concerned - is that there is no indication as to whether the material excluded was done by design or by less than thorough literature search. We are equally concerned that most current secondary sources, critical in character as they may be, give scant attention to numerical data.

On the other hand, tertiary sources - handbooks, reference books, and other tabulated and graphical compilations - as they exist today, are comprehensive but, as a rule, uncritical. They usually attempt to cover whole disciplines, thus obviously are superficial in treatment. Since they command a wide market, we believe that their service to advancement of science is at least questionable. Additionally, the change which is taking place in the generation of new and diversified numerical data, and the rate by which this is done, is not reflected in an increased third-level service. The emergence of new tertiary literature sources does not parallel the shift that has occurred in the primary literature.

The status of current secondary and tertiary services being as they are briefly stated above, the innovative approach of the *Solubility Data Project* is that its compilation and critical evaluation work involve consolidation and reprocessing services when both activities are based on intellectual and scholarly reworking of information from primary sources.

It comprises compact compilation, rationalization and simplification, and the fitting of isolated numerical data into a critically evaluated general framework.

The *Solubility Data Project* developed a mechanism which involves a number of innovations in exploiting the literature fully, and which contains new elements of a more imaginative approach of transfer of reliable information from primary to secondary/tertiary sources. *The fundamental trend of the Solubility Data Project is toward integration of secondary and tertiary services with the objective of producing in-depth critical analysis and evaluation which are characteristic to secondary services, in a scope as broad as conventional tertiary services.*

Fundamental to the philosophy of the project is the recognition that the basic element of strength is the active participation of career scientists in it. Consolidating primary literature data and producing a truly critically-evaluated set of numerical data, and synthesizing data in a meaningful relationship, are demands considered worthy of the efforts of top scientists. Career scientists, who themselves contribute to science by their involvement, in active scientific research, are the backbone of the project. The scholarly work is commissioned to recognized authorities, involving a process of careful selection in the best tradition of IUPAC. This selection in turn is the key to the quality of the output. These top experts are expected to view their specific topics dispassionately, paying equal attention to their own contributions and to those of their peers. They digest literature data into a coherent story by weeding out what is wrong from what is believed to be right. To fulfill this task, the evaluator must cover *all* relevant open literature. No reference is excluded by design and every effort is made to detect every bit of relevant primary source. Poor quality or wrong data are mentioned and explicitly disqualified as such. In fact, it is only when the reliable data are presented alongside the unreliable data that proper justice can be done. The user is bound to have incomparably more confidence in a succinct evaluative commentary and a comprehensive review with a complete bibliography to both good and poor data.

It is the standard practice that any given solute-solvent system consists of two essential parts: I. Critical Evaluation and Recommended Values, and II. Compiled Data Sheets.

The Critical Evaluation part gives the following information:

(i) a verbal text of evaluation which discusses the numerical solubility information appearing in the primary sources located in the literature. The evaluation text concerns primarily the quality of data after consideration of the purity of the materials and their characterization, the experimental method employed and the uncertainties in control of physical parameters, the reproducibility of the data, the agreement of the worker's results on accepted test systems with standard values, and finally, the data fit to generally accepted graphical tests;

(ii) a set of recommended numerical data. Whenever possible, the set of recommended data includes weighted average and standard minimum deviations, and a set of smoothing equations derived from the experimental data endorsed by the evaluator;

(iii) a graphical plot of recommended data.

The compilation part consists of data sheets of the best experimental data in the primary literature. Generally speaking, such independent data sheets are given only to the best and endorsed data covering the known range of experimental parameters. Data sheets based on primary sources where the data are of a lower precision are given only when no better data are available. Experimental data with a precision poorer than considered acceptable are reproduced in the form of data sheets when they are the only known data for a particular system. Such data are considered to be still suitable for some applications, and their presence in the compilation should alert researchers to areas that need more work.

The typical data sheet carries the following information:

(i) components - definition of the system - their names, formulas and Chemical Abstracts registry numbers;

(ii) reference to the primary source where the numerical information is reported. In cases when the primary source is a less common periodical or a report document, published though of limited availability, abstract references are also given;

(iii) experimental variables;

(iv) identification of the compiler, his affiliation and the date of compilation;

(v) experimental values as they appear in the primary source. Whenever available, the data are given both in tabular and graphical form. If auxiliary information is available, the experimental data are converted also to SI units by the compiler.

Under the general heading of Auxiliary Information, the essential experimental details are summarized:

(vi) experimental method used for the generation of data;

(vii) type of apparatus and procedure employed;

(viii) source and purity of materials;

(ix) estimated error;

(x) references relevant to the generation of experimental data as cited in the primary source.

This new approach to numerical data presentation, developed during our four years of existence, has been strongly influenced by the diversity of background of those whom we are supposed to serve. We thus deemed it right to preface the evaluation/compilation sheets in each volume with a detailed discussion of the principles of the accurate determination of relevant solubility data and related thermodynamic information.

Finally, the role of education is more than corollary to the efforts we are seeking. The scientific standards advocated here are necessary to strengthen science and technology, and should be regarded as a major effort in the training and formation of the next generation of scientists and engineers. Specifically, we believe that there is going to be an impact of our project on scientific-communication practices. The quality of consolidation adopted by this program offers down-to-earth guidelines, concrete examples which are bound to make primary publication services more responsive than ever before to the needs of users. The self-regulatory message to scientists of 15 years ago to refrain from unnecessary publication has not achieved much. The literature is still, in 1978, cluttered with poor-quality articles. The Weinberg report (in "Reader in Science Information," Eds. J. Sherrod and A. Hodina, Microcard Editions Books, Indian Head Inc., 1973, p. 292) states that "admonition to authors to restrain themselves from premature, unnecessary publication can have little effect unless the climate of the entire technical and scholarly community encourages restraint..." We think that projects of this kind translate the climate into operational terms by exerting pressure on authors to avoid submitting low-grade material. The type of our output, we hope, will encourage attention to quality as authors will increasingly realize that their work will not be suited for permanent retrievability unless it meets the standards adopted in this project. It should help to dispel confusion in the minds of many authors of what represents a permanently useful bit of information of an archival value, and what does not.

If we succeed in that aim, even partially, we have then done our share in protecting the scientific community from unwanted and irrelevant, wrong numerical information.

A. S. Kertes

July 1978

Editor's Preface

The users of this volume will find (1) the best available experimental solubility data of helium and neon gas in liquids as reported in the scientific literature, (2) tables of smoothed mole fraction solubility data for the systems which were studied over a temperature interval and (3) tables of either tentative or recommended solubility data when two or more laboratories reported solubility data over the same range of temperature and pressure. Users have the option of using the experimental values either directly or in their own smoothing equations or of using the smoothed values prepared by the compilers and evaluators. The goal was to cover the literature thoroughly enough so that the user need not do a detailed literature search for helium and neon solubility data prior to 1978.

Some words of explanation are required with respect to units, corrections, smoothing equations, auxiliary data and data sources, nomenclature and other points. The experimental data are presented in the units found in the original paper. In addition the original data are often converted to other units, especially mole fraction. Temperatures have been converted to Kelvin. In evaluations of solubility data, S.I. units are used.

Only in the past 10 to 15 years have experimental methods for the determination of the solubility of gases in liquids developed to the point where 0.5 percent or better accuracy is attained. Only a small fraction of the literatures' gas solubility data are accurate to 0.5 percent. The corrections for non-ideal gas behavior and for expansion of the liquid phase on dissolution of the gas are small and well within the normal experimental error. Thus such corrections were not made for the helium and neon gas solubility data at low pressure.

The lack of high accuracy is also the reason that, excepting water as a solvent, only a two-constant equation is used to smooth and evaluate the gas solubility data. A Gibbs energy of solution equation linear in temperature is used

$$\Delta G°/\text{J mol}^{-1} = -RT \ln X_1 = A + BT$$

or in alternate form

$$\ln X_1 = -\Delta G°/RT = -(A/R)/T - (B/R)$$

where A is $\Delta H°$, B is $-\Delta S°$, X_1 is the mole fraction solubility at a gas partial pressure of 101.325 kPa (1 atm), and R is 8.31433 J K^{-1} mol^{-1}.

An inconsistency, which we believe is justified, is found with respect to the solubility data in water. Much time and effort was expended in evaluating the solubility data of each gas in water. A recommended equation and table of values are presented. However, for systems which contain water and other solvent components such as electrolytes or water miscible polar organic compounds, the experimental gas solubility in water from that paper is given, even when it is at variance with our recommended values. These data of sometimes poorer quality are presented because the author's ratio of gas solubility in water to solubility in the aqueous solution may be more accurate than the solubility itself. This may be especially true of some of the solubility data in aqueous electrolyte solutions.

Solvent density data were often required in making solubility unit conversions. The density data were not directly referenced. The main sources of density data are

- Circular 461 of the U.S. National Bureau of Standards
- American Petroleum Research Project 44 Publications
- The International Critical Tables, Volume III (E.W. Washburn, Editor) McGraw-Hill Co., 1931
- Smow Table, *Pure and Applied Chemistry* 1976, *45*, 1-9
- Thermodynamic Properties of Aliphatic Alcohols, R. C. Wilhoit and B. J. Zwolinski, *J. Phys. Chem. Ref. Data* 1973, *2*, Supplement No. 1
- Organic Solvents, J. A. Riddick and W. B. Bunger (Technique of Chemistry, Volume II, A. Weissberger, Editor) Wiley-Interscience, New York, 1970, 3rd Ed.

The Ostwald Coefficient, L

The Ostwald coefficient, L, is defined as the ratio of the volume of gas absorbed to the volume of the absorbing liquid, all measured at the same temperature:

$$L = \frac{V(g)}{V(l)}$$

If the gas is ideal and Henry's Law is applicable, the Ostwald coefficient is independent of the partial pressure of the gas. It is necessary, in practice, to state the temperature and total pressure for which the Ostwald coefficient is measured. The mole fraction solubility, X, is related to the Ostwald coefficient by

$$X = \left[\frac{RT}{P(g)\ L\ v^{o}(l)} + 1 \right]^{-1}$$

where P is the partial pressure of gas. The mole fraction solubility will be at a partial pressure of P(g).

The Absorption Coefficient, β

There are several "absorption coefficients", the most commonly used one being defined as the volume of gas, reduced to 273.15K and 1 atmosphere, absorbed per unit volume of liquid when the total pressure is 1 atmosphere. β is related to the Bunsen coefficient by

$$\beta = \alpha(1-P(l))$$

where P(l) is the partial pressure of the liquid in atmosphere.

The Henry's Law Constant

A generally used formulation of Henry's Law may be expressed as

$$P(g) = K_H X$$

where K_H is the Henry's Law constant and X the mole fraction solubility. Other formulations are

$$P(g) = K_2 C(l)$$

or

$$C(g) = K_c C(l)$$

where K_2 and K_c are constants, C the concentration, and (l) and (g) refer to the liquid and gas phases. Unfortunately, K_H, K_2 and K_c are all sometimes referred to as Henry's Law constants. Henry's Law is a limiting law but can sometimes be used for converting solubility data from the experimental pressure to a partial gas pressure of 1 atmosphere, provided the mole fraction of the gas in the liquid is small, and that the difference in pressures is small. Great caution must be exercised in using Henry's Law.

The Mole Ratio, N

The mole ratio, N, is defined by

$$N = n(g)/n(l)$$

Table 1 contains a presentation of the most commonly used inter-conversions not already discussed.

For gas solubilities greater than about 0.01 mole fraction at a partial pressure of 1 atmosphere there are several additional factors which must be taken into account to unambiguously report gas solubilities. Solution densities or the partial molar volume of gases must be known. Corrections should be made for the possible non-ideality of the gas or the non-applicability of Henry's Law.

The solubility data are supplemented with partial molal volume and calorimetric enthalpy of solution data when they are available.

Chemical Abstracts recommended names and registry numbers were used throughout. Common names are cross referenced to Chemical Abstract recommended names in the index.

The Editor would appreciate users calling errors and omissions to his attention.

The Editor gratefully acknowledges the advice and comments of members of the IUPAC Commission on Equilibrium Data and the Subcommittee on Solubility Data; the cooperation and hard work of the Evaluators and compilers; and the untiring efforts of the typists Peggy Tyler, Carolyn Dowie, and Lesley Flanagan.

Acknowledgment is made to the Donors of the Petroleum Research Fund, administered by the American Chemical Society, for partial support of the compilation and evaluation of the gas solubility data.

H. Lawrence Clever

July 1978

THE SOLUBILITY OF GASES IN LIQUIDS

C. L. Young, R. Battino, and H. L. Clever

INTRODUCTION

The Solubility Data Project aims to make a comprehensive search of the literature for data on the solubility of gases, liquids and solids in liquids. Data of suitable accuracy are compiled into data sheets set out in a uniform format. The data for each system are evaluated and where data of sufficient accuracy are available values recommended and in some cases a smoothing equation suggested to represent the variation of solubility with pressure and/or temperature. A text giving an evaluation and recommended values and the compiled data sheets are published on consecutive pages.

DEFINITION OF GAS SOLUBILITY

The distinction between vapor-liquid equilibria and the solubility of gases in liquids is arbitrary. It is generally accepted that the equilibrium set up at 300K between a typical gas such as argon and a liquid such as water is gas-liquid solubility whereas the equilibrium set up between hexane and cyclohexane at 350K is an example of vapor-liquid equilibrium. However, the distinction between gas-liquid solubility and vapor-liquid equilibrium is often not so clear. The equilibria set up between methane and propane above the critical temperature of methane and below the critical temperature of propane may be classed as vapor-liquid equilibrium or as gas-liquid solubility depending on the particular range of pressure considered and the particular worker concerned.

The difficulty partly stems from our inability to rigorously distinguish between a gas, a vapor, and a liquid, which has been discussed in numerous textbooks. We have taken a fairly liberal view in these volumes and have included systems which may be regarded, by some workers, as vapor-liquid equilibria.

UNITS AND QUANTITIES

The solubility of gases in liquids is of interest to a wide range of scientific and technological disciplines and not solely to chemistry. Therefore a variety of ways for reporting gas solubility have been used in the primary literature and inevitably sometimes, because of insufficient available information, it has been necessary to use several quantities in the compiled tables. Where possible, the gas solubility has been quoted as a mole fraction of the gaseous component in the liquid phase. The units of pressure used are bar, pascal, millimeters of mercury and atmosphere. Temperatures are reported in Kelvin.

EVALUATION AND COMPILATION

The solubility of comparatively few systems is known with sufficient accuracy to enable a set of recommended values to be presented. This is true both of the measurement near atmospheric pressure and at high pressures. Although a considerable number of systems have been studied by at least two workers, the range of pressures and/or temperatures is often sufficiently different to make meaningful comparison impossible.

Occasionally, it is not clear why two groups of workers obtained very different sets of results at the same temperature and pressure, although both sets of results were obtained by reliable methods and are internally consistent. In such cases, sometimes an incorrect assessment has been given. There are several examples where two or more sets of data have been classified as tentative although the sets are mutually inconsistent.

Many high pressure solubility data have been published in a smoothed form. Such data are particularly difficult to evaluate, and unless specifically discussed by the authors, the estimated error on such values can only be regarded as an "informed guess".

Many of the high pressure solubility data have been obtained in a more general study of high pressure vapor-liquid equilibrium. In such cases a note is included to indicate that additional vapor-liquid equilibrium data are given in the source. Since the evaluation is for the compiled data, it is possible that the solubility data are given a classification which is better than that which would be given for the complete vapor-liquid data (or vice versa). For example, it is difficult to determine coexisting liquid and vapor compositions near the critical point of a mixture using some widely used experimental techniques which yield accurate high pressure solubility data. For example, conventional methods of analysis may give results with an expected error which would be regarded as sufficiently small for vapor-liquid equilibrium data but an order of magnitude too large for acceptable high pressure gas-liquid solubility.

It is occasionally possible to evaluate data on mixtures of a given substance with a member of a homologous series by considering all the available data for the given substance with other members of the homologous series. In this study the use of such a technique has been very limited.

The estimated error is often omitted in the original article and sometimes the errors quoted do not cover all the variables. In order to increase the usefulness of the compiled tables estimated errors have been included even when absent from the original article. If the error on *any* variable has been inserted by the compiler this has been noted.

PURITY OF MATERIALS

The purity of materials has been quoted in the compiled tables where given in the original publication. The solubility is usually more sensitive to impurities in the gaseous component than to liquid impurities in the liquid component. However, the most important impurities are traces of a gas dissolved in the liquid. Inadequate degassing of the absorbing liquid is probably the most often overlooked serious source of error in gas solubility measurements.

APPARATUS AND PROCEDURES

In the compiled tables brief mention is made of the apparatus and procedure. There are several reviews on experimental methods of determining gas solubilities and these are given in References 1-7.

METHODS OF EXPRESSING GAS SOLUBILITIES

Because gas solubilities are important for many different scientific and engineering problems, they have been expressed in a great many ways:

The Mole Fraction, X(g)

The mole fraction solubility for a binary system is given by:

$$X(g) = \frac{n(g)}{n(g) + n(l)}$$

$$= \frac{W(g)/M(g)}{\{W(g)/M(g)\} + \{W(l)/M(l)\}}$$

here n is the number of moles of a substance (an *amount* of substance), W is the mass of a substance, and M is the molecular mass. To be unambiguous, the partial pressure of the gas (or the total pressure) and the temperature of measurement must be specified.

The Weight Per Cent Solubility, wt%

For a binary system this is given by

$$wt\% = 100\ W(g)/\{W(g) + W(l)\}$$

where W is the weight of substance. As in the case of mole fraction, the pressure (partial or total) and the temperature must be specified. The weight per cent solubility is related to the mole fraction solubility by

$$X(g) = \frac{\{wt\%/M(g)\}}{\{wt\%/M(g)\} + \{(100 - wt\%)/M(1)\}}$$

The Weight Solubility, C_W

The weight solubility is the number of moles of dissolved gas per gram of solvent when the partial pressure of gas is 1 atmosphere. The weight solubility is related to the mole fraction solubility at one atmosphere partial pressure by

$$X(g) \text{ (partial pressure 1 atm)} = \frac{C_W M(1)}{1 + C_W M(1)}$$

where M(1) is the molecular weight of the solvent.

The Moles Per Unit Volume Solubility, n

Often for multicomponent systems the density of the liquid mixture is not known and the solubility is quoted as moles of gas per unit volume of liquid mixture. This is related to the mole fraction solubility by

$$X = \frac{n\, v^{o}(1)}{1 + n\, v^{o}(1)}$$

where $v^{o}(1)$ is the molar volume of the liquid component.

The Bunsen Coefficient, α

The Bunsen coefficient is defined as the volume of gas reduced to 273.15K and 1 atmosphere pressure which is absorbed by unit volume of solvent (at the temperature of measurement) under a partial pressure of 1 atmosphere. If ideal gas behavior and Henry's law is assumed to be obeyed,

$$\alpha = \frac{V(g)}{V(1)} \frac{273.15}{T}$$

where V(g) is the volume of gas absorbed and V(1) is the original (starting) volume of absorbing solvent. The mole fraction solubility X is related to the Bunsen coefficient by

$$X \text{ (1 atm)} = \frac{\alpha}{\alpha + \frac{273.15}{T} \frac{v^{o}(g)}{v^{o}(1)}}$$

where $v^{o}(g)$ and $v^{o}(1)$ are the molar volumes of gas and solvent at a pressure of one atmosphere. If the gas is ideal,

$$X = \frac{\alpha}{\alpha + \frac{273.15R}{v^{o}(1)}}$$

Real gases do not follow the ideal gas law and it is important to establish the real gas law used for calculating α in the original publication and to make the necessary adjustments when calculating the mole fraction solubility.

The Kuenen Coefficient, S

This is the volume of gas, reduced to 273.15K and 1 atmosphere pressure, dissolved at a partial pressure of gas of 1 atmosphere by 1 gram of solvent.

TABLE 1 Interconversion of parameters used for reporting solubility

$$L = \alpha(T/273.15)$$

$$C_W = \alpha/v_o\rho$$

$$K_H = \frac{17.033 \times 10^6 \rho_{soln}}{\alpha\ M(1)} + 760$$

$$L = C_W\ v_{t,gas}\rho$$

where v_o is the molal volume of the gas in $cm^3 mol^{-1}$ at 0°C, ρ the density of the solvent at the temperature of the measurement, ρ_{soln} the density of the solution at the temperature of the measurement, and $v_{t,gas}$ the molal volume of the gas ($cm^3 mol^{-1}$) at the temperature of the measurement.

SALT EFFECTS

The effect of a dissolved salt in the solvent on the solubility of a gas is often studied. The activity coefficient of a dissolved gas is a function of the concentration of all solute species (see ref. 8). At a given temperature and pressure the logarithm of the dissolved gas activity coefficient can be represented by a power series in C_s, the electrolyte concentration, and C_i, the nonelectrolyte solute gas concentration

$$\log f_i = \sum_{m,n} k_{mn}\ C_s^n\ C_i^m$$

It is usually assumed that only the linear terms are important for low C_s and C_i values when there is negligible chemical interaction between solute species.

$$\log f_i = k_s C_s + k_i C_i$$

where k_s is the salt effect parameter and k_i is the solute-solute gas interaction parameter. The dissolved gas activity is the same in the pure solvent and a salt solution in that solvent for a given partial pressure and temperature

$$a_i = f_i S_i = f_i^o S_i^o \text{ and } f_i = f_i^o \frac{S_i^o}{S_i}$$

where S_i and S_i^o are the gas solubility in the salt solution and in the pure solvent, respectively, and the f's are the corresponding activity coefficients. It follows that $\log \frac{f_i}{f_i^o} = \log \frac{S_i^o}{S_i} = k_s C_s + k_i(S_i - S_i^o)$. When the quantity $(S_i - S_i^o)$ is small the second term is negligible even though k_s and k_i may be of similar magnitude. This is generally the case for gas solubilities and the equation reduces to

$$\log \frac{f_i}{f_i^o} = \log \frac{S_i^o}{S_i} = k_s C_s$$

which is the form of the empirical Setschenow equation in use since the 1880's. A salt that increases the activity coefficient of the dissolved gas is said to salt-out and a salt that decreases the activity coefficient of the dissolved gas is said to salt-in.

Although salt effect studies have been carried out for many years, there appears to be no common agreement of the units for either the gas solubility or the salt concentration. Both molar ($mol\ dm^{-3}$) and molal ($mol\ kg^{-1}$) are used for the salt concentration. The gas solubility ratio S_i^o/S_i is given as Bunsen coefficient ratio and Ostwald coefficient ratio, which would be the same as a molar ratio; Kueunen coefficient ratio, volume dissolved in 1 g or 1 kg of solvent which would be a molal ratio; and mole fraction ratio. Recent theoretical treatments use salt concentration in mol dm^{-3} and S_i^o/S_i ratio as mole fraction ratio with each salt ion acting as a mole. Evaluations which compare the results of several workers are made in the units most compatible with present theory.

TEMPERATURE DEPENDENCE OF GAS SOLUBILITY

In a few cases it has been found possible to fit the mole fraction solubility at various temperatures using an equation of the form

$$\ln x = A + B / (T/100K) + C \ln (T/100K) + DT/100K$$

It is then possible to write the thermodynamic functions $\Delta\overline{G}_1^o$, $\Delta\overline{H}_1^o$, $\Delta\overline{S}_1^o$ and $\Delta\overline{C}^o_{p_1}$ for the transfer of the gas from the vapor phase at 101,325 Pa partial pressure to the (hypothetical) solution phase of unit mole fraction as:

$$\Delta\overline{G}_1^o = -RAT - 100\ RB - RCT \ln (T/100) - RDT^2/100$$

$$\Delta\overline{S}_1^o = RA + RC \ln (T/100) + RC + 2\ RDT/100$$

$$\Delta\overline{H}_1^o = -100\ RB + RCT + RDT^2/100$$

$$\Delta\overline{C}^o_{p_1} = RC + 2\ RDT/100$$

In cases where there are solubilities at only a few temperatures it is convenient to use the simpler equations

$$\Delta\overline{G}_1^o = -\ RT \ln x = A + BT$$

in which case $A = \Delta\overline{H}_1^o$ and $-B = \Delta\overline{S}_1^o$.

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APPENDIX I. Conversion Factors k and k^{-1}

Non-SI Unit	k: 1 (non-SI Unit) = k (SI Unit)		k^{-1}: 1 (SI Unit) = k^{-1} (non-SI Unit)	
LENGTH			SI Unit, m	
Å (angstrom)	1×10^{-10}	(*)	1×10^{10}	(*)
cm (centimeter)	1×10^{-2}	(*)	1×10^{2}	(*)
in (inch)	254×10^{-4}	(*)	$3\ 937\ 008 \times 10^{-5}$	
ft (foot)	$3\ 048 \times 10^{-4}$	(*)	$3\ 280\ 840 \times 10^{-6}$	
AREA			SI Unit, m^2	
cm^2	1×10^{-4}	(*)	1×10^{4}	(*)
in^2	$64\ 516 \times 10^{-8}$	(*)	$1\ 550\ 003 \times 10^{-3}$	
ft^2	$9\ 290\ 304 \times 10^{-8}$	(*)	$1\ 076\ 391 \times 10^{-5}$	
VOLUME			SI Unit, m^3	
cm^3	1×10^{-6}	(*)	1×10^{6}	(*)
in^3	$16\ 387\ 064 \times 10^{-12}$	(*)	$6\ 102\ 374 \times 10^{-2}$	
ft^3	$2\ 831\ 685 \times 10^{-8}$		$3\ 531\ 467 \times 10^{-5}$	
l (litre)	1×10^{-3}	(*)	1×10^{3}	(*)
UKgal (UK gallon)	$45\ 461 \times 10^{-7}$		$21\ 997 \times 10^{-2}$	
USgal (US gallon)	$37\ 854 \times 10^{-7}$		$26\ 417 \times 10^{-2}$	
MASS			SI Unit, kg	
g (gram)	1×10^{-3}	(*)	1×10^{3}	(*)
t (tonne)	1×10^{3}	(*)	1×10^{-3}	(*)
lb (pound)	$45\ 359\ 237 \times 10^{-8}$	(*)	$2\ 204\ 623 \times 10^{-6}$	
DENSITY			SI Unit, kg m^{-3}	
g cm^{-3}	1×10^{3}	(*)	1×10^{-3}	(*)
g l^{-1}	1	(*)	1	(*)
lb in^{-3}	$2\ 767\ 991 \times 10^{-2}$		$3\ 612\ 728 \times 10^{-11}$	
lb ft^{-3}	$1\ 601\ 847 \times 10^{-5}$		$6\ 242\ 795 \times 10^{-8}$	
lb $UKgal^{-1}$	$99\ 776 \times 10^{-3}$		$100\ 224 \times 10^{-7}$	
lb $USgal^{-1}$	$1\ 198\ 264 \times 10^{-4}$		$8\ 345\ 406 \times 10^{-9}$	
PRESSURE			SI Unit, Pa (pascal, kg $m^{-1}s^{-2}$)	
dyn cm^{-2}	1×10^{-1}	(*)	1×10	(*)
at (kgf cm^{-2})	$980\ 665 \times 10^{-1}$	(*)	$1\ 019\ 716 \times 10^{-11}$	
atm (atmosphere)	$101\ 325$	(*)	$9\ 869\ 233 \times 10^{-12}$	
bar	1×10^{5}	(*)	1×10^{-5}	(*)
lbf in^{-2} (p.s.i.)	$6\ 894\ 757 \times 10^{-3}$		$1\ 450\ 377 \times 10^{-10}$	
lbf ft^{-2}	$47\ 880 \times 10^{-3}$		$20\ 886 \times 10^{-6}$	
inHg (inch of mercury)	$3\ 386\ 388 \times 10^{-3}$		$2\ 952\ 999 \times 10^{-10}$	
mmHg (millimeter of mercury, torr)	$1\ 333\ 224 \times 10^{-4}$		$7\ 500\ 617 \times 10^{-9}$	

APPENDIX I. Conversion Factors k and k^{-1}

Non-SI Unit	k 1 (non-SI Unit) = k (SI Unit)		k^{-1} 1 (SI Unit) = k^{-1} (non-SI Unit)	
ENERGY			Unit, J (joule, kg m^2s^{-2})	
erg	1 x 10^{-7}	(*)	1 x 10^{7}	(*)
cal_{IT} (I.T. calorie)	41 868 x 10^{-4}	(*)	2 388 459 x 10^{-7}	
cal_{th} (thermochemical calorie)	4 184 x 10^{-3}	(*)	2 390 057 x 10^{-7}	
kW h (kilowatt hour)	36 x 10^{5}	(*)	2 777 778 x 10^{-13}	
1 atm	101 325 x 10^{-3}	(*)	9 869 233 x 10^{-9}	
ft lbf	1 355 818 x 10^{-6}		7 375 622 x 10^{-7}	
hp h (horse power hour)	2 684 519		3 725 062 x 10^{-13}	
Btu (British thermal unit)	1 055 056 x 10^{-3}		9 478 172 x 10^{-10}	

An asterisk (*) denotes an exact relationship

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Water; H_2O; 7732-18-5	R. Battino Department of Chemistry Wright State University Dayton, OH 45431 USA April 1977

CRITICAL EVALUATION:

The data produced by eight workers were considered to be sufficiently accurate to use for the smoothing equation. However, in fitting the data those points which showed deviations greater than two standard deviations were rejected. Thus we used 59 data points obtained as follows (reference - number of data points used from that reference): 1-8, 2-5, 3-5, 4-24, 5-3, 6-1, 7-1, 8-1, 9-11. The fitting equation used was

$$\ln X_1 = A + B/(T/100K) + C \ln (T/100K) + DT/100K \quad (1)$$

Using T/100K as the variable rather than T/K gives coefficients of approximately equal magnitude. The best fit for 59 points gave

$$\ln X_1 = -41.4611 + 42.5962/(T/100K) + 14.0094 \ln (T/100K) \quad (2)$$

where X_1 is the mole fraction solubility of helium at 101.325 Pa (1 atm) partial pressure of gas. The fit in ln X_1 gave a standard deviation of 0.54% taken at the middle of the temperature range. Table 1 gives smoothed values at 5K intervals for the mole fraction solubility at 101.325 Pa and the Ostwald coefficient.

Table 1 also gives the thermodynamic functions $\Delta\bar{G}^\circ_1$, $\Delta\bar{H}^\circ_1$, $\Delta\bar{S}^\circ_1$, and $\Delta\bar{C}^\circ_{p_1}$ for the transfer of the gas from the vapor phase at 101.325 Pa partial gas pressure to the (hypothetical) solution phase of unit mole fraction. These were calculated from the smoothing equation according to the following equations:

$$\Delta\bar{G}^\circ_1 = - RAT - 100RB = RCT \ln (T/100) - RDT^2/100 \quad (3)$$

$$\Delta\bar{S}^\circ_1 = RA + RC \ln (T/100) + RC + 2RDT/100 \quad (4)$$

$$\Delta\bar{H}^\circ_1 = - 100RB + RCT + RDT^2/100 \quad (5)$$

$$\Delta\bar{C}^\circ_{p_1} = RC + 2RDT/100 \quad (6)$$

Since the three constant equations gave the best fit, $\Delta\bar{C}^\circ_{p_1}$ is independent of temperature.

Several sets of data were rejected for purposes of the fitting equation or preparing separate data sheets. The data of Shoor, et al. (10) were obtained via a gas chromatographic method and were about 4 % low. Friedman's single value (11) was 1.5 % low. Antropoff's values (12) were erratically very high. Hawkin's single value (13) was 12 % low. The measurements of Feillolay and Lucas (14) at 25 and 35°C were 2 to 5 percent high despite a reproducibility of ± 0.5 percent. Ramsay, Collie and Traver's (15) early value was only qualitative (± 10 %) and it is about 30 percent low. Valentiner's (16) measurements were done at three temperatures using a mixture of gases that was 70 % neon and 30 % helium. His values calculated using this mixture were only qualitative. Estreicher's measurements (17) were very high.[a]

Weiss (5) also measured the solubility of ^{3}He in water. Those data appear just following the natural helium in water data sheets.

Figure 1 shows the temperature dependence of solubility for helium obtained from the smoothing equation. There is a pronounced minimum at 303 K.

Experimental values of the partial molal enthalpy of solution and of the partial molal volume of the dissolved gas would complement the solubility data. No report of the direct calorimetric determination of the enthalpy of solution of helium in water was found. There are no reports of the partial molal volume of helium in water from experiments at atmospheric Pressure. There are reports of the partial molal volume of helium in water

[a] See added note following references on page 4.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Water; H_2O; 7732-18-5	R. Battino Department of Chemistry Wright State University Dayton, OH 45431 USA April 1977

CRITICAL EVALUATION:

Table 1. Smoothed values of helium solubility in water and thermodynamic functions[a] using equation 1 at 101.325 kPa (1 atm) partial pressure of helium.

T/K	Mol Fraction[b] $X_1 \times 10^6$	Ostwald[c] $L \times 10^3$	$\Delta\bar{G}_1^o$/kJ mol^{-1}[d]	$\Delta\bar{H}_1^o$/ J mol^{-1}	$\Delta\bar{S}_1^o$/$JK^{-1}mol^{-1}$
273.15	7.585	9.436	26.77	-3600	-111.2
278.15	7.389	9.361	27.32	-3017	-109.1
283.15	7.237	9.330	27.87	-2435	-107.0
288.15	7.123	9.341	28.40	-1853	-105.0
293.15	7.044	9.389	28.91	-1270	-103.0
298.15	6.997	9.474	29.42	- 688	-101.0
303.15	6.978	9.594	29.92	- 105	- 99.06
308.15	6.987	9.748	30.42	+ 477	- 97.16
313.15	7.020	9.935	30.90	1059	- 95.28
318.15	7.077	10.16	31.37	1642	- 93.44
323.15	7.158	10.41	31.83	2224	- 91.62
328.15	7.261	10.70	32.28	2807	- 89.83
333.15	7.385	11.02	32.73	3389	- 88.07
338.15	7.532	11.38	33.17	3971	- 86.33
343.15	7.700	11.77	33.59	4554	- 84.62
348.15	7.890	12.20	34.01	5136	- 82.94

a $\Delta\bar{C}_p^o$ was independent of temperature and has the value 116 J K^{-1} mol^{-1}.

b The mole fraction solubility of helium at 101.325 kPa (1 atm) partial pressure of the gas.

c Ostwald coefficient.

d cal_{th} = 4.184 joule.

and aqueous salt solutions derived from high pressure gas solubility data, from high pressure density data, and from a study of aqueous helium solutions under hydrostatic pressure. The values of the partial molal volume of helium in water from the high pressure studies are summarized in Table 2.

Four of the sets of values of the helium partial molal volume in water depend on the high helium pressure solubility measurements of Wiebe and Gaddy (19). Both Michaels, Gerver, and Bijl (18), and Namiot (21) have derived the partial molal volume values for helium in water from the least square fit of the Krichevskii - Kasarnovskii equation (20) to the Wiebe and Gaddy solubility data. It is generally accepted that although the Krichevskii - Kasarnovskii equation often fits the experimental gas solubility data well, the partial molal volumes derived from the equation are low. This seems to be the case for the helium and water system. Gardner and Smith (23) have fitted both the Wiebe and Gaddy and their own data to a theoretical equation which is a quadratic in pressure and which assumes a pressure dependent partial molal volume of the dissolved gas. Popov and Draken (24) calculated an apparent molal volume of helium in water from their measurement of density of the gas saturated solutions at pressures of 20 to 100 atm. They used the Wiebe and Gaddy solubility data to calculate the gas concentration in the solutions. Their value of the helium apparent molal volume is so high when compared with values by the other methods that it must be considered dubious unless it is substantiated by future work. Enns, Scholander, and Bradstreet (22) studied the equilibrium pressure of helium required to maintain a constant concentration of dissolved gas as the

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Water; H_2O; 7732-18-5	R. Battino Department of Chemistry Wright State University Dayton, OH 45431 USA April 1977

CRITICAL EVALUATION:

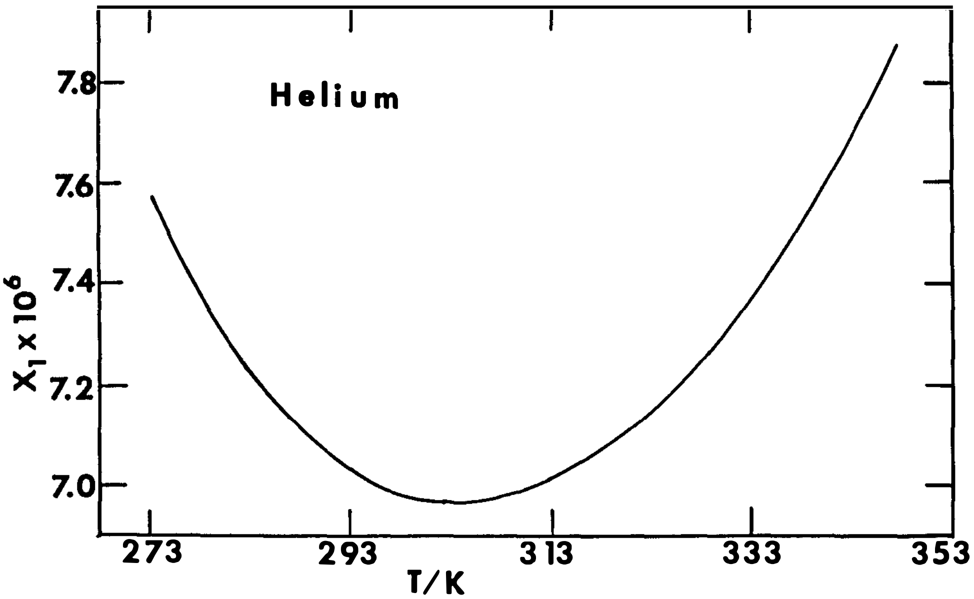

FIGURE 1. The mole fraction solubility of helium in water at 101. 325 kPa (1 atm).

hydrostatic pressure on the solution varied from 34 - 102 atm from which they derived a partial molal volume of helium in water.

The present recommendation is to accept as a tentative value the partial molal volume for helium in water of Enns , Scholander, and Bradstreet . The values of Gardner and Smith at several temperatures and salt concentrations make up a self-consistent set of data that may be preferred for some applications.

References

1. Morrison, T. J.; Johnstone, N. B. J. Chem. Soc. 1954 3149514,
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15. Ramsay, W.; Collie, J. N.; Travers, M. J. Chem. Soc. 1895, 67, 684.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Water; H_2O; 7732-18-5	R. Battino Department of Chemistry Wright State University Dayton, OH 45431 USA April, 1977

CRITICAL EVALUATION:

Table 2. Summary of literature values of the partial molal volume of helium dissolved in water.

T/K	P/atm[a]	V_1/cm^{3}mol^{-1}	Reference and Comments
273.15	25 - 1000	16.6	Michaels, Gerver, and Bijl (18). High pressure helium solubility data of Wiebe and Gaddy (19) fitted to the Krichevskii and Kasarnovskii (20) equation.
298.15	25 - 1000	15.5	
323.15	25 - 1000	15.6	
348.15	25 - 1000	15.9	
273.15	25 - 1000	17	Namiot (21). Same data and treatment as above.
298.15	34 - 102	29.7	Enns, Scholander, and Bradstreet (22). A study of the helium equilibrium pressure required to maintain a fixed concentration of helium dissolved in water as the hydrostatic pressure increased from 34 to 102 atm.
		29.7	
298.15	25 - 1000	14.8	Gardiner and Smith (23). The Wiebe and Gaddy (19) data treated as described below.
323.15	25 - 1000	20.0	
298.15	(1)	14.8	Gardiner and Smith (23). Their high pressure (100 - 600 atm) gas solubility data were fitted to a theoretical equation which was quadratic in pressure. A pressure dependent partial molal volume was assumed. They also report partial molal volumes of helium dissolved in 1 and 4 molal aqueous NaCl solutions.
	200	15.7	
	400	16.5	
	600	17.4	
323.15	(1)	26.9	
	200	20.3	
	400	13.6	
	600	7.0	
373.15	(1)	43.6	
	200	30.7	
	400	17.8	
	600	4.9	
298.15	20 - 100	78.4 ± 1.9	Popov and Drakin (24). The density of the helium saturated water was measured over the pressure range and apparent molal volumes were calculated using the solubility data of Wiebe and Gaddy (19).

[a] 1 atm ≡ 101.325 kPa

16. Valentiner, S. Preuss. Bergakad. Clausthal Festschrift 1925, 414.
17. Estreicher, S. Z. Physik. Chem. 1899, 31, 176.
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19. Wiebe, R.; Gaddy, V. L. J. Am. Chem. Soc. 1935, 57, 847.
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ADDED NOTE: Abrosimov, Strkhov, and Krestov (25) made five determinations of the solubility of helium in water from 10 - 45 °C and their values ranged from 13 % high to 2 % low. The values were too erratic to use. However, a data sheet for their helium solubility values in H_2O + D_2O mixtures and in D_2O is included.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Cady, H.P.; Elsey, H.M.; Berger, E.V.

J.Am.Chem. Soc. 1922, 44, 1456-1461.

VARIABLES:

T/K: 275.15 - 303.15

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $x_1 \times 10^4$	Bunsen Coefficient/α
275.15	0.07540*	0.00938
275.15	0.07523*	0.00936
283.15	0.07260*	0.00903
283.15	0.07139	0.00888
298.15	0.06949*	0.00862
298.15	0.06925*	0.00859
303.15	0.06539	0.00810
303.15	0.06482	0.00803
303.15	0.06628	0.00821
303.15	0.06749	0.00836

The mole fraction solubility is at 101.325 kPa (1 atm) partial pressure of the helium. The mole fraction solubility was calculated by the compiler.

*Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

AUXILIARY INFORMATION

METHOD: A volume of degassed water is determined by displacement of mercury. Gentle stirring for more than 24 hours dissolves the gas. The amount of gas dissolved is determined by reading calibrated and thermostated gas burets.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Extracted from natural gas by liquefaction and absorption on charcoal. "Pure" by spectroscopic examination.
2. Water. Conductivity water.

APPARATUS/PROCEDURE:

Procedure and apparatus described in original measurements paper.

ESTIMATED ERROR:

REFERENCES:

COMPONENTS:

1. Helium; He; 7440-59-7

2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Lannung, A.

J. Am. Chem. Soc. 1930, *52*, 68 - 80.

VARIABLES:

T/K: 288.15 - 303.15

PREPARED BY:

R.Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$
288.15	0.0716*	0.89
288.15	0.0708*	0.88
293.15	0.0717	0.89
293.15	0.0701*	0.87
303.15	0.0694*	0.86
303.15	0.0694*	0.86

The mole fraction solubility at 101.325 kPa (1 atm) partial pressure of the gas. The mole fraction solubility was calculated by the compiler.

*Solubility values which were used in the final smoothing equation for the recommended values given in the critical evaluation.

AUXILIARY INFORMATION

METHOD:

Manometric/volumetric procedure. Water is degassed while setting on mercury. Gas uptake measured on gas buret.

APPARATUS/PROCEDURE:

The apparatus is based on the design of v. Antropoff (1). The apparatus is designed so that the entire apparatus is shaken in a thermostat.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Linde. 99.5 percent with 0.5 per cent neon.

2. Water. Distilled. The specific conductivity was 2×10^{-7}.

ESTIMATED ERROR:

$\delta T/K = 0.03$

REFERENCES:

1. v. Antropoff, A. *Z. Elektrochem.* 1919, *25*, 269.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Akerlof, A.

J. Am. Chem. Soc. 1935, *57*, 1196-1201

VARIABLES:

T/K: 298.15

PREPARED BY:

R.Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$
298.15	0.0693*	0.86

The mole fraction solubility at 101.325 kPa (1 atm) partial pressure of helium was calculated by the compiler.

*Solubility value which was used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

AUXILIARY INFORMATION

METHOD:

Volume of solution determined by the direct displacement of mercury. Gas uptake determined by using a gas buret. Water degassed by boiling in vacuum.

APPARATUS/PROCEDURE:

Details of procedure and diagram of apparatus in original paper.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Source not given. Gas 98 per cent helium.
2. Water. No information given.

ESTIMATED ERROR:

REFERENCES:

COMPONENTS:

1. Helium; He; 7440-59-7
2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Behnke, A.R.; Yarbrough, O.D.

U.S. Nav. Med. Bull. 1938, 36, 542 - 548.

VARIABLES:

T/K: 311.15

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $x_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$
311.15	0.07058*	0.872

The mole fraction solubility at 101.325 kPa (1 atm) partial pressure of the gas. The mole fraction solubility calculated by the compiler.

*Solubility value which was used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

AUXILIARY INFORMATION

METHOD:

APPARATUS/PROCEDURE:

Used the Van Slyke procedure (1).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Source not given. 97.65 percent helium.
2. Water. No information given.

ESTIMATED ERROR:

REFERENCES:

1. Van Slyke, D.D.; Dillon, R.T.; Margaria, R.
   J. Biol. Chem. 1934, 105, 571.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Morrison, T.J.; Johnstone, N.B.

J. Chem. Soc. 1954, 3441 - 3446.

VARIABLES:

T/K: 277.75 - 346.15

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Kuenen Coefficient $S \times 10^3$	T/K	Mol Fraction $X_1 \times 10^4$	Kuenen Coefficient $S \times 10^3$
277.75	0.07588	9.44	313.55	0.06814	8.41
279.15	0.07515	9.35	318.05	0.06858	8.45
284.15	0.07269*	9.04	322.05	0.06984	8.59
285.15	0.07213*	8.97	327.55	0.07100	8.71
286.35	0.07134*	8.87	329.05	0.07187	8.81
289.75	0.07009	8.71	331.75	0.07262	8.89
294.85	0.06871	8.53	333.65	0.07376*	9.02
297.85	0.06827	8.47	340.55	0.07576*	9.23
300.55	0.06816	8.45	343.65	0.07746*	9.42
306.15	0.06739	8.34	344.55	0.07750*	9.42
307.75	0.06799	8.41	346.15	0.07790*	9.46

The original paper reports the helium solubility in water, S_o, as cm^3 of helium at a partial pressure 760 torr,reduced to 760 torr and 273.15 K, dissolved by 1 kg water. The same solubility value is reported above as the Kuenen coefficient x 10^3 at a helium partial pressure of 101.325 kPa (1 atm)

The mole fraction solubility at a helium partial pressure of 101.325 kPa (1 atm) was calculated by the compiler.

*Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

The authors fitted their solubility data to the equation $\log_{10} S_o = -58.987 + 2740/(T/K)$.

AUXILIARY INFORMATION

METHOD:

The previously degassed solvent is flowed in a thin film through the gas in a glass absorption spiral. Volume changes are measured in burets.

SOURCE AND PURITY OF MATERIALS:

1. Helium. British Oxygen Co. Ltd. Spectroscopically pure.

2. Water. No information given.

APPARATUS/PROCEDURE:

The apparatus described by Morrison and Billett (1) was used.

ESTIMATED ERROR:

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1952, 3819.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

de Wet, W.J.

J. S. Afr. Chem. Inst. 1964, 17, 9-13

VARIABLES:

T/K: 291.25 - 305.75

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $x_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$
291.25	0.0716	0.89
298.45	0.0709	0.88
305.75	0.0695*	0.86

Mole fraction solubility at 101.325 kPa (1 atm) partial pressure of the helium calculated by the compiler.

*Solubility value which was used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

AUXILIARY INFORMATION

METHOD:

Degassed liquid is flowed in a thin film through a glass spiral containing the gas. Volumes determined via calibrated burets.

APPARATUS/PROCEDURE:

Used modification of Morrison and Billett (1) apparatus. Degassing as modified by Clever, et al.(2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures.

2. Water. Distilled.

ESTIMATED ERROR:

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033; Ibid. 1952, 3819.

2. Clever, H.L.; Battino, R.; Saylor, J. H.; Gross, P.M. J. Phys. Chem. 1957, 61, 1078.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Water; H_2O; 7732-18-5	Weiss, R.F. Science 1970, 168, 247
VARIABLES: T/K: 273.15 - 313.29	PREPARED BY: R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient/α
273.75	0.07520*	0.009355
293.26	0.07025*	0.008724
313.29	0.07058*	0.008713

The mole fraction solubility is at 101.325 kPa (1 atm) partial pressure of the helium. The mole fraction solubility was calculated by the compiler.

*Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

AUXILIARY INFORMATION

METHOD: The Scholander micro-gasometric technique as adapted by Douglas (1) was used. The gas is dissolved in previously degassed water over mercury. All volumes are read on a micrometer which displaces mercury.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

1. Helium. Air Reduction reactor grade. Better than 99.99 per cent.
2. Water. Distilled.

ESTIMATED ERROR:

REFERENCES:

1. Douglas, E. J. Phys. Chem. 1964, 68, 169; ibid., 1965, 69, 2608.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Weiss, R.F.

J.Chem.Eng.Data 1971, 16, 235-241.

VARIABLES:

T/K: 273.75 - 313.30

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient
273.75	0.07525*	0.009361
273.75	0.07518*	0.009353
273.75	0.07521*	0.009356
273.75	0.07517*	0.009351
283.42	0.07267*	0.009038
283.44	0.07218*	0.008978
283.43	0.07242*	0.009008
283.44	0.07218*	0.008978
283.44	0.07236*	0.009000
293.25	0.07018*	0.008716
293.26	0.07047*	0.008752
293.26	0.07005*	0.008700
293.26	0.07042*	0.008746
293.23	0.07033*	0.008734
293.28	0.07001*	0.008695

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient
303.41	0.06974*	0.008639
303.39	0.06953*	0.008612
303.37	0.06971*	0.008602
303.39	0.06944*	0.008601
303.40	0.06953*	0.008612
303.39	0.06949*	0.008607
313.29	0.07021*	0.008667
313.29	0.07088	0.008750
313.30	0.07071*	0.008729
313.29	0.07052*	0.008705

The mole fraction solubility is at 101.325 kPa (1 atm) partial pressure of the helium. The mole fraction solubility was calculated by the compiler.

*Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

AUXILIARY INFORMATION

METHOD: The Scholander micro-gasometric technique as adapted by Douglas (1) was used. The gas is dissolved in previously degassed water over mercury. All volumes are read on a micrometer which displaces mercury.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

1. Helium. Air Reduction. Better than 99.99 per cent helium.

2. Water. Distilled.

ESTIMATED ERROR:

$\delta T/K = 0.01$

REFERENCES:

Douglas, E.
J. Phys. Chem. 1964, 68, 169;
ibid. 1965, 69, 2608.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Benson, B.B.; Krause, D.

J. Chem. Phys. 1976, *64*, 689 - 709.

VARIABLES:

T/K: 274.15 - 325.15

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$
274.151	0.076301	0.9502
278.143	0.074388*	0.9264
278.145	0.074455*	0.9272
283.147	0.072849*	0.9069
288.149	0.071767*	0.8930
288.152	0.071685*	0.8920
293.150	0.070801*	0.8801
298.147	0.070522*	0.8757
303.159	0.070304*	0.8717
308.153	0.070373*	0.8712
313.153	0.070837	0.8754
318.152	0.071276*	0.8789
325.153	0.071855*	0.8910

The mole fraction solubility at 101.325 kPa (1 atm) partial pressure of helium was calculated by the compiler.

*Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

AUXILIARY INFORMATION

METHOD: Gas-free water and the pure gas are equilibrated, and volumetric samples of the liquid and gaseous phases are isolated. The gas dissolved in the water is extracted and the number of moles determined on a special mercury manometer. After removal of water vapor, the number of moles of helium in the gaseous phase sample is measured with the same manometer. The pressure (and fugacity) above the solution may be calculated from the helium analysis. Real gas corrections are made. Predicted maximum error is 0.02 per cent.

APPARATUS/PROCEDURE:

No drawings of the apparatus are given in the original paper.

SOURCE AND PURITY OF MATERIALS:

1. Helium. No information given.

2. Water. No information given.

ESTIMATED ERROR: Smoothed data fit to 0.12 per cent rms in the solubility.

Calculated error from measurements is 0.02 per cent.

REFERENCES:

COMPONENTS:

1. Helium; He; 7440-59-7

2. Water-d_2; D_2O; 7789-20-0

ORIGINAL MEASUREMENTS:

Abrosimov, V.K.; Strakhov, A.N.; Krestov, G.A.

Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol. 1974, 17, 1463-1465.

VARIABLES:

T/K: 283.38 - 318.45
P/kPa: 101.325 (1 atm)

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$
283.38	0.09276	1.148
292.72	0.08698	1.076
298.15	0.08576	1.060
308.25	0.08417	1.038
318.45	0.08541	1.050

Mole fraction solubility at 101.325 Pa (1 atm) partial pressure of gas calculated by compiler.

AUXILIARY INFORMATION

METHOD:

The authors also measured the solubility of helium in pure water and mixtures of H_2O and D_2O.

APPARATUS/PROCEDURE:

The apparatus (1) is a modification of the apparatus used by Ben-Naim and Baer (2).

SOURCE AND PURITY OF MATERIALS:

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.01$ (compiler)

REFERENCES:

1. Patsatsiya, K.M.; Krestov, G.A. Zh. Fiz. Khim. 1970, 44, 1835.

2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:

1. Helium-3; ^3He; 14762-55-1

2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Weiss, R.F.

Science 1970, 168, 247 - 248.

VARIABLES:

T/K: 273.75 - 313.29

P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
273.75	0.9254 ± 0.0026	0.9274
293.26	0.8620 ± 0.0016	0.9255
313.29	0.8574 ± 0.0019	0.9834

The Bunsen coefficients are the mean of 4 and 5 measurements.

The Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The Scholander microgasometric technique as adapted by Douglas (1) was used. The equilibrium chamber was enlarged to contain approximately 10 ml of solvent. The procedures for degassing the water and transferring the gas were checked for air contamination by gas chromatography. All volumes were read on a micrometer which displaces mercury.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

1. Helium-3. Monsanto Research. Greater than 99.97 per cent helium with $^3He/^4He = 10^4$.

2. Water. No information given.

ESTIMATED ERROR:

Bunsen coefficient 0.3 per cent.

REFERENCES:

1. Douglas, E. J. Phys. Chem. 1964, 68, 169; ibid. 1965, 69, 2608.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Sea Water	H. L. Clever Department of Chemistry Emory University Atlanta, Georgia 30322 U.S.A. January 1978

CRITICAL EVALUATION:

Evaluation of the Solubility of Helium in Sea Water.

There are three reports of the solubility of helium in sea water (1,2,3). König (1) reports helium solubility values at four temperatures which he estimates to have an uncertainty of five percent. Weiss (2,3) reports four to five helium solubility values at each of five temperatures which he estimates to have an uncertainty of one-half of one percent. The three sets of data agree within the accuracy estimates of the two authors.

Presented here are the helium Bunsen solubility values determined by Weiss in water, sea water and in two dilutions of sea water. Weiss has fitted his data by the method of least squares to an equation for the natural logarithm of the Bunsen coefficient, α, which is consistent with both the integrated form of the Vant Hoff equation and the Setschenow salt effect equation. The equation, which is valid for the temperature range of 272.15 to 313.15 K and the salinity range of 0 to 40 S ‰ reproduced Weiss' helium Bunsen values with root-mean-square deviation of 2×10^{-5} at S ‰ = 18.152. The equation is

$$\ln \alpha = - 34.6261 + 43.0285 (100/T) + 14.1391 \ln (100/T)$$

$$+ S ‰ [-0.042340 + 0.022624 (T/100) - 0.0033120 (T/100)^2]$$

Weiss gave equations for the solubility of helium from moist air at one atm total pressure in units of ml He(STP) dm^{-3} sea water and ml He(STP) kg^{-1} sea water which assumed that the helium behaves as an ideal gas and has a mol fraction of 5.24×10^{-6} (3) in dry air. The equations are

$$\ln[\text{ml HE(STP) dm}^{-3}] = - 152.9405 + 196.8840 (100/T) + 126.8015 \ln (T/100)$$

$$- 20.6767 (T/100) + S ‰ [-0.040543 + 0.021315 (T/100)$$

$$- 0.0030732 (T/100)^2]$$

and

$$\ln[\text{ml He(STP) kg}^{-1}] = - 167.2178 + 216.3442 (100/T) + 139.2032 \ln (T/100)$$

$$- 22.6202 (T/100) + S ‰ [-0.044781 + 0.023541 (T/100)$$

$$- 0.0034266 (T/100)^2]$$

Weiss' paper (2) gives extensive tables of the helium Bunsen coefficient and of the ml He(STP) from moist air kg^{-1} sea water as a function of temperature and salinity as calculated from the above equations.

In addition to the natural helium solubility in sea water, Weiss also reports the solubility of ^3He in sea water. The ^3He solubility data sheet follows the natural helium solubility data sheet.

1. König, H. _Z. Naturforsch._ 1963, _18a_, 363.
2. Weiss, R. F. _J. Chem. Eng. Data_ 1971, _16_, 235.
3. Weiss, R. F. _Science_ 1970, _168_, 247.
4. Glukauf, E. _Proc. Roy. Soc._ A 1946, _185_, 98.
   and _Compendium of Meteorology_, American Meteorological Soc., Boston, MA 1951, 3 - 11.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Sea Water	Weiss, R. F. *J. Chem. Eng. Data* 1971, *16*, 235-241.
VARIABLES: T/K: 271.57 - 313.61 He P/kPa: 101.325 (1 atm) Salinity /mil^{-1}: 0 - 36.425	PREPARED BY: H.L.Clever, S.A.Johnson

EXPERIMENTAL VALUES:

Salinity ‰ 0.0		18.152		33.668		36.425	
T/K	Bunsen x 10^3	T/K	Bunsen x 10^3	T/K	Bunsen x 10^3	T/K	Bunsen x 10^3
273.75	9.361			271.57	7.977	273.21	7.766
273.75	9.353			271.57	7.978	273.21	7.736
273.75	9.356	278.21	8.346	271.57	7.980	273.21	7.795
273.75	9.351	278.22	8.387			273.22	7.764
		278.22	8.367	277.07	7.746	273.23	7.795
283.42	9.038	278.22	8.360	277.07	7.705		
283.43	9.008	278.22	8.371	277.07	7.714	283.72	7.554
283.44	8.978					283.72	7.475
283.44	8.978			283.11	7.610	283.72	7.538
283.44	9.000			283.11	7.637	283.72	7.471
				283.11	7.642	283.73	7.462
293.23	8.734						
293.25	8.716			293.40	7.535	293.27	7.464
293.26	8.752			293.40	7.511	293.29	7.409
293.26	8.700	298.29	8.018	293.40	7.537	293.29	7.402
293.26	8.746	298.29	8.034			293.30	7.405
293.28	8.695	298.29	8.033	298.26	7.453		
		298.30	8.037	298.26	7.474	303.28	7.402
303.37	8.602			298.26	7.503	303.29	7.457
303.39	8.612					303.29	7.407
303.39	8.635			303.50	7.510	303.30	7.431
303.39	8.601			303.50	7.532	303.30	7.435
303.39	8.607			303.50	7.496		
303.40	8.612					313.61	7.487
303.41	8.639					313.61	7.488
				313.31	7.646	313.61	7.471
313.29	8.667			313.31	7.637	313.61	7.501
313.29	8.750			313.31	7.642		
313.29	8.705						
313.30	8.729						

AUXILIARY INFORMATION

METHOD:	SOURCE AND PURITY OF MATERIALS:
Solubility determinations by the Scholander microgasometric technique as used by Douglas (1), with minor modification.	1. Helium. Air Reduction. Specified > 99.99 % pure. Gas chromatographic checks showed ≦ 0.01 % air. 2. Sea Water. Passed through 0.45 μ millipore filter and poisoned with 1 mg/l of $HgCl_2$.
APPARATUS/PROCEDURE: An equilibrium chamber, containing pure gas saturated with water vapor, is separated by mercury from a closed side chamber containing degassed water. The apparatus is tipped on its side, allowing degassed water to flow into the equilibrium chamber. Dissolution is aided by mechanical shaking.	ESTIMATED ERROR: $\delta T/K = 0.01°$ δsalinity = 0.004 % REFERENCES: 1. Douglas, E. *J. Phys. Chem.* 1964, *68*, 169. *ibid.* 1965, *69*, 2608.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Sea Water	Weiss, R.F. Science 1970, 168, 247-248.
VARIABLES: T/K: 273.21 - 313.61 P/kPa: 101.325 (1 atm) Salinity/mil^{-1}: 36.425	PREPARED BY: S.A.Johnson

EXPERIMENTAL VALUES:

T/K	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
273.21	0.7771 ± 0.0025	0.7773
293.28	0.7420 ± 0.0029	0.7967
313.61	0.7488 ± 0.0015	0.8597

The Bunsen coefficients are the mean of 4 or 5 measurements.

The Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:
The Scholander microgasometric technique as adapted by Douglas (1) was used. The equilibrium chamber was enlarged to contain approximately 10 ml solvent. The procedures for degassing the water and transferring the gas were checked for air contamination by gas chromatography. All volumes were read on a micrometer which displaced mercury.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

1. Helium. Air Reduction Co. Reactor grade, better than 99.99 percent He. The ratio $^3He/^4He$ was less than 10^{-6}.

2. Sea Water. No information given.

ESTIMATED ERROR:

REFERENCES:

1. Douglas, E.
J. Phys. Chem. 1964, 68, 169;
ibid. 1965, 69, 2608.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium-3; He: 14762-55-1 2. Sea Water	Weiss, R.F. *Science* 1970, 168, 247 - 248.
VARIABLES: T/K: 273.21 - 313.61 P/kPa: 101.325 (1 atm) Salinity/mil^{-1}: 36.425	PREPARED BY: S.A.Johnson

EXPERIMENTAL VALUES:

T/K	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
273.21	0.7655 ± 0.0012	0.7657
293.28	0.7339 ± 0.0009	0.7880
313.61	0.7346 ± 0.0028	0.8434

The Bunsen coefficients are the mean of four measurements.

The Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The Scholander microgasometric technique as adapted by Douglas (1) was used. The equilibrium chamber was enlarged to contain approximately 10 ml of solvent. The procedures for degassing the water and transferring the gas were checked for air contamination by gas chromatography. All volumes were read on a micrometer which displaced mercury.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

1. Helium-3. Monsanto Research. Greater than 99.97 per cent helium with $^3He/^4He = 10^4$.
2. Sea Water. No information given.

ESTIMATED ERROR:

Bunsen coefficient 0.4 per cent.

REFERENCES:

1. Douglas, E. *J. Phys. Chem.* 1964, 68, 169; *ibid.* 1965, 69, 2608.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Water; H_2O; 7732-18-5 3. Electrolyte	H. L. Clever Chemistry Department Emory University Atlanta, GA 30322 USA February 1978

CRITICAL EVALUATION: The Solubility of Helium in Electrolyte Solutions.

TABLE 1. The salt effect parameter, k_{SX}, for helium dissolved in various elctrolyte solutions.

Solvent System	T/K	$k_{SX} = (1/m) \log (X^o/X)$				
		Akerlof 1935 (3)	Morrison, Johnstone 1955 (4)	Clever, Reddy 1964 (7)	Feillolay, Lucas 1972 (6)	Shoor, Walker, Gubbins 1969 (5)
$KOH + H_2O$	298.15					0.15[a]
	313.15					0.15[a]
	333.15					0.15[a]
	353.15					0.15[a]
$HCl + H_2O$	298.15		0.023			
$HClO_4 + H_2O$	298.15	-0.034				
$HNO_3 + H_2O$	298.15		0.002			
$LiCl + H_2O$	298.15	-0.017	0.065			
$LiI + H_2O$	298.15	-0.028				
$NaCl + H_2O$	298.15	0.067	0.096			
$NaBr + H_2O$	298.15		0.102			
$KCl + H_2O$	298.15	0.069	0.083			
$KI + H_2O$	298.15		0.098			
$NaNO_3 + H_2O$	298.15	0.064				
$Na_2SO_4 + H_2O$	298.15		0.141			
$BaCl_2 + H_2O$	298.15		0.109			
$NH_4Cl + H_2O$	298.15		0.042			
$(CH_3)_4NI + H_2O$	298.15		0.014			
$(C_2H_5)_4NBr + H_2O$	298.15		-0.009			
$(C_4H_9)_4NBr + H_2O$	298.15				-0.017	
	308.15				-0.033	
$NaI + CH_3OH$	303.15			0.116		

a These values are $(1/C) \log (X^o/X)$, but for KOH solutions near unit molarity the molar and molal values differ by only about one percent. The values for $KOH + H_2O$ are a factor of 10 greater than reported in the original paper which appears to contain a decimal error.

There are four reports (3,4,5,6) of the solubility of helium at 1 atm in aqueous salt solutions, and there is one report (7) of the solubility of helium at 1 atm in a methanol and salt solution.

The results are summarized below as the Setschenow salt effect parameter, $k_{SX} = (1/m)\log(X°/X)$ where m is the salt molality and $X°/X$ is the mole fraction ratio of the helium solubility in the pure solvent, $X°$, to the helium solubility in the salt solution, X. This form of the salt effect parameter has come into use in the past several years as a result of the theoretical developments based on scaled particle theory (1,2).

Actually the theory defines the salt effect parameter as $k_{SC} = (1/C)\log(X°/X)$ in the limit $C \to 0$, where C is the electrolyte concentration in moles dm^{-3}. In the limit of infinite dilution k_{SC} and k_{SX} should go to the same value in aqueous solutions. Much of the literature's salt effect data are in the form of an $S°/S$ ratio where $S°$ is the gas volume (STP) dissolved

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Water; H_2O; 7732-18-5 3. Electrolyte	H. L. Clever Chemistry Department Emory University Atlanta, GA 30322 USA

CRITICAL EVALUATION:

in 1.000 kg of pure solvent, and S is the gas volume (STP) dissolved in the salt solution containing 1.000 kg of solvent.

The relationship between the X°/X and S°/S ratios is

$$X°/X = \frac{S°/V_m}{1000/M} \bigg/ \frac{S/V_m}{(1000/M) + m_M^+ + m_A^-}$$

where V_m is the molar volume of the gas at 273.15 K and 101.325 kPa (1 atm), and M is the solvent molecular weight, and m_{M+} and m_{A-} are the molalities of the salt cation and anion, respectively.

For a one molal solution of a 1 - 1 electrolytes dissolved in water

$$X°/X = 57.50\ S°/55.50\ S$$

and $k_{sx} = (1/1)\log(X°/X) = \log(S°/S) + \log(57.50/55.50) = \log S°/S + 0.015$

The salt effect parameters, k_{sx}, are summarized in Table 1.

Akerlof's (3) tabulation of values appears to contain several errors. Akerlof reports a helium in water Bunsen coefficient of 0.0086 which he compares with Lannung's earlier value of 0.0087. Akerlof appears to have used the Lannung value in his calculation of the salt effect parameters. We have recalculated the values using Akerlof's value for helium in water. In addition Akerlof's values of k_s for helium in aqueous LiCl and aqueous LiI are not consistent with the salt molalities and helium solubilities reported in the paper. They have been recalculated using the molalities and solubilities in the paper.

Both the Morrison and Johnstone (4) and the Akerlof (3) salt effect parameters are based on only two solubility measurements, the solubility of helium in pure water and the solubility of helium in one salt solution. Morrison and Johnstone used a salt concentration near 1 g. equivalent Kg^{-1} H_2O and estimate an uncertainty of 0.010 in k_s. Akerlof used much higher salt concentrations. Both Akerlof (3) and Morrison and Johnstone (4) report salt effect parameters for helium in LiCl, NaCl, and KCl solutions.

The k_{sx} values of the two laboratories do not agree within the expected experimental error for the three salt solutions. The k_{sx} values for aqueous LiCl even differ in sign. The difference in values may reflect a concentration effect on k_{sx} but more experimental work is needed to confirm such an effect. At present we recommend the Morrison and Johnstone values as the more probable values, especially for comparison with theories that apply in the limit of infinite dilution.

Both Shoor, Walker and Gubbins (5) and Feillolay and Lucas (6) carried out their studies as a function of both temperature and salt concentration. Both of their data sets appear to be internally consistent, and are recommended as tentative values. Feillolay and Lucas (6) have theoretical reasons to suggest the k_s values go through a maximum at a salt concentration some place between 1 and 2 molal. Their experimental data appear to show the predicted trend at two temperatures, but more studies of this point are needed to make a convincing case. In Table 1 we have recorded only the average k_{sx} value, but Feillolay and Lucas' complete set of data are given on the data page for their paper.

The k_{sx} value for helium dissolved in NaI and CH_3OH based on the report of Clever and Reddy (7) appears to fall within the same numerical range expected for helium in NaI and H_2O. The value contains uncertainties because of assumptions about the solution vapor pressure and the validity of Henry's law in the system.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Water; H_2O; 7732-18-5 3. Electrolyte	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA

CRITICAL EVALUATION:

1. Shoor, S. K.; Gubbins, K. E. J. Phys. Chem. 1969, 73, 498.
2. Masterton, W. L.; Lee, T. P. J. Phys. Chem. 1970, 74, 1776.
3. Akerlof, G. J. Am. Chem. Soc. 1935, 57, 1196.
4. Morrison, T. S.; Johnstone, N. B. B. J. Chem. Soc. 1955, 3655.
5. Shoor, S. K.; Walker, R. D., Jr.; Gubbins, K. E. J. Phys. Chem. 1969, 73, 312.
6. Feillolay, A.; Lucas, M. J. Phys. Chem. 1972, 76, 3068.
7. Clever, H. L.; Reddy, G. S. J. Chem. Eng. Data 1963, 8, 191.

ADDED NOTE. Mishnina, Avdeeva, and Bozhovskaya (8) give a table of smoothed values of Bunsen coefficients for helium dissolved in aqueous sodium chloride solutions. The table was prepared from the water solubility data of Morrison and Johnstone (9) and the helium solubility in sodium chloride solution of Cherepennikov (10). The Cherepennikov paper was not available to the Evaluator, and the Setschenow parameters were not included in the evaluation. However, a data sheet is included which shows the smoothed Bunsen coefficients from 278.15 - 318.15 K and NaCl concentrations from 0 - 5.4 g eq dm^{-3}, and the Setschenow parameters at five degree intervals over the 40 degree range as quoted by Mishnina, Avdeeva, and Bozhovskaya (8).

8. Mishnina, T.A.; Avdeeva, O.I.; Bozhovskaya, T.K. Materialy Vses. Nauchn. Issled. Geol. Inst. 1961, 46, 93.
9. Morrison, T.J.; Johnstone, N.B. J. Chem. Soc. 1954, 3441.
10. Cherepennikov, A. A. Coll. Reports of the Sci. Conf. 1958, LICI, L.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Water; H_2O; 7732-18-5
3. Acids

ORIGINAL MEASUREMENTS:

Morrison, T.J.; Johnstone, N.B.B.

J. Chem. Soc. 1955, 3655-3659.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

T.D.Kittredge, H.L.Clever

EXPERIMENTAL VALUES:

T/K	$k_S = (1/m) \log (S^o/S)$	$k_{SX} = (1/m) \log (X^o/X)$
Hydrochloric acid; HCl; 7647-01-0		
298.15	0.008	0.023
Nitric acid; HNO_3; 7697-37-2		
298.15	-0.013	+0.002

The values of the Setschenow salt effect parameters, k_S, were apparently determined from only two solubility measurements. They were the solubility of helium in pure water, S^o, and the solubility of helium in a near one equivalent of acid per 1.000 kg of water solution, S. Neither solubility value is given in the paper. The S^o/S ratio was referenced to a solution containing 1.000 kg of water. The compiler calculated the salt effect parameter k_{SX} from the mole fraction solubility ratio X^o/X. The acids were assumed to be 100 per cent ionized and both cation and anion were used in the mole fraction calculation.

AUXILIARY INFORMATION

METHOD:

Gas absorption in a flow system.

APPARATUS/PROCEDURE:

The previously degassed solvent flows in a thin film down an absorption spiral containing helium gas plus solvent vapor at a total pressure of 1 atm. The volume of gas absorbed is measured in attached calibrated burets (1).

SOURCE AND PURITY OF MATERIALS:

1. Helium. British Oxygen Co. Ltd.
2. Water. No information given.
3. Acids. No information given.

ESTIMATED ERROR:

$\delta k_s = 0.010$

REFERENCES:

1. Morrison, T.J.;Billett, F. *J. Chem. Soc.* 1952, 3819.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Water; H_2O; 7732-18-5 3. Perchloric Acid; $HClO_4$; 7601-90-3	Akerlof, G. J. Am. Chem. Soc. 1935, 57, 1196-1201.
VARIABLES: T/K: 298.15 P/kPa: 101.325 (1 atm)	PREPARED BY: T.D.Kittredge, H.L.Clever

EXPERIMENTAL VALUES:

T/K	He Solubility dm^3 (STP) / 1.000 kg H_2O	mol acid / 1.000 kg H_2O	$k_S = (1/m)\log(S^o/S)$	$k_{SX} = (1/m)\log(X^o/X)$
298.15	0.0086	0.0	-	-
	0.0187	6.89	-0.049	-0.034

The paper is not clear as to whether the solubility of helium in the salt solution is for 1.000 kg of H_2O or for 1.000 kg of solution. The salt effect parameter, k_{SX}, was calculated by the compiler assuming that the helium solubility was for salt solution containing 1.000 kg water.

AUXILIARY INFORMATION

METHOD: Gas absorption. The helium was presaturated with water vapor, the solvent salt concentration was determined by a density measurement, and the solvent volume was measured by displacement of an equivalent volume of mercury. The gas-liquid interface was gently stirred for two hours, although equilibrium appeared to be established within a matter of minutes.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

1. Helium. Source not given. Gas stated to be 98 per cent He with N_2 the impurity present in the greatest amount.
2. Water. No information given.
3. Perchloric acid. No information.

ESTIMATED ERROR:

$\delta T/K = 0.01$

REFERENCES:

COMPONENTS:

1. Helium; He; 7440-59-7
2. Water; H_2O; 7732-18-5
3. Ammonium Type Salts

ORIGINAL MEASUREMENTS:

Morrison, T.J.; Johnstone, N.B.B.

J. Chem. Soc. 1955, 3655 - 3659.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

T.D.Kittredge, H.L.Clever

EXPERIMENTAL VALUES:

T/K	$k_s = (1/m) \log (S^o/S)$	$k_{sX} = (1/m) \log (X^o/X)$
Ammonium chloride ; NH_4Cl; 12125-02-9		
298.15	0.027	0.042
N, N, N-Trimethyl methanaminium iodide (Tetramethyl ammonium iodide); $C_4H_{12}NI$; 75-58-1		
298.15	-0.001	+0.014
N, N, N-Triethyl ethanaminium bromide (Tetraethyl ammonium bromide); $C_8H_{20}NBr$; 71-91-0		
298.15	-0.024	-0.009

The values of the Setschenow salt effect parameters, k_s, were apparently determined from only two solubility measurements. They were the solubility of helium in pure water, S^o, and the solubility of helium in a near one equivalent of salt per 1.000 kg of water solution, S. Neither solubility value is given in the paper. The S^o/S ratios are referenced to a solution containing 1.000 kg of water. The compiler calculated the salt effect parameter k_{sX} from the mole fraction solubility ratio X^o/X. The salts were assumed to be 100 per cent ionized and cation and anion were summed together in the mole fraction calculation.

AUXILIARY INFORMATION

METHOD:

Gas absorption in a flow system.

APPARATUS/PROCEDURE:

The previously degassed solvent flows in a thin film down an absorption spiral containing helium gas plus solvent vapor at a total pressure of 1 atm. The volume of the gas absorbed is measured in attached calibrated burets.(1).

SOURCE AND PURITY OF MATERIALS:

1. Helium. British Oxygen Co. Ltd.
2. Water. No information given.
3. Salts. No information given.

ESTIMATED ERROR:

$\delta k_s = 0.010$

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1952, 3819.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Water; H_2O; 7732-18-5
3. N,N,N-Tributyl-1-butanaminium Bromide (Tetrabutyl Ammonium Bromide); $C_{16}H_{36}NBr$ 1643-19-2

ORIGINAL MEASUREMENTS:

Feillolay, A.;Lucas, M.

J. Phys. Chem. 1972, 76, 3068 - 3072.

VARIABLES:

T/K: 298.15 - 308.15

Salt/mol kg^{-1} H_2O: 0 - 4

PREPARED BY:

P.L.Long, H.L.Clever

EXPERIMENTAL VALUES:

T/K	Solubility ml He (STP) kg^{-1} H_2O	Salt mole kg^{-1} H_2O	$k_s = (1/m)\log(S^o/S)$
298.15	8.52, 8.53, 8.54	0.0	-
	8.77	0.264	-0.046
	8.66	0.270	-0.024
	8.91	0.475	-0.040
	8.90	0.496	-0.037
	8.94	0.524	-0.039
	8.94	0.545	-0.037
	8.95	0.557	-0.037
	9.09	0.797	-0.035
	9.09	0.831	-0.033
	9.18	0.839	-0.038
	9.08	0.853	-0.032
	8.89	1.105	-0.016
	9.08	1.513	-0.018
	9.08	1.644	-0.017
	10.65	3.421	-0.028
	11.07	3.454	-0.033
	10.92	3.455	-0.031
	11.50	4.023	-0.032
308.15	8.35, 8.34, 8.30	0.0	-
	8.89	0.522	-0.054
	8.97	0.530	-0.061
	9.13	0.820	-0.049
	9.21	0.830	-0.053
	9.65	1.636	-0.039
	11.70	3.460	-0.043
	11.82	3.465	-0.044
	12.70	4.030	-0.045

AUXILIARY INFORMATION

METHOD:

APPARATUS/PROCEDURE: The apparatus is modeled after the apparatus used by Hung (1). The procedure was the same as that used by Hung except that the time allowed for equilibration is longer. In the present work the gas-liquid equilibration required about 16 hours.

SOURCE AND PURITY OF MATERIALS:

1. Helium. l'Air Liquide. Stated to be of 99.99 per cent purity.
2. Water. No information given.
3. N,N,N-Tributyl-1-butanaminium bromide. Southwestern Analytical Chemical. Polarographic grade, used as received.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Hung, J.H. 1968, Ph.D. thesis, Clark University, Worcester, MA.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Water; H_2O; 7732-18-5
3. Barium Chloride; $BaCl_2$; 10361-37-2

ORIGINAL MEASUREMENTS:

Morrison, T.J.; Johnstone, N.B.B.

J. Chem. Soc. 1955, 3655 - 3659.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

T.D.Kittredge, H.L.Clever

EXPERIMENTAL VALUES:

T/K	k_s = (1/m) log (S^o/S)	k_{sX} = (1/m) log (X^o/X)
298.15	0.086	0.109

The value of the Setschenow salt effect parameter, k_S, was apparently determined from only two solubility measurements. They were the solubility of helium in pure water, S^o, and the solubility of helium in a near one equivalent of salt per kg of water solution, S. The S^o/S ratio was referenced to a solution containing 1.000 kg of water. The compiler calculated the salt effect parameter, k_{SX}.

AUXILIARY INFORMATION

METHOD:

Gas absorption in a flow system.

APPARATUS/PROCEDURE:

The previously degassed solvent flows in a thin film down an absorption spiral containing helium gas plus solvent vapor at a total pressure of 1 atm. The volume of gas absorbed is measured in attached calibrated burets (1).

SOURCE AND PURITY OF MATERIALS:

1. Helium. British Oxygen Co. Ltd.
2. Water. No information given.
3. Barium chloride. No information given.

ESTIMATED ERROR:

$\delta k_s = 0.010$

REFERENCES:

Morrison, T.J.; Billett, F. J. Chem. Soc. 1952, 3819.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Water; H_2O; 7732-18-5

3. Potassium Hydroxide; KOH; 1310-58-3

ORIGINAL MEASUREMENTS:

Shoor, S.K.;Walker, R.D.; Gubbins, K.E.

J. Phys. Chem. 1969, 73, 312 - 317.

VARIABLES:

T/K: 298.15 - 353.15

KOH/mol dm^{-3}: 0 - 7.60

PREPARED BY:

P.L.Long, H.L.Clever

EXPERIMENTAL VALUES:

T/K	Helium Solubility Mol Fraction x 10^6	Solubility Ratio X^o/X	Potassium Wt %	Hydroxide mol dm^{-3}	$k_s = \frac{\log (X^o/X)}{C}$
298.15	6.7	1.00	0.00	0.00	-
		1.39	5.00	0.92	0.155
		1.75	9.00	1.70	0.143
		3.57	19.00	3.99	0.139
		13.1	32.40	7.60	0.147
313.15	6.7	1.00	0.00	0.00	-
		1.36	5.00	0.92	0.145
		1.73	9.00	1.70	0.140
		3.71	19.00	3.99	0.142
		12.7	32.40	7.60	0.145
333.15	7.2	1.00	0.00	0.00	-
		1.39	5.00	0.92	0.155
		1.96	9.00	1.70	0.172
		3.59	19.00	3.99	0.139
		13.0	32.40	7.60	0.147
353.15	8.0	1.00	0.00	0.00	-
		1.44	5.00	0.92	0.172
		1.89	9.00	1.70	0.163
		3.77	19.00	3.99	0.144
		13.7	32.40	7.60	0.150

The k_s values were calculated by the compiler. There appears to be a factor of 10 error in the original paper. The KOH molarities are at 298.15 K.

AUXILIARY INFORMATION

METHOD:

Gas chromatograph (1).

APPARATUS/PROCEDURE:

Gas chromatographic analysis, thermal conductivity detector, nitrogen carrier gas. The helium saturated solutions were prepared by bubbling the gas through presaturators and then through the KOH solution. Samples were withdrawn from the solution over a period of 48 hours to determine equilibrium. Samples transfered from saturator to gas chromatograph in gas-tight Hamilton syringes.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Source not given. Minimum purity 99.99 per cent.
2. Water. Distilled and degassed in glass-teflon still.
3. Potassium hydroxide. Baker Analyzed reagent grade which contained a maximum of 1 % K_2CO_3. KOH solutions protected from atm CO_2.

ESTIMATED ERROR:

$\delta T/K = 0.05$

REFERENCES:

Gubbins, K.E.; Carden, S.N.; Walker, R. D. J. Gas Chromatog. 1965, 3, 98.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Water; H_2O; 7732-18-5
3. Alkali Halides

ORIGINAL MEASUREMENTS:

Akerlof, G.

J. Am. Chem. Soc. 1935, 57, 1196-1201.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

T.D.Kittredge, H.L.Clever

EXPERIMENTAL VALUES:

T/K	He solubility dm^3 (STP) / 1.000 kg H_2O	mol salt / 1.000 kg H_2O	$(1/m)\log(S^o/S) = k_s$	$(1/m)\log(X^o/X) = k_{sX}$
Lithium Chloride; LiCl; 7447-41-8				
298.15	0.0086	0.0		
	0.0136	6.18	-0.032	-0.017
Lithium Iodide; LiI; 10377-51-2				
298.15	0.0086	0.0		
	0.0109	2.40	-0.043	-0.028
Sodium Chloride; NaCl; 7647-14-5				
298.15	0.0086	0.0		
	0.0043	5.81	0.052	0.067
Potassium Chloride; KCl; 7447-40-7				
298.15	0.0086	0.0		
	0.0048	4.72	0.054	0.069

The paper is not clear as to whether the solubility of helium in the salt solutions is for 1.000 kg of H_2O or for 1.000 kg of solution. The salt effect parameter, k_{sX}, was calculated by the compiler, assuming the solubility was for 1.000 kg H_2O.

AUXILIARY INFORMATION

METHOD: Gas absorption. The helium was presaturated with water vapor, the solvent salt concentration was determined by a density measurement, and the solvent volume was measured by displacement of an equivalent volume of mercury. The gas-liquid interface was gently stirred for two hours, although equilibrium appeared to be established within a matter of minutes.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

1. Helium. Source not given. 98 per cent He with N_2 the impurity present in the greatest amount.
2. Water. No information given.
3. Alkali Halides. No information given.

ESTIMATED ERROR: $\delta T/K = 0.01$

REFERENCES:

COMPONENTS:

1. Helium; He; 7440-59-7
2. Water; H_2O; 7732-18-5
3. Alkali Halides

ORIGINAL MEASUREMENTS:

Morrison, T.J.; Johnstone, N.B.B.

J. Chem. Soc. 1955, 3655 - 3659.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

T.D.Kittredge

EXPERIMENTAL VALUES:

T/K	$k_s = (1/m) \log (S^o/S)$	$k_{sX} = (1/m) \log (X^o/X)$
Lithium Chloride; LiCl; 7447-41-8		
298.15	0.050	0.065
Sodium Chloride; NaCl; 7647-14-5		
298.15	0.081	0.096
Sodium Bromide; NaBr; 7647-15-6		
298.15	0.087	0.102
Potassium Chloride; KCl; 7447-40-7		
298.15	0.068	0.083
Potassium Iodide; KI; 7681-11-0		
298.15	0.083	0.098

The values of the Setschenow salt effect parameters, k_s, were apparently determined from only two solubility measurements. They were the solubility of helium in pure water, S^o, and the solubility of helium in a near one equivalent of salt per kg of water solution, S. The S^o/S ratio was referenced to a solution containing 1.000 kg of water. The compiler calculated the salt effect parameter k_{sX} from the mole fraction solubility ratio X^o/X.

AUXILIARY INFORMATION

METHOD:

Gas absorption in a flow system.

APPARATUS/PROCEDURE:

The previously degassed solvent flows in a thin film down an absorption spiral containing helium gas plus solvent vapor at a total pressure of 1 atm. The volume of gas absorbed is measured in attached calibrated burets (1).

SOURCE AND PURITY OF MATERIALS:

1. Helium. British Oxygen Co. Ltd.
2. Water. No information given.
3. Alkali Halides. No information given.

ESTIMATED ERROR:

$\delta k_s = 0.010$

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1952, 3819.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Water; H_2O; 7732-18-5
3. Sodium Chloride; NaCl; 7647-14-5

ORIGINAL MEASUREMENTS:

Mishnina, T.A.; Avdeeva, O.I.; Bozhovskaya, T.K.

Materialy Vses. Nauchn. Issled. Geol. Inst. 1961, 46, 93 - 110.

VARIABLES:

T/K: 278.15 - 318.15
NaCl/ g eq dm^{-3}: 0 - 5.4
P/kPa: 101.325 (1 atm)

PREPARED BY:

A. L. Cramer

EXPERIMENTAL VALUES:

NaCl/g eq dm^{-3} → T/K ↓	Bunsen Coefficient, $\alpha \times 10^3$												Setschenow Parameter, k_s
	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.4	
278.15	9.4	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	0.073
283.15	9.1	8.3	7.6	7.0	6.4	5.9	5.4	5.0	4.6	4.2	3.9	3.6	0.074
288.15	8.8	8.0	7.4	6.8	6.2	5.7	5.3	4.8	4.4	4.2	3.7	3.5	0.076
293.15	8.6	7.9	7.2	6.6	6.0	5.5	5.0	4.6	4.2	3.9	3.6	3.3	0.077
298.15	8.5	7.8	7.1	6.5	5.9	5.4	4.9	4.5	4.1	3.8	3.4	3.2	0.079
303.15	8.4	7.7	6.9	6.4	5.8	5.3	4.8	4.4	4.0	3.7	3.3	3.1	0.080
308.15	8.4	7.6	6.9	6.3	5.8	5.2	4.8	4.3	4.0	3.6	3.3	3.0	0.082
313.15	8.4	7.6	6.9	6.3	5.7	5.2	4.7	4.3	3.9	3.5	3.2	2.8	0.084
318.15	8.5	7.6	6.9	6.3	5.7	5.2	4.7	4.3	3.9	3.5	3.2	2.9	0.086

AUXILIARY INFORMATION

METHOD:

The table of smoothed Bunsen coefficients of helium dissolved in aqueous sodium chloride solutions was prepared by the authors from the data of Morrison and Johnstone (1) and of Cherepennikov (2). The secondary source of data is used because the original Cherepennikov solubility data was not available to the compiler.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

No information given.

ESTIMATED ERROR:

REFERENCES:

1. Morrison, T.J.; Johnstone, N.B. J. Chem. Soc. 1954, 3441.
2. Cherepennikov, A.A. Coll. Reports of the Sci. Conf. 1958, LICI, L.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Water; H_2O; 7732-18-5 3. Sodium Sulfate; Na_2SO_4; 7757-82-6	Morrison, T.J.; Johnstone, N.B.B. *J. Chem. Soc.* 1955, 3655 - 3659
VARIABLES: T/K: 298.15 P/kPa: 101.325 (1 atm)	PREPARED BY: T.D.Kittredge, H.L.Clever

EXPERIMENTAL VALUES:

T/K	k_s = (1/m) log (S^o/S)	k_{sX} = (1/m) log (X^o/X)
298.15	0.118	0.141

The value of the Setschenow salt effect parameter, k_s, was apparently determined from only two solubility measurements. They were the solubility of helium in pure water, S^o, and the solubility of helium in a near one equivalent of salt per 1.000 kg of water solution, S. The S^o/S ratio was referenced to a solution containing 1.000 kg of water. The compiler calculated the salt effect parameter, k_{sX}.

AUXILIARY INFORMATION

METHOD:

Gas absorption in a flow system.

APPARATUS/PROCEDURE:

The previously degassed solvent flows in a thin film down an absorption spiral containing helium gas plus solvent vapor at a total pressure of 1 atm. The volume of gas absorbed is measured in attached calibrated burets (1).

SOURCE AND PURITY OF MATERIALS:

1. Helium. British Oxygen Co., Ltd.
2. Water. No information given.
3. Sodium Sulfate. No information given

ESTIMATED ERROR:

δk_s = 0.010

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1952, 3819.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Water; H_2O; 7732-18-5
3. Sodium Nitrate; $NaNO_3$;7631-99-4

ORIGINAL MEASUREMENTS:

Akerlof, G.

J. Am. Chem. Soc. 1935, 57,1196-1201.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

T.D.Kittredge, H.L.Clever

EXPERIMENTAL VALUES:

T/K	He solubility dm^3 (STP) He / 1.000 kg H_2O	mol salt / 1.000 kg H_2O	k_s = (1/m) log(S^o/S)	k_{sX} = (1/m) log(X^o/X)
298.15	0.0086	0.0	-	-
	0.0039	6.95	0.049	0.064

The paper is not clear as to whether the solubility of helium in the salt solution is for 1.000 kg of H_2O or for 1.000 kg solution. The salt effect parameter, k_{sX}, was calculated by the compiler, assuming that the helium solubility was for salt solution containing 1.000 kg H_2O.

AUXILIARY INFORMATION

METHOD: Gas absorption. The helium was presaturated with water vapor, the solvent salt concentration was determined by a density measurement, and the solvent volume was measured by displacement of an equivalent volume of mercury. The gas-liquid interface was gently stirred for two hours, although equilibrium appeared to be established within a matter of minutes.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

1. Helium. Source not given. Gas stated to be 98 per cent He with N_2 the impurity present in the greatest amount.
2. Water. No information given.
3. Sodium Nitrate. No information.

ESTIMATED ERROR:

$\delta T/K = 0.01$

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Methanol; CH_4O; 67-56-1 3. Sodium Iodide; NaI; 7681-82-5	Clever, H.L.;Reddy, G.S. J. Chem. Eng. Data 1963, 8, 191 - 192.
VARIABLES: T/K: 303.15 NaI/mol dm^{-3}: 0 - 3.53 Total P/kPa: 101.325 (1 atm)	PREPARED BY: S.A.Johnson

EXPERIMENTAL VALUES:

T/K	Ostwald Coefficient L x 10^2	Solubility Ratio S^o/S	Sodium Iodide mol dm^{-3}	Salt Effect Parameters k_{sC}	k_{sm}	k_{sX}
303.15	3.75 (S^o)	1.0	0.0			
	3.52	1.065	0.171	0.254	0.198	0.116
	2.92	1.285	0.419			
	1.69	2.225	1.32	(Values at infinite dilution)		
	1.46	2.560	2.31			
	1.10	3.395	2.82			
	0.90	4.165	3.53			

The salt effect parameters are: $k_{sC} = (1/C)\log(S^o/S)$

$k_{sm} = (1/m)\log(S^o/S)$

$k_{sX} = (1/m)\log(X^o/X)$

where c is the NaI concentration in mol dm^{-3} of solution, m is the NaI concentration in mol kg^{-1} of methanol, S^o/S is the Ostwald coefficient of solubility ratio, and X^o/X is the mol fraction solubility ratio assuming 100 per cent dissociation of the NaI.

The density of the methanol + NaI solution as a function of NaI molarity is:

$$\rho/\text{g cm}^{-3} = 0.781 + 0.129\ C$$

AUXILIARY INFORMATION

METHOD:

APPARATUS/PROCEDURE: The apparatus was modeled after that of Markham and Kobe (1). A length of TRUEBORE tubing of 0.4643 cm^2 crossection was used as the gas buret. The volume of helium, presaturated with solvent vapor, taken up by 103.1 cm^3 of solution was measured.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Regular grade, stated to be 99.99 per cent pure.
2. Methanol. Merck Anhydrous.
3. Sodium Iodide. Baker, Analyzed Reagent Grade.

ESTIMATED ERROR:

REFERENCES:

1. Markham, A.E.;Kobe, K.A. J. Am. Chem. Soc. 1941, 63, 449.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Ethanol (Ethyl Alcohol); C_2H_6O; 64-17-5
3. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Cargill, R.W.

J. Chem. Soc., Faraday Trans. 1. 1978, 74, 1444 - 1456.

VARIABLES:
T/K: 277.35 - 335.15
He P/kPa: 101.325 (1 atm)
Ethanol/X_2: 0.0 - 0.982

PREPARED BY:

P.L.Long

EXPERIMENTAL VALUES:

Ethanol Mol Fraction	T/K	10^4T^{-1}	log(S/cm^3 kg^{-1})	S/cm^3 kg^{-1}
0.00*	278.35	35.93	0.970	9.33
	284.05	35.21	0.961	9.14
	294.45	33.97	0.930	8.51
	332.35	30.09	0.953	8.97
0.008	277.35	36.06	0.976	9.46
	278.75	35.88	0.968	9.29
	285.45	35.04	0.954	8.99
	294.15	34.00	0.945	8.81
	303.95	32.90	0.936	8.63
	314.25	31.83	0.937	8.65
	324.55	30.81	0.959	9.10
	332.75	30.06	0.964	9.20
0.021	277.85	36.00	0.978	9.51
	285.25	35.07	0.954	8.99
	294.25	33.99	0.950	8.91
	313.15	31.94	0.941	8.73
	322.95	30.95	0.961	9.14
	332.65	30.07	0.979	9.53
0.048	277.35	36.06	0.967	9.27
	285.75	35.01	0.958	9.08
	295.35	33.87	0.947	8.85
	303.75	32.93	0.953	8.97
	314.25	31.83	0.952	8.95
	323.85	30.88	0.971	9.35
	334.45	29.90	0.980	9.55

*Values in water. For other helium + water solubility values from the same laboratory see reference 3 data sheet.

AUXILIARY INFORMATION

METHOD: Absorption of gas by a thin film of liquid. Modification of the Morrison and Billett method. Modifications include replacing Valve A with a constant-flow pump (Watson-Marlow MHRE/22, with Neoprene tubing), and measuring the mass of the solvent leaving the absorption tube (instead of the volume) on a top-pan balance (1). The solubility, S, is reported as cm^3 He, at 273.15 K and 101.325 kPa, absorbed in 1.000 kg solvent.

APPARATUS/PROCEDURE: Modification of the Morrison and Billet apparatus. The solvent is degassed using the vapor-pump principle (1). Each determination contains about 20 cm^3 of gas in up to 500 cm^3 of solvent, which is then recycled. The density of the solution is checked after each run, so that the exact composition of the solution can be determined (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium.
2. Ethanol.
3. Water.

ESTIMATED ERROR:

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; Ibid. 1952, 3819.
2. International Critical Tables 1928, III, 116-119.
3. Morrison, T. J.; Johnstone, N. B. J. Chem. Soc. 1954, 3441.

COMPONENTS:	
1. Helium; He; 7440-59-7	Cargill, R. W
2. Ethanol; (Ethyl Alcohol); C_2H_6O 64-17-5	J. Chem. Soc., Faraday Trans. 1. 1978, 74, 1444 - 1456.
3. Water; H_2O; 7732-18-5	

Ethanol Mol Fraction	T/K	10^4T^{-1}	$\log(S/cm^3\ kg^{-1})$	$S/cm^3\ kg^{-1}$
0.075	281.55	35.53	0.951	8.93
	285.45	35.04	0.940	8.71
	298.75	33.48	0.952	8.95
	313.65	31.89	0.969	9.31
	329.85	30.31	1.001	10.0
0.099	277.85	36.00	0.927	8.45
	285.35	35.05	0.926	8.43
	294.15	34.00	0.936	8.63
	304.05	32.89	0.945	8.81
	312.55	32.00	0.963	9.18
	323.55	30.94	1.000	10.0
	333.45	29.99	1.049	11.2
0.180	279.05	35.84	0.936	8.63
	289.25	34.58	0.967	9.27
	298.85	33.47	0.986	9.68
	309.75	32.29	1.039	10.9
	321.15	31.24	1.105	12.7
	332.85	30.05	1.160	14.5
0.216	278.35	35.93	0.937	8.65
	286.55	34.91	0.962	9.16
	295.85	33.81	1.007	10.2
	304.65	32.83	1.039	10.9
	315.35	31.72	1.117	13.1
	324.65	30.80	1.145	14.0
	335.05	29.85	1.227	16.9
0.312	279.05	35.84	1.003	10.1
	289.45	34.55	1.075	11.9
	298.75	33.48	1.123	13.3
	309.75	32.29	1.176	15.0
	321.85	31.07	1.266	18.5
	333.35	30.00	1.336	21.7
0.410	278.35	35.95	1.111	12.9
	286.65	34.90	1.131	13.5
	295.65	33.83	1.204	16.0
	305.15	32.78	1.248	17.7
	314.95	31.76	1.310	20.4
	324.65	30.80	1.340	21.9
	335.15	29.84	1.446	27.9
0.585	278.55	35.90	1.254	17.9
	288.75	34.64	1.290	19.5
	297.65	33.60	1.337	21.7
	310.85	32.18	1.411	25.8
	321.25	31.13	1.455	28.5
0.677	279.65	35.76	1.320	20.9
	288.75	34.80	1.363	23.1
	299.05	33.44	1.408	25.6
	309.65	32.30	1.462	29.0
	320.55	31.20	1.516	32.8
	332.65	30.07	1.605	40.3
0.885	278.55	35.90	1.432	27.0
	294.85	33.92	1.513	32.6
	314.25	31.83	1.602	40.0
	328.75	30.42	1.652	44.9
0.982	278.85	35.87	1.484	30.5
	289.15	34.59	1.541	34.8
	299.15	33.43	1.584	38.4
	309.15	32.35	1.642	43.9
	320.15	31.24	1.702	50.4
	333.15	30.02	1.789	61.5

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. 2-Methyl-2-propanol (t-Butanol); $C_4H_{10}O$; 75-65-0 3. Water; H_2O; 7732-18-5	R. W. Cargill *J. Chem. Soc., Faraday Trans. 1.* 1978, *74*, 1444 - 1456.
VARIABLES: T/K: 277.45 - 334.25 Mole Fractions (x): 0.00 - 0.854	**PREPARED BY:** P. L. Long

EXPERIMENTAL VALUES:

t-Butanol Mol Fraction	T/K	10^4T^{-1}	$\log(S/cm^3\ kg^{-1})$	$S/cm^3\ kg^{-1}$
0.00*	278.35	35.93	0.970	9.33
	284.05	35.21	0.961	9.14
	294.45	33.97	0.930	8.51
	332.35	30.09	0.953	8.97
0.006	277.75	36.01	0.984	9.64
	286.05	34.97	0.962	9.16
	293.75	34.05	0.946	8.83
	304.75	32.82	0.944	8.79
	314.35	31.82	0.952	8.95
	323.55	30.91	0.952	8.95
	333.45	29.99	0.963	9.18
0.011	277.85	36.00	0.979	9.53
	285.15	35.08	0.960	9.12
	294.75	33.93	0.942	8.75
	304.65	32.83	0.942	8.75
	313.15	31.94	0.941	8.73
	324.05	30.86	0.954	8.99
	333.85	29.97	0.967	9.27
0.029	278.25	35.94	0.944	8.79
	285.75	35.01	0.930	8.51
	294.85	33.92	0.933	8.57
	303.15	32.99	0.946	8.83
	318.95	31.36	0.970	9.33
0.046	277.45	36.05	0.907	8.07
	279.15	35.83	0.907	8.07

*Values in water. For other helium + water solubility values from the same laboratory see reference 3 data sheet.

AUXILIARY INFORMATION

METHOD: Absorption of gas by a thin film of liquid. Modification of the Morrison and Billett method. Modifications include replacing Valve A with a constant-flow pump (Watson-Marlow MHRE/22, with Neoprene tubing), and measuring the mass of the solvent leaving the absorption tube (instead of the volume) on a top-pan balance (1). The solubility, S, is reported as cm^3 He at 273.15 K and 101.325 kPa absorbed in 1.000 kg solvent.

APPARATUS/PROCEDURE: Modified Morrison and Billet apparatus. The solvent was degassed using the vapor-pump principle (1). Each determination contained about 20 cm^3 of gas in up to 500 cm^3 of solvent, which was then recycled. The density of the solution was checked after each run, so that the exact composition of the solution could be determined (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium.
2. t-Butanol.
3. Water.

ESTIMATED ERROR:

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033. *ibid.* 1952, 3819.
2. *International Critical Tables* 1928, *III*, 113.
3. Morrison, T. J.; Johnstone, N. B. *J. Chem. Soc.* 1954, 3441.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7	R. W. Cargill
2. 2-Methyl-2-propanol (*t*-Butanol); $C_4H_{10}O$; 75-65-0	*J. Chem. Soc., Faraday Trans. 1.* 1978, *74*, 1444 - 1456.
3. Water; H_2O; 7732-18-5	

t-Butanol Mol Fraction	T/K	10^4T^{-1}	$\log(S/cm^3\ kg^{-1})$	$S/cm^3\ kg^{-1}$
0.046	285.15	35.08	0.906	8.05
	294.85	33.92	0.921	8.34
	304.15	32.88	0.931	8.53
	313.85	31.87	0.981	9.57
	324.05	30.86	1.009	10.2
	333.35	30.00	1.047	11.1
0.072	278.15	35.96	0.928	8.47
	286.65	34.90	0.933	8.57
	296.75	33.70	0.960	9.12
	306.05	32.68	0.984	9.64
	320.65	31.19	1.045	11.1
	331.65	30.16	1.106	12.8
0.102	282.15	35.45	0.980	9.55
	299.55	33.38	1.017	10.4
	308.15	32.46	1.035	10.8
	318.35	31.42	1.095	12.4
	332.75	30.06	1.170	14.8
0.144	277.95	35.98	0.987	9.71
	286.85	34.87	1.039	10.9
	299.45	33.40	1.094	12.4
	307.45	32.53	1.142	13.9
	322.05	31.06	1.201	15.9
	333.85	29.96	1.245	17.6
0.314	278.05	35.97	1.215	16.4
	287.25	34.82	1.261	18.2
	296.55	33.72	1.300	20.0
	308.35	32.44	1.359	22.9
	321.75	31.08	1.413	25.9
	333.85	29.96	1.485	30.5
0.530	277.45	36.05	1.351	22.4
	287.25	34.82	1.399	25.1
	297.15	33.66	1.449	28.1
	308.65	32.41	1.497	31.4
	320.65	31.19	1.559	36.2
	334.55	29.90	1.623	42.0
0.714	279.15	35.83	1.432	27.0
	279.55	35.77	1.436	27.3
	289.15	34.59	1.494	31.2
	289.75	34.52	1.479	30.1
	303.15	33.01	1.546	35.2
	319.45	31.30	1.653	45.0
0.854	281.35	35.55	1.487	30.7
	289.15	34.59	1.532	34.0
	298.55	33.50	1.585	38.5
	320.25	31.23	1.703	50.5

COMPONENTS:

1. Helium; He; 7440-59-7
2. Water; H_2O; 7732-18-5
3. Nitromethane; CH_3NO_2; 75-52-5

ORIGINAL MEASUREMENTS:

Friedman, H. L.

J. Am. Chem. Soc. 1954, 76, 3294-3297.

VARIABLES:

T/K: 298.00
P/kPa: 93.326 (700 mmHg)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
Water			
298.00			0.91
			0.93
			0.96
	0.0687	0.85	0.93 av.
Water saturated with nitromethane (about 4 mol percent) (2)			
298.00			0.89
			0.84
			0.92
		0.81	0.88 av.
Nitromethane saturated with water (about 12 mol percent) (2)			
298.00			1.70
			1.63
		1.53	1.67 av.

The author reported Ostwald coefficients measured at about 700 mmHg. The Bunsen coefficient and the mole fraction solubility at 101.325 kPa (1 atm) were calculated by the compiler with the assumptions that the gas is ideal, and that Henry's law is obeyed.

The Ostwald coefficient in dry nitromethane is 1.75×10^{-2}.

AUXILIARY INFORMATION

METHOD: Gas absorption. The method was essentially that employed by Eucken and Herzberg (1). Modifications included a magnetic stirring device instead of shaking the saturation vessel, and balancing the gas pressure against a column of mercury with electrical contacts instead of balancing the gas pressure against the atmosphere.

APPARATUS/PROCEDURE: The solvent was degassed by vacuum. The procedure, repeated 5 - 10 times, was to alternate 5 - 15 s evacuation and rapid stirring to produce cavitation. In the solubility measurement, gas, presaturated with solvent vapor, was brought into contact with about 80 ml of solvent in the saturation vessel. Initial conditions were established by a time extrapolation. Solubility equilibrium was approached from both under- and supersaturation by varying the rate.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Air Reduction Co. Reagent grade, 99.8 per cent pure by mass spectroscopy.
2. Water. Conductivity water.
3. Nitromethane. Source not given. Distilled.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/mmHg = 0.3$
$\delta L/L = 0.03$

REFERENCES:

1. Euken, A.; Herzberg, G. Z. Phys. Chem. 1950, 195, 1.

2. Corelli, R. M. Aerotecnica 1950, 30, 32. Chem. Abstr. 1952, 46, 3370e.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Pentane; C_5H_{12}; 109-66-0	Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. *Hung. J. Ind. Chem.* 1976, *4*, 269-280.
VARIABLES: T/K: 298.15 P/kPa: 101.325 (1 atm)	PREPARED BY: S. A. Johnson

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.15	2.6	5.0	5.5

The mole fraction and Bunsen coefficient were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Volumetric method. The apparatus of Bodor, Bor, Mohai, and Sipos (1) was used.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

Both the gas and liquid were analyti-grade reagents of Hungarian or foreign origin. No further information.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Bodor, E.; Bor, Gy.; Mohai, B. Sipos, G.
Veszpremi Vegyip. Egy. Kozl. 1957, *1*, 55;
Chem. Abstr. 1961, *55*, 3175h.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Hexane; C_6H_{14}; 110-54-3

ORIGINAL MEASUREMENTS:

Clever, H.L.; Battino, R.; Saylor, J.H. Gross, P.M.

J. Phys. Chem. 1957, 61, 1078-1083.

VARIABLES:

T/K 288.15 - 314.95

P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L.Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	2.35	4.06	4.28
298.45	2.57	4.38	4.79
314.95	3.11	5.18	5.97

Smoothed Data. $\Delta G^{o}/J\ mol^{-1} = -RT\ln X_1 = 8011.0 + 41.756\ T$

Std. Dev. ΔG^{o} = 34.3, Coef. Corr. 0.9982

$\Delta H^{o}/J\ mol^{-1} = 8011.0$, $\Delta S^{o}/J\ K^{-1}\ mol^{-1} = -41.756$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^{o}/J\ mol^{-1}$
288.15	2.33	20,043
293.15	2.46	20,252
298.15	2.60	20,461
303.15	2.74	20,669
308.15	2.89	20,878
313.15	3.04	21,087

There is a report of the partial molal volume of helium in hexane by dilatometry at 298.15 K of 42.3 ± 1 $cm^3\ mol^{-1}$ (3).

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Volumeteric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The pressure is maintained at 1 atm as the gas is absorbed.

ADDED NOTE. Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind. Chem. 1976, 4, 269 report an Ostwald coefficient of 0.044 at 298.15 K for this system. The value was not used in the smoothed data fit above.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium, Matheson Co., Both standard and research grade used.

2. Hexane. Humphrey-Wilkinson, Inc., N.Haven, CN. Shaken with H_2SO_4, washed, dried over sodium, distilled.

ESTIMATED ERROR:

$\delta T/K = 0.05$

$\delta P/torr = 3$

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.
2. Baldwin, R.R.; Daniel, S.G. J. Appl. Chem. 1952, 2, 161.
3. Ng, W.Y.; Walkley, J. J. Phys. Chem. 1969, 73, 2274.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Heptane; C_7H_{16}; 142-82-5

ORIGINAL MEASUREMENTS:

Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M.

J. Phys. Chem. 1957, 61, 1078 -1083.

VARIABLES:

T/K 288.15 - 314.95

P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L.Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	2.24	3.46	3.65
298.15	2.49	3.78	4.13
314.95	2.95	4.40	5.07

Smoothed Data. $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 7766.6 + 42.929\ T$

Std. Dev. $\Delta G^o = 3.8$, Coef. Corr. 0.9999

$\Delta H^o/J\ mol^{-1} = 7766.6$, $\Delta S^o/J\ K^{-1}\ mol^{-1} = -42.929$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^o/J\ mol^{-1}$
288.15	2.24	20,136
293.15	2.36	20,351
298.15	2.49	20,566
303.15	2.63	20,780
308.15	2.76	20,995
313.15	2.90	21,210

There are two reports of the partial molal volume of helium dissolved in heptane. The partial molal volume by dilatometry at 298.15 K is 43.5 ± 1 $cm^3\ mol^{-1}$. An apparent molal volume by a density determination of the saturated solution at pressures of 90 to 100 atm and a temperature of 298.15 K is 37.5 ± 0.3 $cm^3\ mol^{-1}$ (4). The value by dilatometry at 1 atm (3) is the tentative recommended value.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumeteric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The pressure is maintained at a total pressure of 1 atm as the gas is absorbed.

ADDED NOTE. Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind. Chem. 1976, 4, 269 report an Ostwald coefficient of 0.044 at 298.15 K for this system. The value was not used in the smoothed data fit above.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co. Both standard and research grades were used.
2. Heptane. Phillips Petroleum Co., Bartlesville, OK, pure grade, used as received.

ESTIMATED ERROR:

$\delta T/K = 0.05$

$\delta P/torr = 3$

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.
2. Baldwin, R.R.; Daniel, S.G. J. Appl. Chem. 1952, 2, 161.
3. Ng, W.Y.; Walkley, J. J. Phys. Chem. 1969, 73, 2274.
4. Popov, G.A.; Drakin, S.I. Zh. Fiz. Khim. 1974, 48, 631.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Octane; C_8H_{18}; 111-65-9	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 U.S.A. USA April 1978

CRITICAL EVALUATION:

The solubility of helium in octane was measured by Clever, Battino, Saylor, and Gross (1),by Makranczy, Megyery-Balog, Rusz, and Patyi (2), and by Wilcock, Battino, and Danforth (3).

The value of Makranczy, et al. (Ostwald coefficient 0.037, mole fraction 2.5×10^{-4} at 298.15 K) is not recommended. It was reported to only two significant figures and it is 3-5 percent higher than the smoothed data value at 298.15 K from the other two laboratories.

The smoothed data of Clever et al. ranges from 4.7 percent higher at 288.15 to 2.1 percent higher at 313.15 K than the smoothed data of Wilcock et al. Although the two data sets agree within experimental error, the more recent data of Wilcock et al. were determined with a better degassing procedure and with better control of temperature and pressure than used in the earlier work. Thus the two data sets were combined by the method of least squares to a Gibbs energy equation linear in temperature with a weight of 2 for the Wilcock et al. data and a weight of 1 for the Clever et al. data.

The recommended values for the transfer of one mole of helium from the gas at a pressure of 101.325 kPa to the hypothetical unit mole fraction solution are

$$\Delta G°/\text{J mol}^{-1} = - RT \ln X_1 = 8486.3 + 40.965\ T$$

Std. Dev. $\Delta G° = 49$, Coef. Corr. = 0.9954

$$\Delta H°/\text{J mol}^{-1} = 8486.3, \quad \Delta S°/\text{J K}^{-1}\text{ mol}^{-1} = -40.965$$

The recommended solubility values and Gibbs energy as a function of temperature are in Table 1.

TABLE 1. The solubility of helium in octane. The mole fraction solubility at 101.325 kPa and the Gibbs energy as a function of temperature.

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/\text{J mol}^{-1}$
283.15	1.971	20,085
288.15	2.098	20,290
293.15	2.229	20,495
298.15	2.363	20,700
303.15	2.500	20,905
308.15	2.641	21,110
313.15	2.784	21,314
318.15	2.930	21,519

Ng and Walkley (4) report a partial molal volume of helium in octane by dilatometry of 47.8 ± 1 $cm^3\ mol^{-1}$ at 298.15 K.

1. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.
2. Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind. Chem. 1976, 4, 269.
3. Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. J. Chem. Thermodyn. 1978, 10, 817.
4. Ng, W. Y.; Walkley, J. J. Phys. Chem. 1969, 73, 2274.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Octane; C_8H_{18}; 111-65-9

ORIGINAL MEASUREMENTS:

Clever, H.L.;Battino, R.; Saylor, J.H.;Gross, P.M.

J. Phys. Chem. 1957, *61*, 1078-1083.

VARIABLES:

T/K: 288.15 - 314.75

P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L.Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	2.17	3.00	3.17
298.15	2.42	3.22	3.52
314.75	2.87	3.85	4.44

Smoothed Data. $\Delta G^o/J\ mol^{-1} = 7936.1 + 42.601\ T = -\ RT\ \ln X_1$

Std. Dev. $\Delta G^o = 2.7$, Coef. Corr. 0.9999

See the evaluation of the helium + octane system for the recommended Gibbs energy equation and recommended solubility values.

There is a report of the partial molal volume of helium dissolved in octane by dilatometry at 298.15 K of 47.8 ± 1 $cm^3\ mol^{-1}$ (3).

The Bunsen coefficients were calculated by the compiler.

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co. Both standard and research grades were used.

2. Octane. Humphrey-Wilkinson Inc., N. Haven, CN. Shaken with H_2SO_4, washed, dried over sodium, distilled.

ESTIMATED ERROR:

$\delta T/K = 0.05$

$\delta P/torr = 3$

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid.* 1952, 3819

2. Baldwin, R.R.; Daniel, S.G. *J. Appl. Chem.* 1952, *2*, 161.

3. Ng, W.Y.; Walkley, J. *J. Phys. Chem.* 1969, *73*, 2274.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Octane; C_8H_{18}; 111-65-9

ORIGINAL MEASUREMENTS:

Wilcock, R.J.; Battino, R.; Danforth, W.F; Wilhelm, E.

J. Chem. Thermodyn. 1978, 10, 817-822.

VARIABLES:

T/K: 288.23 - 312.92

P/kPa: 101.325 (1 atm)

PREPARED BY:

A.L. Cramer

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
283.23	1.933	2.697	2.797
298.33	2.370	3.250	3.550
312.92	2.733	3.685	4.221

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 8585.2 + 40.731\ T$

Std. Dev. $\Delta G^o = 27$, Coef. Corr. = 0.9990

See the evaluation of helium + octane for the recommended Gibbs energy equation and solubility values.

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

A preliminary report of this work appeared in Conf. Int. Thermodyn. Chim., {C.R.}, 4th 1975, 6, 122 - 128; Chem. Abstr. 1977, 86, 22375d.

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

The apparatus is based on the design of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3).

Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.

Solubility Determination. The degassed solvent is passed in a thin film down a glass spiral tube containing the solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co. Inc. Purest commercially available grade.
2. Octane. Phillips Petroleum Co. 99 mol per cent minimum.

ESTIMATED ERROR:

$\delta T/K = 0.03$

$\delta P/mmHg = 0.5$

$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. J. Am. Oil Chem. Soc. 1968, 45, 830.
3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. Anal. Chem. 1971, 43, 806.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. 3-Methylheptane; C_8H_{18}; 589-81-1	Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078-1083.

VARIABLES:	PREPARED BY:
T/K: 288.15 - 314.75 P/kPa: 101.325 (1 atm)	P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	2.24	3.12	3.29
298.15	2.49	3.44	3.75
314.75	2.95	3.98	4.59

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 7823.7 + 42.733\ T$

Std. Dev. $\Delta G°$ = 4.9, Coef. Corr. = 0.9999

$\Delta H°/J\ mol^{-1}$ = 7823.7, $\Delta S°/J\ K^{-1}\ mol^{-1}$ = -42.733

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	2.24	20,137
293.15	2.36	20,351
298.15	2.50	20,565
303.15	2.63	20,778
308.15	2.76	20,992
313.15	2.90	21,206
318.15	3.04	21,419

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Both standard and research grades were used.

2. 3-Methylheptane. Humphrey-Wilkinson, Inc. Shaken with H_2SO_4, washed, dried over Na, distilled through a vacuum column.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.

2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.

COMPONENTS:

1. Helium; He; 7440-59-7

2. 2,3-Dimethylhexane; C_8H_{18}; 584-94-1

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, *61*, 1078-1083.

VARIABLES:

T/K: 288.15 - 314.05

P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	2.26	3.19	3.37
298.15	2.47	3.44	3.76
314.05	2.89	3.95	4.54

Smoothed Data: $\Delta G°/J\ mol^{-1} = RT \ln X_1 = 7200.1 + 44.850\ T$

Std. Dev. $\Delta G°$ = 15.8, Coef. Corr. = 0.9996

$\Delta H°/J\ mol^{-1} = 7200.1$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -44.850$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	2.25	20,124
293.15	2.37	20,348
298.15	2.49	20,572
303.15	2.61	20,796
308.15	2.73	21,021
313.15	2.86	21,245
318.15	2.99	21,469

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1).The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Both standard and research grades were used.

2. 2,3-Dimethylhexane. Humphrey-Wilkinson, Inc. Shaken with H_2SO_4, washed, dried over Na, distilled through a vacuum column.

ESTIMATED ERROR:

$\delta T/K = 0.05$

$\delta P/torr = 3$

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *Ibid.* 1952, 3819.

2. Baldwin, R. R.; Daniel, S. G. *J. Appl. Chem.* 1952, *2*, 161.

COMPONENTS:

1. Helium; He; 7440-59-7

2. 2,4-Dimethylhexane; C_8H_{18}; 589-43-5

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, 61, 1078-1083.

VARIABLES:

T/K: 288.15 - 314.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	2.42	3.35	3.53
298.15	2.72	3.71	4.05
314.15	3.33	4.46	5.13

Smoothed Data: $\Delta G°/J\ mol^{-1} = RT \ln X_1 = 9304.5 + 36.983\ T$

Std. Dev. $\Delta G°$ = 17.7, Coef. Corr. = 0.9993

$\Delta H°/J\ mol^{-1}$ = 9304.5, $\Delta S°/J\ K^{-1}\ mol^{-1}$ = -36.983

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	2.41	19,961
293.15	2.57	20,146
298.15	2.74	20,331
303.15	2.92	20,516
308.15	3.10	20,701
313.15	3.28	20,886
318.15	3.47	21,070

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Both standard and research grades were used.

2. 2,4-Dimethylhexane. Humphrey-Wilkinson, Inc. Shaken with H_2SO_4, washed, dried over Na, distilled through a vacuum column.

ESTIMATED ERROR:

$\delta T/K = 0.05$

$\delta P/torr = 3$

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; Ibid. 1952, 3819.

2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.

COMPONENTS:

1. Helium; He; 7440-59-7
2. 2,2,4-Trimethylpentane (Isooctane; C_8H_{18}; 540-84-1

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, *61*, 1078-1083.

VARIABLES:

T/K: 288.15 - 314.95
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	2.76	3.76	3.97
298.15	3.10	4.20	4.58
314.95	3.63	4.80	5.53

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 7670.1 + 41.489\ T$

Std. Dev. $\Delta G°$ = 11.6, Coef. Corr. = 0.9998

$\Delta H°/J\ mol^{-1} = 7670.1$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -41.489$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	2.77	19,625
293.15	2.93	19,833
298.15	3.08	20,040
303.15	3.24	20,248
308.15	3.41	20,455
313.15	3.58	20,663

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Both standard and research grades were used.
2. 2,2,4-Trimethylpentane. Enjay Co. Used as received.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid*. 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. *J. Appl. Chem.* 1952, *2*, 161.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Nonane; C_9H_{20}; 111-84-2

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, *61*, 1078-1083.

VARIABLES:

T/K: 288.15 - 314.95
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	2.03	2.56	2.70
298.15	2.41	3.00	3.28
314.95	2.87	3.53	4.07

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 9558.8 + 37.394\ T$

Std. Dev. $\Delta G°$ = 49.7, Coef. Corr. = 0.9952

$\Delta H°/J\ mol^{-1} = 9558.8$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -37.394$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	2.06	20,334
293.15	2.21	20,521
298.15	2.36	20,708
303.15	2.51	20,895
308.15	2.67	21,082
313.15	2.83	21,269
318.15	3.00	21,456

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor is maintained at 1 atm as the gas is absorbed.

ADDED NOTE. Makranczy, J.; Megyery-Balog, K.;Rusz, L.;Patyi, L. *Hung. J. Ind. Chem.* 1976, *4*, 269 report an Ostwald coefficient of 0.028 at 298.15 K for this system. The value was not used in the smoothed data fit above.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Both standard and research grades were used.
2. Nonane. Phillips Petroleum Co. Used as received.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid.* 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. *J. Appl. Chem.* 1952, *2*, 161.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Decane; $C_{10}H_{22}$; 124-18-5	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 U.S.A. April 1978

CRITICAL EVALUATION:

The solubility of helium in decane was measured by Clever, Battino, Saylor, and Gross (1), by Makranczy, Megyery-Balog, Rusz, and Patyi (2), and by Wilcock, Battino, and Danforth (3).

The value of Makranczy *et al.* (Ostwald coefficient 0.025, mole fraction 2.0×10^{-4} at 298.15 K) is not recommended. It was reported to only two significant figures and it is 15 - 20 percent lower than the smoothed data value at 298.15 K from the other two laboratories.

The smoothed data values of Wilcock *et al.* range from 4.4 percent higher at 288.15 K to 1.7 percent higher at 313.15 K. The two data sets agree within experimental error but the more recent data were determined with a better degassing procedure and with better control of temperature and pressure than used in the earlier work. Thus the data sets were combined with a weight of 2 to the Wilcock *et al.* values and a weight of 1 to the Clever *et al.* values by the method of least squares to a Gibbs energy equation linear in temperature. The solubility value at 288.35 K (1) was more than two standard deviations from the fit. It was omitted and the remaining solubility values were fitted again.

The recommended values for the thermodynamic changes in transfer of one mole of helium from a pressure of 101.325 kPa to the hypothetical unit mole fraction solution are

$$\Delta G°/\text{J mol}^{-1} = - RT \ln X_1 = 6,619.1 + 47.144\ T$$

$$\text{Std. Dev. } \Delta G° = 31, \quad \text{Coef. Corr.} = 0.9987$$

$$\Delta H°/\text{J mol}^{-1} = 6,619.1, \quad \Delta S°/\text{J K}^{-1}\text{ mol}^{-1} = -47.144$$

The recommended mole fraction solubility and Gibbs energy values are in Table 1.

TABLE 1. The solubility of helium in decane. The mole fraction solubility and the Gibbs energy at 101.325 kPa as a function of temperature.

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/\text{J mol}^{-1}$
283.15	2.072	19,968
288.15	2.176	20,203
293.15	2.281	20,439
298.15	2.387	20,675
303.15	2.494	20,911
308.15	2.603	21,146
313.15	2.713	21,382
318.15	2.823	21,618

1. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078.
2. Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. *Hung. J. Ind. Chem.* 1976, *4*, 269.
3. Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. *J. Chem. Thermodyn.* 1978, *10*, 817.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Decane; $C_{10}H_{22}$; 124-18-5

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, 61, 1078-1083

VARIABLES:

T/K: 288.35 - 314.55

P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.35	2.04	2.35	2.48
298.15	2.39	2.73	2.98
314.55	2.69	3.02	3.48

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 7690.5 + 43.806\ T$

Std. Dev. $\Delta G°$ = 69.7, Coef. Corr. = 0.9929

See the evaluation of helium + decane for the recommended Gibbs energy equation and the recommended solubility values.

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Both standard and research grades were used.

2. Decane. Humphrey-Wilkinson, Inc. Shaken with H_2SO_4, washed, dried over Na.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; Ibid. 1952, 3819.

2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Decane; $C_{10}H_{22}$; 124-18-5	Wilcock, R.J.; Battino, R.; Danforth, W.F; Wilhelm, E. J.Chem.Thermodyn. 1978, 10, 817-822.
VARIABLES: T/K: 283.18 - 313.35 P/kPa: 101.325 (1 atm)	PREPARED BY: A.L. Cramer

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
283.18	2.081	2.420	2.509
298.23	2.367	2.710	2.959
313.35	2.756	3.105	3.562

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 6885.8 + 46.223\ T$

Std. Dev. $\Delta G^o = 26$, Coef. Corr. = 0.9993

See the evaluation of helium + decane for the recommended Gibbs energy equation and recommended solubility values.

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

A preliminary report of this work appeared in Conf. Int. Thermodyn. Chim., {C.R.}, 4th 1975, 6, 122-128; Chem Abstr. 1977, 86, 22375d.

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

The apparatus is based on the design of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3).

See the helium + octane data sheet for more details.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co. Inc. Purest commercially available grade.
2. Decane. Phillips Petroleum Co. 99 mol per cent minimum.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison, T.J.; Billett, F. J.Chem.Soc. 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. J.Am.Oil Chem. Soc. 1968, 45, 830.
3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. Anal. Chem. 1971, 43, 806.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Undecane; $C_{11}H_{24}$; 1120-21-4

ORIGINAL MEASUREMENTS:

Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L.

Hung. J. Ind. Chem. 1976, *4*, 269-280.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

S. A. Johnson

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.15	1.9	2.0	2.2

The mole fraction and Bunsen coefficient were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:
Volumetric method. The apparatus of Bodor, Bor, Mohai, and Sipos (1) was used.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:
Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Bodor, E.; Bor, Gy.; Mohai, B.; Sipos, G.
Veszpremi Vegyip. Egy. Kozl. 1957, *1*, 55;
Chem. Abstr. 1961, *55*, 3175h.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Dodecane; $C_{12}H_{26}$; 112-40-3

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, *61*, 1078-1083.

VARIABLES:

T/K: 288.15 - 314.55
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	2.00	1.98	2.09
298.15	2.24	2.20	2.40
314.55	2.58	2.49	2.87

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 7207.5 + 45.761\ T$

Std. Dev. $\Delta G°$ = 16.4, Coef. Corr. = 0.9996

$\Delta H°/J\ mol^{-1} = 7207.5$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -45.761$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	2.01	20,394
293.15	2.12	20,622
298.15	2.22	20,851
303.15	2.33	21,080
308.15	2.44	21,309
313.15	2.56	21,538
318.15	2.67	21,766

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor is maintained at 1 atm as the gas is absorbed.

ADDED NOTE. Makranczy, J.; Megyery-Balog, K.;Rusz, L.;Patyi, L. *Hung. J. Ind. Chem.* 1976, *4*, 269 report an Ostwald coefficient of 0.022 at 298.15 K for this system. The value was not used in the smoothed data fit above.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Both standard and research grades were used.
2. Dodecane. Humphrey-Wilkinson, Inc. Shaken with H_2SO_4, washed, dried over Na.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *Ibid.* 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. *J. Appl. Chem.* 1952, *2*. 161.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Tridecane; $C_{13}H_{28}$; 629-50-5	Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. *Hung. J. Ind. Chem.* 1976, *4*, 269-280.

VARIABLES:	PREPARED BY:
T/K: 298.15 P/kPa: 101.325 (1 atm)	S. A. Johnson

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.15	1.9	1.7	1.9

The mole fraction and Bunsen coefficient were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Volumetric method. The apparatus of Bodor, Bor, Mohai, and Sipos (1) was used.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Bodor, E.; Bor, Gy.; Mohai, B.; Sipos, G.
Veszpremi Vegyip. Egy. Kozl. 1957, *1*, 55;
Chem. Abstr. 1961, *55*, 3175h.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Tetradecane; $C_{14}H_{30}$; 629-59-4

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, 61, 1078-1083.

VARIABLES:

T/K: 288.35 - 314.10
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.35	2.10	1.76	1.86
298.15	2.26	1.99	2.17
314.10	2.60	2.12	2.44

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 6310.9 + 48.565\ T$

Std. Dev. $\Delta G°$ = 17.3, Coef. Corr. = 0.9996

$\Delta H°/J\ mol^{-1} = 6310.9$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -48.565$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	2.09	20,305
293.15	2.18	20,548
298.15	2.28	20,791
303.15	2.38	21,033
308.15	2.47	21,276
313.15	2.57	21,519
318.15	2.67	21,762

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor is maintained at 1 atm as the gas is absorbed.

ADDED NOTE. Makranczy, J.; Megyery-Balog, K.;Rusz, L.;Patyi, L. Hung. J. Ind. Chem. 1976, 4, 269 report an Ostwald coefficient of 0.017 at 298.15 K for this system. The value was not used in the smoothed data fit above.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Both standard and research grades were used.
2. Tetradecane. Humphrey-Wilkinson, Inc. Shaken with H_2SO_4, washed, dried over Na.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Pentadecane; $C_{15}H_{32}$; 629-62-9

   or

   Hexadecane; $C_{16}H_{34}$; 544-76-3

ORIGINAL MEASUREMENTS:

Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L.

Hung. J. Ind. Chem. 1976, *4*, 269-280.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

S. A. Johnson

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
	Pentadecane; $C_{15}H_{32}$; 629-62-9		
298.15	1.8	1.5	1.6
	Hexadecane; $C_{16}H_{34}$; 544-76-3		
298.15	1.8	1.4	1.5

The mole fraction and Bunsen coefficient were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Volumetric method. The apparatus of Bodor, Bor, Mohai, and Sipos (1) was used.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Bodor, E.; Bor, Gy.; Mohai, B.; Sipos, G. *Veszpremi Vegyip. Egy. Kozl.* 1957, *1*, 55; *Chem. Abstr.* 1961, *55*, 3175h.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Cyclohexane; C_6H_{12}; 110-82-7	H. L. Clever Chemistry Department Emory University Atlanta, GA 30322 USA January 1978

CRITICAL EVALUATION:

The solubility of helium in cyclohexane was measured by Lannung (1), and by Clever, Battino, Saylor and Gross (2). The two data sets agree to within better than one percent over 288 - 303 K, the temperature range of common measurement. The agreement is well within the estimated experimental error of the methods used. Dymond and Hildebrand (3) show a helium in cyclohexane solubility value at 298.15 K on a graph. Their value was not used in the evaluation.

The two data sets were combined on a one to one weight basis for the recommended values (Table 1). The recommended thermodynamic values for the transfer of one mole of helium from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

$$\Delta G°/\text{J mol}^{-1} = 10{,}164 + 40.841\ T$$

$$\text{Std. Dev. } \Delta G° = 23.2, \quad \text{Coef. Corr.} = 0.9980$$

$$\Delta H°/\text{J mol}^{-1} = 10{,}164, \quad \Delta S°/\text{J K}^{-1}\text{ mol}^{-1} = -40.841$$

The recommended mole fraction solubilities at 101.325 kPa and the Gibbs energy changes are summarized at five degree intervals between 288.15 and 318.15 K in Table 2.

TABLE 1. Parameters for Gibbs energy equation.

$\Delta G°/\text{J mol}^{-1} = A + BT$	Std. Dev. $\Delta G°$	No. Exp. Points	Weight	Reference
10,297 + 40.398 T	28.3	6	1	1
10,009 + 41.341 T	6.0	3	1	2
10,164 + 40.841 T	23.2	9		1 + 2

TABLE 2. Recommended mole fraction solubility and Gibbs energy of solution at 101.325 kPa (1 atm).

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/\text{J mol}^{-1}$
288.15	1.06	21,933
293.15	1.14	22,137
298.15	1.22	22,341
303.15	1.30	22,545
308.15	1.39	22,749
313.15	1.48	22,954
318.15	1.58	23,158

1. Lannung, A. J. Am. Chem. Soc. 1930, 52, 68.
2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.
3. Dymond, J.; Hildebrand, J. H. Ind. Eng. Chem. Fundam. 1967, 6, 130.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Cyclohexane; C_6H_{12}; 110-82-7

ORIGINAL MEASUREMENTS:

Lannung, A.

J. Am. Chem. Soc. 1930, *52*, 68 - 80.

VARIABLES:

T/K: 288.15 - 303.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	1.06	2.21	2.33
288.15	1.05	2.20	2.32
293.15	1.15	2.39	2.56
293.15	1.12	2.32	2.49
303.15	1.32	2.70	3.00
303.15	1.29	2.65	2.94

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 10{,}297 + 40.398\ T$

Std. Dev. $\Delta G°$ = 28.3, Coef. Corr. = 0.9948

For the recommended Gibbs free energy equation see the critical evaluation of the solubility of helium in cyclohexane.

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The mole fraction solubility and the Ostwald coefficient were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced.

APPARATUS/PROCEDURE: The apparatus is a modification of that of von Antropoff (1). A calibrated, combined all glass manometer and bulb is enclosed in an air thermostat. Mercury is used as the calibration and confining liquid. The solvent is degassed in the apparatus. The solvent and the gas are shaken together until equilibrium is established.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Linde's Liquid Air. Contained 0.5 per cent by volume neon.
2. Cyclohexane. Poulenc Frères, shaken with fuming sulfuric acid, separated and shaken with water until neutral. Kept over P_2O_5, and distilled over P_2O_5. First ¼ rejected, m.p. = 6.0°C. Distilled over Na, used m.p. 6.3°.

ESTIMATED ERROR:

$\delta T/K = 0.03$

REFERENCES:

1. v. Antropoff, A. *Z. Electrochem.* 1919, *25*, 269.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Cyclohexane; C_6H_{12}; 110-82-7

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, 61, 1078 - 1083.

VARIABLES:

T/K: 288.15 - 314.75

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	1.06	2.20	2.32
298.45	1.23	2.53	2.76
314.75	1.51	3.05	3.51

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 10{,}009 + 41.341\ T$

Std. Dev. $\Delta G° = 6.0$, Coef. Corr. = 0.9999

For the recommended free energy equation see the critical evaluation of the solubility of helium in cyclohexane.

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure is maintained at 1 atm as the gas is absorbed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co. Both research and standard grades were used with no difference in results.

2. Cyclohexane. Phillips Petroleum Co., Bartlesville, OK. Used as received.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.

2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Methylcyclohexane; C_7H_{14}; 108-87-2

ORIGINAL MEASUREMENTS:

Clever, H. L.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1958, 62, 89 - 91.

VARIABLES:

T/K: 289.15 - 316.25

P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
289.15	1.46	2.57	2.72
303.15	1.68	2.93	3.25
316.25	2.07	3.54	4.10

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 9804.7 + 39.657\ T$

Std. Dev. $\Delta G°$ = 69.5, Coef. Corr. = 0.9917

$\Delta H°/J\ mol^{-1} = 9804.7$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -39.657$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	1.42	21,232
293.15	1.52	21,430
298.15	1.62	21,628
303.15	1.73	21,827
308.15	1.85	22,025
313.15	1.96	22,223
318.15	2.08	22,421

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric (1). The apparatus is a modification of that used by Morrison and Billett (2). Modifications include the addition of a spiral solvent storage tubing, a manometer for constant reference pressure, and an extra gas buret for highly soluble gases.

APPARATUS/PROCEDURE: (a.) Degassing. 700 ml of solvent is shaken and evacuated while attached to a cold trap, until no bubbles are seen; solvent is then transferred through a 1 mm. capillary tubing, released as a fine mist into a continuously evacuated flask. (b.) Solvent is saturated with gas as it flows through 8 mm x 180 cm of tubing attached to a gas buret. Pressure is maintained at 1 atm. as the gas is absorbed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Both standard and research grades were used.

2. Methylcyclohexane. Eastman Kodak Co., white label. Dried over Na and distilled; corrected b.p. 100.95 to 100.97°, lit. b.p. 100.93°.

ESTIMATED ERROR:

$\delta T/K = 0.05$

$\delta P/mm\ Hg = 3$

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.

2. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Cyclooctane; C_8H_{16}; 292-64-8

ORIGINAL MEASUREMENTS:

Wilcock, R. J.; Battino, R; Wilhelm, E.

J. Chem. Thermodyn. 1977, *9*, 111-115.

VARIABLES:

T/K: 289.23 - 313.51
P/kPa: 101.325

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
289.23	0.805	1.35	1.429
298.15	0.822	1.37	1.491
313.51	1.015	1.66	1.907

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 7618.0 + 52.284\ T$

Std. Dev. $\Delta G°$ = 97.1, Coef. Corr. = 0.9888

$\Delta H°/J\ mol^{-1} = 7618.0$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -52.284$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	0.773	22,684
293.15	0.816	22,945
298.15	0.860	23,207
303.15	0.904	23,468
308.15	0.950	23,729
313.15	0.996	23,991

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

APPARATUS/PROCEDURE: Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.
Solubility Determination. The degassed solvent passes in a thin film down a glass spiral containing the solute gas and solvent vapor at a total pressure of one atm. The volume of gas absorbed is measured in the attached gas buret, and the solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Minimum purity 99.995 mol per cent.

2. Cyclooctane. Chemical Samples Co. 99 mol per cent, fractionally distilled, n(Na D, 298.15 K) = 1.4562.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033.

2. Battino, R.; Evans, F. D.; Danforth, W. F. *J. Am. Oil Chem. Soc.* 1968, *45*, 830.

COMPONENTS:

1. Helium; He; 7440-59-7

2. *cis*-1,2-Dimethylcyclohexane; C_8H_{16}; 2207-01-4

ORIGINAL MEASUREMENTS:

Geller, E. B.; Battino, R.; Wilhelm, E.

J. Chem. Thermodyn. 1976, *8*, 197-202.

VARIABLES:

T/K: 297.96 - 298.28

P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
297.96	1.48	2.34	2.55
298.28	1.40	2.22	2.42

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans and Danforth (2).

APPARATUS/PROCEDURE: Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.
Solubility Determination. The degassed solvent is passed in a thin film down a glass spiral tube containing the solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Either Air Products & Chemicals, Inc. or Matheson Co., Inc., 99 mol % or better.

2. *cis*-1,2-Dimethylcyclohexane. Chemical Samples Co., fractionally distilled and stored in dark. n_D(298.15 K) 1.4337.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033.

2. Battino, R.; Evans, F. D.; Danforth, W. F. *J. Am. Oil Chem. Soc.* 1968, *45*, 830.

COMPONENTS:

1. Helium; He; 7440-59-7
2. trans-1,2-Dimethylcyclohexane; C_8H_{16}; 6876-23-9

ORIGINAL MEASUREMENTS:

Geller, E. B.; Battino, R.; Wilhelm, E.

J. Chem. Thermodyn. 1976, 8, 197-202.

VARIABLES:

T/K: 298.03
P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.03	1.80	2.78	3.03

The solubility value was adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficient was calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

APPARATUS/PROCEDURE: Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.
Solubility Determination. The degassed solvent passes in a thin film down a glass spiral containing the solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is measured in a buret system, and the solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Either Air Products & Chemicals, Inc. or Matheson Co., Inc., 99 mol % or better.
2. trans-1,2-Dimethylcyclohexane. Chemical Samples Co., fractionally distilled and stored in dark. n_D(298.15) 1.4248.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F. D.; Danforth, W. F. J. Am. Oil Chem. Soc. 1968, 45, 830.

COMPONENTS:

1. Helium; He; 7440-59-7
2. cis-1,3-Dimethylcyclohexane; 59 mol %; C_8H_{16}; 638-04-0
3. trans-1,3-Dimethylcyclohexane; 41 mol %; C_8H_{16}; 2207-03-6

ORIGINAL MEASUREMENTS:

Geller, E. B.; Battino, R.; Wilhelm. E.

J. Chem. Thermodyn. 1976, 8, 197-202.

VARIABLES:

T/K: 298.09
P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.09	1.68	2.59	2.83

The solubility value was adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficient was calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

APPARATUS/PROCEDURE: Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns. Solubility Determination. The degassed solvent passes in a thin film down a glass spiral tube conatining the solute gas plus the solvent vapor at a total pressure of one atm. The absorbed gas volume is measured in a buret system, and the solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Either Air Products & Chemicals, Inc., or Matheson Co., Inc. 99 mol % or better.
2. cis-1,3-Dimethylcyclohexane. Chemical Samples Co., binary mixture, analysed by R. I. by authors, used as received.
3. trans-1,3-Dimethylcyclohexane. Chemical Samples Co., binary mixture, analysed by R. I. by authors, used as received.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F. D.; Danforth, W. F. J. Am. Oil Chem. Soc. 1968, 45, 830.

COMPONENTS:

1. Helium; He; 7440-59-7
2. cis-1,4-Dimethylcyclohexane; 70 mol %; C_8H_{16}; 624-29-3
3. trans-1,4-Dimethylcyclohexane; 30 mol %; C_8H_{16}; 2207-04-7

ORIGINAL MEASUREMENTS:

Geller, E. B.; Battino, R.; Wilhelm, E.

J. Chem. Thermodyn. 1976, 8, 197-202.

VARIABLES:

T/K: 298.15 - 298.24
P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.15	1.64	2.53	2.76
298.24	1.64	2.53	2.76

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

APPARATUS/PROCEDURE: Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns. Solubility Determination. The degassed solvent is passed in a thin film down a glass spiral tube containing the solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final gas volume in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Either Air Products & Chemicals, Inc., or Matheson Co., Inc. 99 mol % or better.
2. cis-1,4-Dimethylcyclohexane. Chemical Samples Co., binary mixture, analysed by R. I. by authors, used as received.
3. trans-1,4-Dimethylcyclohexane. Chemical Samples Co., binary mixture, analysed by R. I. by authors, used as received.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F. D.; Danforth, W. F. J. Am. Oil Chem. Soc. 1968, 45, 830.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Benzene; C_6H_6; 71-43-2	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA January 1978

CRITICAL EVALUATION:

Since the early qualitative observation of Ramsay, Collie, and Travers (1) that helium is insoluble in benzene, the solubility of helium in benzene at 101,325 kPa (1 atm) was measured by Lannung (2), Clever, Battino, Saylor, and Gross (3), and de Wet (4). The three data sets and an equal weight calculation of the three were each fitted by the method of least squares to a free energy equation linear in temperature,

$$\Delta G° = - RT \ln X_1 = A + BT.$$

In the combined data least squares fit only the 298.15 K solubility value from reference 3 fell more than 2 standard deviations from the least square line. That value was omitted and a second least square linear fit found which is the recommended equation. The information on the linear free energy equations is summarized in Table 1. Table 2 contains the recommended mole fraction solubilities of helium in benzene at five degree intervals from 288.15 to 318.15 K.

The recommended thermodynamic values for the transfer of helium from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

$$\Delta G°/J\ mol^{-1} = - RT \ln X_1 = 10{,}321 + 44{,}256\ T$$

$$\text{Std. Dev. } \Delta G° = 22.6, \quad \text{Coef. Corr.} = 0.9977$$

$$\Delta H°/J\ mol^{-1} = 10{,}321, \quad \Delta S°/J\ K^{-1}\ mol^{-1} = -44.256$$

TABLE 1. Parameters for $\Delta G° = A + BT$ Equation.

$\Delta G°/J\ mol^{-1}$	Std. Dev. $\Delta G°$	No. Exp. Points	Weight	Reference
10,318 + 44.260 T	25.0	10	1	2
10,242 + 44.422 T	51.2	3	1	3
10,057 + 45.153 T	25.6	3	1	4
I. 10,349 + 44.140 T	30.8	16		
II. 10,321 + 44.256 T	22.6	15		

TABLE 2. Solubility of Helium in Benzene. Recommended Mole Fraction Solubility and Gibbs Energy of Solution as a Function of Temperature.

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	0.657	23,073
293.15	0.707	23,294
298.15	0.759	23,515
303.15	0.813	23,737
308.15	0.869	23,958
313.15	0.926	24,179
318.15	0.986	24,401

Popov and Drakin (5) calculated apparent molal volumes of helium dissolved in benzene at 298.15 K from their density measurements of the saturated solutions over the pressure interval of 10 - 100 atm. Their results are:

P/atm	9.98	29.36	58.60	78.30	97.66
$\bar{V}_1/cm^3\ mol^{-1}$	33 ± 6	32 ± 2	30 ± 2	29 ± 0.7	24.4 ± 0.6

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Benzene; C_6H_6; 71-43-2	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322

CRITICAL EVALUATION:

No report of calorimetric measurement of the enthalpy of solution of helium in benzene was found.

1. Ramsay, W.; Collie, J. N.; Travers, M. J. Chem. Soc. 1895, 67, 684.
2. Lannung, A. J. Am. Chem. Soc. 1930, 52, 68.
3. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.
4. de Wet, W. J. J. S. Afr. Chem. Inst. 1964, 17, 9.
5. Popov, G. A.; Drakin, S. I. Zh. Fiz. Khim. 1974, 48, 631.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Benzene; C_6H_6; 71-43-2

ORIGINAL MEASUREMENTS:

Lannung, A.

J. Am. Chem. Soc. 1930, 52, 68 - 80.

VARIABLES:

T/K: 288.15 - 303.15

PREPARED BY:

P.L.Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.650	1.65	1.74
288.15	0.650	1.65	1.74
293.15	0.714	1.80	1.93
293.15	0.714	1.80	1.93
293.15	0.710	1.79	1.92
298.15	0.770	1.93	2.11
298.15	0.766	1.92	2.10
298.15	0.758	1.90	2.07
303.15	0.807	2.01	2.23
303.15	0.803	2.00	2.22

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 10,318 + 44.260\ T$

Std. Dev.ΔG^o = 25.0, Coef. Corr. = 0.9946

For the recommended Gibbs free energy equation see the critical evaluation of the solubility of helium in benzene.

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The mole fraction solubility and the Ostwald coefficient were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced.

APPARATUS/PROCEDURE: The apparatus is a modification of that of von Antropoff (1). A calibrated, combined all glass manometer and bulb is enclosed in an air thermostat. Mercury is used as the calibration and confining liquid. The solvent is degassed in the apparatus. The solvent and the gas are shaken together until equilibrium is established.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Linde's Liquid Air. Contained 0.5 per cent by volume neon.
2. Benzene. Kahlbaum, "zur Molekulargewichtsbestimmung". Melting point 5.48 °C.

ESTIMATED ERROR:

$\delta T/K = 0.03$

REFERENCES:

1. v. Antropoff, A. Z. Electrochem. 1919, 25, 269.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Benzene; C_6H_6; 71-43-2	Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M. *J. Phys. Chem.* 1957, *61*, 1078 - 1083.
VARIABLES: T/K: 288.15 - 314.95	PREPARED BY: P.L.Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.655	1.68	1.77
298.15	0.786	1.97	2.15
314.95	0.949	2.33	2.69

Smoothed Data: $\Delta G^{\circ} = -RT \ln X_1 = 10{,}242 + 44.422\ T$ (J mol^{-1})

Std. Dev. $\Delta G^{\circ} = 51.2$, Coef. Corr. = 0.9964

For the recommended free energy equation see the critical evaluation of the solubility of helium in benzene.

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficents were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co. Both research and standrad grades were used with no difference in results.
2. Benzene. Jones & Laughlin Steel Co., Pittsburgh, PA. Shaken with H_2SO_4, water washed, dried over sodium, and distilled.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid.* 1952, 3819.
2. Baldwin, R.R.; Daniel, S.G. *J. Appl. Chem.* 1952, *2*, 161.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Benzene; C_6H_6; 71-43-2

ORIGINAL MEASUREMENTS:

de Wet, W.J.

J.S. Afr. Chem. Inst. 1964, *17*, 9-13.

VARIABLES:

T/K: 291.75 - 305.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L.Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
291.75	0.697	1.76	1.88
299.15	0.759	1.90	2.08
305.15	0.837	2.08	2.32

Smoothed Data: $\Delta G^{o}/J\ mol^{-1} = -RT \ln X_1 = 10{,}057 + 45.153\ T$

Std. Dev. $\Delta G^{o} = 25.6$, Coef. Corr. = 0.9964

For the recommended free energy equation see the critical evaluation of the solubility of helium in benzene.

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric.

To degas, the solvent is placed in a large continously evacuated bulb until the solvent boils freely without further release of dissolved gases.

To saturate, the solvent is flowed in a thin film through a glass spiral containing the gas. The volume of gas absorbed is measured on an attached buret system.

APPARATUS/PROCEDURE:

The apparatus is a modification of that used by Morrison and Billett (1) and others (2). The degassed solvent is saturated with gas as it flows through a glass spiral containing the gas. The amount of solvent passed through the spiral was such that 10 - 25 ml of gas was absorbed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. No source given. The gas purified over activated charcoal at liquid air temperature. Impurities estimated to be less than 0.3 percent.
2. Benzene. No source given. Benzene distilled immediately before use.

ESTIMATED ERROR:

$\delta T/K = 0.05$

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid.* 1952, 3819.
2. Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Methylbenzene (Toluene); C_7H_8; 108-88-3	H. L. Clever Emory University Department of Chemistry Atlanta, Georgia 30322 USA January 1978

CRITICAL EVALUATION:

The solubility of helium in toluene was measured by Saylor and Battino (1) and by de Wet (2). The two sets of data agree within 2.7 percent over 288 - 308 K, the temperature range of common measurement. The agreement is within the experimental uncertainty of the method used. The two sets of data have been combined on a one to one weight basis by the method of least squares in a Gibbs energy equation, $\Delta G° = A + BT$ (Table 1). The recommended thermodynamic values for the transfer of helium from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

$$\Delta G°/\text{J mol}^{-1} = -RT \ln X_1 = 10{,}157 + 42.599\,T$$

$$\text{Std. Dev. } \Delta G° = 47, \quad \text{Coef. Corr.} = 0.9967$$

$$\Delta H°/\text{J mol}^{-1} = 10{,}157, \quad \Delta S°/\text{J K}^{-1}\text{ mol}^{-1} = -42.599$$

The recommended mole fraction solubilities at 101.325 kPa (1 atm) and the Gibbs energy changes at five degree intervals are given in Table 2.

TABLE 1. Parameters for the Gibbs energy change as a function of temperature.

$\Delta G° = A + BT$	Std. Dev. $\Delta G°$	No. Exp. Points	Weight	Reference
10,454 + 41.720 T	36.1	4	1	1
10,608 + 40.965 T	24.7	3	1	2
10,157 + 42.599 T	47.0	7		1 + 2

TABLE 2. Recommended mole fraction solubility of helium in toluene at 101.325 kPa (1 atm).

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/\text{J mol}^{-1}$
288.15	0.858	22,432
293.15	0.923	22,645
298.15	0.990	22,858
303.15	1.059	23,071
308.15	1.13	23,284
313.15	1.20	23,497
318.15	1.28	23,710
323.15	1.36	23,923
328.15	1.44	24,136

1. Saylor, J. H.; Battino, R. *J. Phys. Chem.* 1958, *62*, 1334.
2. de Wet, W. H. *J. S. Afr. Chem. Inst.* 1964, *17*, 9.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Methylbenzene (Toluene); C_7H_8; 108-88-3

ORIGINAL MEASUREMENTS:

Saylor, J. H.; Battino, R.

J. Phys. Chem. 1958, *62*, 1334 - 1337.

VARIABLES:

T/K: 288.15 - 328.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.846	1.79	1.89
298.15	0.981	2.05	2.24
313.15	1.17	2.42	2.77
328.15	1.45	2.93	3.52

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 10{,}454 + 41{,}720\ T$

Std. Dev. $\Delta G°$ = 36.1, Coef. Corr. = 0.9988

For the recommended free energy equation see the critical evaluation of the solubility of helium in toluene.

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Research grade.
2. Toluene. Mallinckrodt. Reagent grade. Shaken with conc. H_2SO_4, water washed, dried over Drierite, distilled b.p. 110.40 - 110.60°C.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/torr = 1$
$\delta X_1/X_1 = 0.04$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid.* 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. *J. Appl. Chem.* 1952, *2*, 161.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Methylbenzene (Toluene); C_7H_8; 108-88-3

ORIGINAL MEASUREMENTS:

de Wet, W. J.

J. S. Afr. Chem. Inst. 1964, *17*, 9 - 13.

VARIABLES:

T/K: 292.15 - 304.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $x_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
292.15	0.924	1.95	2.09
299.35	1.01	2.12	2.32
304.15	1.10	2.29	2.55

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 10{,}608 + 40.965\ T$

Std. Dev. $\Delta G°$ = 24.7, Coef. Corr. = 0.9951

For the recommended free energy equation see the critical evaluation of the solubility of helium in toluene.

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric.

To degas, the solvent was placed in a large continuously evacuated bulb until the solvent boiled freely without further release of dissolved gases.

To saturate, the solvent is flowed in a thin film through a glass spiral containing the gas. The volume of gas absorbed is measured on an attached buret system.

APPARATUS/PROCEDURE:

The apparatus is a modification of that used by Morrison and Billett (1) and others (2). The degassed solvent is saturated with gas as it flows through a glass spiral containing the gas. The amount of solvent passed through the spiral was such that 10-25 ml of gas was absorbed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. No source given. The gas purified over activated charcoal at liquid air temperature. Impurities estimated to be less than 0.3 percent.
2. Toluene. No source given. Toluene distilled immediately before use.

ESTIMATED ERROR:

$\delta T/K = 0.05$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *Ibid.* 1952, 3819.
2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. 1,2-Dimethylbenzene (o-Xylene); C_8H_{10}; 95-47-6	Byrne, J. E.; Battino, R.; Wilhelm, E. J. Chem. Thermodyn. 1975, 7, 515-522.

VARIABLES:	PREPARED BY:
T/K: 283.16 - 313.19 P/kPa: 101.325 (1 atm)	H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
283.16	0.758	1.42	1.474
283.42	0.757	1.42	1.472
298.12	0.929	1.72	1.874
298.17	0.936	1.73	1.890
313.05	1.112	2.03	2.324
313.09	1.111	2.01	2.300
313.19	1.118	2.04	2.336

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 9508.0 + 45.305\ T$

Std. Dev. $\Delta G°$ = 10.4, Coef. Corr. = 0.9999

$\Delta H°/J\ mol^{-1}$ = 9508.0, $\Delta S°/J\ K^{-1}\ mol^{-1}$ = -45.305

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
283.15	0.758	22,336
288.15	0.813	22,563
293.15	0.870	22,789
298.15	0.928	23,016
303.15	0.989	23,242
308.15	1.05	23,469
313.15	1.12	23,695
318.15	1.18	23,922

The solubility values were adjusted to a partial pressure of helium of 101.325 pKa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

APPARATUS/PROCEDURE: Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.
Solubility Determination. The degassed solvent is passed in a thin film down a glass spiral tube containing the solute gas and the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Either Air Products & Chemicals,Inc., or Matheson Co., Inc. 99 mol % or better.
2. 1,2-Dimethylbenzene. Phillips Petroleum Co. Pure grade.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F. D.; Danforth, W. F. J. Am. Oil Chem. Soc. 1968, 45, 830.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. 1,3-Dimethylbenzene (*m*-Xylene); C_8H_{10}; 108-38-3	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA February 1978

CRITICAL EVALUATION:

The solubility of helium in 1,3-dimethyl benzene was measured by de Wet (1) and by Byrne, Battino, and Wilhelm (2). The two sets of values differ by about 9 per cent over the 288 - 308 K temperature range of common measurement, with de Wet's data being the higher valued. The experimental technique used by the two laboratories is similar, and the gas and solvent appear to be of equivalent purity. Low solubility values could arise from either incomplete degassing, nonattainment of equilibrium, or both. High values could come from contamination of the helium in a more soluble gas. For the helium + 1,3-dimethylbenzene, there is no reason to favor one data set over the other. No recommendation of solubility values can be made without either further experimental work or a factor analysis of the noble gases' solubility in all solvents.

Table 1 gives the fit of the Gibbs energy equation, $\Delta G° = - RT \ln X_1 = A + BT$, for each of the two data sets and for the combined data set. Table 2 gives the smoothed values of the mole fraction solubility at five degree intervals for the two data sets and the combined data set.

TABLE 1. Parameters for the Gibbs energy as a function of temperature.

$\Delta G°/J\ mol^{-1} = A + BT$	Std. Dev. $\Delta G°$	No. Exp. Points	Reference
9,982.5 + 42.848 T	31.5	8	2
10,057 + 41.914 T	36.3	3	1
9,975.8 + 42.684 T	100.	11	

TABLE 2. Comparison of smoothed mole fraction solubility data at 101.325 kPa (1 atm).

T/K	Mole Fraction/$X_1 \times 10^4$		
	Byrne, et al. (1)	de Wet (2)	Combined
283.15	0.832	-	0.844
288.15	0.896	0.973	0.916
293.15	0.962	1.04	0.988
298.15	1.03	1.12	1.06
303.15	1.10	1.20	1.13
308.13	1.17	1.28	1.20
313.15	1.25	-	1.27

1. De Wet, W. J. *J. S. Afr. Chem. Inst.* 1964, *17*, 9.
2. Byrne, J. E.; Battino, R.; Wilhelm, E. *J. Chem. Thermodyn.* 1975, *7*, 515.

COMPONENTS:

1. Helium; He; 7440-59-7
2. 1,3-Dimethylbenzene (m-Xylene); C_8H_{10}; 108-38-3

ORIGINAL MEASUREMENTS:

de Wet, W. J.

J. S. Afr. Chem. Inst. 1964, 17, 9 - 13.

VARIABLES:

T/K: 291.35 - 304.75

P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
291.35	1.01	1.85	1.97
298.95	1.15	2.09	2.29
304.75	1.21	2.19	2.44

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 10{,}057 + 41.914\ T$

Std. Dev. $\Delta G°$ = 36.3, Coef. Corr. = 0.9918

For the recommended free energy equation see the critical evaluation of the solubility of helium in m-xylene.

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric.

To degas, the solvent is placed in a large continuously evacuated bulb until the solvent boils freely without further release of dissolved gases.

To saturate, the solvent is flowed in a thin film through a glass spiral containing the gas. The volume of gas absorbed is measured on an attached buret system.

APPARATUS/PROCEDURE:

The apparatus is a modification of that used by Morrison and Billett(1) and others (2). The degassed solvent is saturated with gas as it flows through a glass spiral containing the gas. The amount of solvent passed through the spiral was such that 10 - 25 ml of gas was absorbed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. No source given. The gas purified over activated charcoal at liquid air temperature. Impurities estimated to be less than 0.3 percent.
2. m-Xylene. No source given. m-Xylene distilled immediately before use.

ESTIMATED ERROR:

$\delta T/K = 0.05$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033. Ibid. 1952, 3819.
2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.

COMPONENTS:

1. Helium; He; 7440-59-7
2. 1,3-Dimethylbenzene (m-Xylene); C_8H_{10}; 108-38-3

ORIGINAL MEASUREMENTS:

Byrne, J. E.; Battino, R.; Wilhelm, E.

J. Chem. Thermodyn. 1975, *7*, 515-522.

VARIABLES:

T/K: 283.15 - 313.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
283.15	0.840	1.55	1.604
283.21	0.841	1.55	1.606
298.09	1.009	1.83	1.998
298.20	1.040	1.89	2.060
298.21	1.014	1.84	2.009
298.24	1.024	1.86	2.029
313.15	1.258	2.25	2.579
313.15	1.262	2.26	2.586

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 9{,}982.5 + 42.848$

Std. Dev. $\Delta G°$ = 31.5, Coef. Corr. = 0.9979

$\Delta H°/J\ mol^{-1} = 9{,}982.5$, $\Delta S°/J\ K^{-1}\ mol^{-1} = 42.848$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
283.15	0.832	22,115
288.15	0.896	22,329
293.15	0.962	22,543
298.15	1.03	22,758
303.15	1.10	22,972
308.15	1.17	23,186
313.15	1.25	23,400

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

The Bunsen and Ostwald coefficients were calculated by the compiler.

APPARATUS/PROCEDURE: Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns. Solubility Determination. The degassed solvent passes in thin film down a glass spiral at a total pressure of one atm of solute gas plus solvent vapor. Solubility equilibrium is rapidly attained. The volume of gas absorbed is measured, and the solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Either Air Products and Chemicals, Inc. or Matheson Co., Inc. 99 mole % or better.
2. m-Xylene. Phillips Petroleum Co., pure grade.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033.
2. Battino, R.; Evans, F. D.; Danforth, W. F. *J. Am. Oil Chem. Soc.* 1968, *45*, 830.

COMPONENTS:

1. Helium; He; 7440-59-7
2. 1,4-Dimethylbenzene (p-Xylene); C_8H_{10}; 106-42-3

ORIGINAL MEASUREMENTS:

Byrne, J. E.; Battino, R.; Wilhelm, E.

J. Chem. Thermodyn. 1975, 7, 515-522.

VARIABLES:

T/K: 288.13 - 313.17

P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.13	0.922	1.68	1.777
288.15	0.923	1.69	1.780
288.17	0.901	1.65	1.736
298.13	1.051	1.90	2.074
298.13	1.076	1.95	2.125
298.13	1.051	1.90	2.074
298.15	1.072	1.94	2.117
298.17	1.103	1.99	2.177
298.18	1.071	1.94	2.114
313.16	1.293	2.30	2.641
313.17	1.309	2.33	2.673
313.17	1.303	2.32	2.662

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 10500 + 40.830\ T$

Std. Dev. $\Delta G° = 35.4$, Coef. Corr. = 0.9957

$\Delta H°/J\ mol^{-1} = 10500$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -40.830$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
283.15	0.852	22,061
288.15	0.920	22,265
293.15	0.992	22,469
298.15	1.07	22,673
303.15	1.14	22,877
308.15	1.22	23,082
313.15	1.31	23,286
318.15	1.39	23,490

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

APPARATUS/PROCEDURE: Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.
Solubility Determination. The degassed solvent passes in a thin film down a glass spiral tube containing the solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final gas volume in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Either Air Products & Chemicals, Inc., or Matheson Co., Inc. 99 mol % or better.
2. 1,4-Dimethylbenzene. Phillips Petroleum Co., pure grade.

ESTIMATED ERROR:

$\delta T/K = 0.03$

$\delta P/mmHg = 0.5$

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F. D.; Danforth, W. F. J. Am. Oil Chem. Soc. 1968, 45, 830.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Methanol; CH_4O; 67-56-1

ORIGINAL MEASUREMENTS:

Lannung, A.

J. Am. Chem. Soc. 1930, 52, 68 - 80.

VARIABLES:

T/K: 288.15 - 303.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L.Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.533	2.97	3.13
288.15	0.535	2.98	3.14
293.15	0.564	3.12	3.35
293.15	0.567	3.14	3.37
298.15	0.594	3.27	3.57
303.15	0.625	3.42	3.80

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 7591.9 + 55.436\ T$

Std. Dev. ΔG^o = 6.3, Coef. Corr. = 0.9998

$\Delta H^o/J\ mol^{-1} = 7591.9$, $\Delta S^o/J\ K^{-1}\ mol^{-1} = -55.436$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^o/J\ mol^{-1}$
288.15	0.535	23,566
293.15	0.564	23,843
298.15	0.595	24,120
303.15	0.625	24,397

The Ostwald coefficients and the mole fraction solubilities of helium were calculated by the compiler.

Clever and Reddy (2) report a Bunsen coefficient of 3.38×10^{-2} ($X_1 = 0.618 \times 10^{-4}$) at 303.15 K and 101.325 kPa. Value not used in smoothed fit.

AUXILIARY INFORMATION

METHOD:

Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes.The amount of solvent is determined by the weight of mercury displaced.

APPARATUS/PROCEDURE: The apparatus is a modification of that of von Antropoff (1). A calibrated combined all glass manometer and bulb is enclosed in an air thermostat. Mercury is used as the calibration and confining liquid. The solvent is degassed in the apparatus. The solvent and the gas are shaken together until equilibrium is established.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Linde Liquid Air Factory. Contained 0.5 per cent by volume neon.
2. Methanol. B.A.S.F. Distilled from freshly cut strips of magnesium metal. The first one-third was discarded.

OTHER DATA: Popov and Drakin report(3) the apparent partial molal volume of He in CH_3OH as 35.3 ± 0.6 $cm^3\ mol^{-1}$.

ESTIMATED ERROR:

$\delta T/K = 0.03$

REFERENCES:

1. von Antropoff, A. Z. Elektrochem. 1919, 25, 269.
2. Clever, H.L.; Reddy, G.S. J. Chem. Eng.Data 1963, 8, 191.
3. Popov, G.A.; Drakin, S.I. Zh. Fiz. Khim. 1974, 48, 631.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Ethanol (Ethyl Alcohol); C_2H_6O; 64-17-5	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA February 1978

CRITICAL EVALUATION:

The solubility of helium in ethanol was measured by Lannung (1) and by Cargill (2). There is a 15 degree range of common measurement between 288 and 303 K. Over that temperature range there is an increasing divergence of the mole fraction solubilities from 0.9 per cent at 288 to 5.8 percent at 303 K.

The helium gas used by Lannung contained 0.5 percent neon. The ethanol used by Cargill contained 0.71 weight percent water. No correction for either of these impurities was made.

Table 1 gives details on the least squares fit of the Gibbs energy to a linear temperature function for the two data sets and their combination.

TABLE 1. Parameters for $\Delta G° = A + BT$

$\Delta G°/J\ mol^{-1} = A + BT$	Std. Dev. $\Delta G°$	No. Exp. Points	Weight	Ref
7,250.9 + 54.434 T	19.3	6	1	1
9,791.5 + 45.547 T	79.1	6	1	2
9,866.8 + 45.428 T	80.0	12		

Table 2 compares the mole fraction solubility of helium in ethanol at 101.325 kPa (1 atm) from the three equations at five degree intervals. The Gibbs energy values in Table 2 are for the combined fit.

TABLE 2. Calculated mole fraction solubility of helium in ethanol at 101.325 kPa (1 atm).

T/K	Mol Fraction/$X_1 \times 10^4$			$\Delta G°/J\ mol^{-1}$
	Lannung (1)	Cargill (2)	Combined	
278.15	-	0.605	0.594	22,503
283.15	-	0.652	0.641	22,730
288.15	0.695	0.701	0.689	22,957
293.15	0.732	0.752	0.740	23,184
298.15	0.770	0.804	0.791	23,411
303.15	0.808	0.858	0.845	23,638
308.15	-	0.914	0.901	23,866
313.15	-	0.972	0.958	24,093
318.15	-	1.030	1.015	24,320
323.15	-	1.090	1.075	24,547
328.15	-	1.155	1.140	24,774
333.15	-	1.220	1.200	25,001

This is an important system which needs more work before solubility values can be recommended. A tentative acceptance of the combined data is recommended with

$$\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 9,886.8 + 45.428\ T$$

$$\text{Std. Dev. } \Delta G° = 80.0, \quad \text{Coef. Corr.} = 0.9934$$

$$\Delta H°/J\ mol^{-1} = 9,866.8, \quad \Delta S°/J\ K^{-1}\ mol^{-1} = -45.428$$

1. Lannung, A. *J. Am. Chem. Soc.* 1930, *52*, 68.
2. Cargill, R. W. *J. Chem. Soc., Faraday Trans. 1.* 1978, *74*, 1444.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Ethanol (Ethyl Alcohol); C_2H_6O; 64-17-5

ORIGINAL MEASUREMENTS:

Lannung, A.

J. Am. Chem. Soc. 1930, *52*, 68 - 80.

VARIABLES:

T/K: 288.15 - 303.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.699	2.70	2.85
288.15	0.689	2.66	2.81
293.15	0.732	2.81	3.02
293.15	0.737	2.83	3.04
303.15	0.800	3.04	3.37
303.15	0.814	3.09	3.43

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 7{,}250.9 + 54.434\ T$

Std. Dev. $\Delta G°$ = 19.3, Coef. Corr. = 0.9987

The mol fraction and Ostwald solubilities were calculated by the compiler.

See the evaluation of the solubility of helium in ethanol for the recommended solubility equation.

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

AUXILIARY INFORMATION

METHOD:

Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced.

APPARATUS/PROCEDURE:

The apparatus is a modification of that of von Antropoff (1). A calibrated, combined all glass manometer and bulb is enclosed in an air thermostat. Mercury is used as the calibration and confining liquid. The solvent is degassed in the apparatus. The solvent and the gas are shaken together until equilibrium is established.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Linde's Liquid Air. Contained 0.5 percent by volume neon.

2. Ethanol. (Alcohol absolutus, Ph. dan.), distilled twice from over freshly prepared quick lime.

ESTIMATED ERROR:

$\delta T/K = 0.03$

REFERENCES:

1. v. Antropoff, A. *Z. Electrochem.* 1919, *25*, 269.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Ethanol (Ethyl Alcohol); C_2H_6O; 64-17-5	Cargill, R. W. J. Chem. Soc., Faraday Trans. 1. 1978, 74, 1444 - 1456.
VARIABLES: T/K: 278.85 - 333.15 P/kPa: 101.325 (1 atm)	PREPARED BY: H. L. Clever

EXPERIMENTAL VALUES:

T/K	Solubility* $cm^3\ kg^{-1}$	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
278.15	30.5	0.627	2.45	2.50
289.15	34.8	0.715	2.76	2.92
299.15	38.4	0.789	3.01	3.30
309.15	43.9	0.902	3.40	3.85
320.15	50.4	1.035	3.86	4.52
333.15	61.5	1.265	4.64	5.66

* Gas volume at 273.15 K and 1 atm in 1.000 kg ethanol.

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 9{,}791.5 + 45.547\ T$

Std. Dev. $\Delta G°$ = 79.1, Coef. Corr. = 0.9963

The mole fraction, Bunsen and Ostwald coefficients were calculated by the compiler.

See the evaluation of the solubility of helium in ethanol for the recommended free energy equation.

AUXILIARY INFORMATION

METHOD: Modified Morrison and Billett apparatus (1); modifications include addition of a constant flow pump, and measuring the mass of the solvent (instead of volume) on a top-pan balance. Each determination used about 20 cm^3 of gas in up to 500 cm^3 of solvent. The solvent was degassed using the vapor-pump principle (1).

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

1. Helium.
2. Ethanol. Source not given. Contained 1.8 mol % (0.71 weight %) water.

ESTIMATED ERROR:

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.

COMPONENTS:

1. Helium; He; 7440-59-7
2. 2-Methyl-1-propanol; $C_4H_{10}O$; 78-83-1

ORIGINAL MEASUREMENTS:

Battino, R.; Evans, F. D.; Danforth, W. F.; Wilhelm, E.

J. Chem. Thermodyn. 1971, *3*, 743-751.

VARIABLES:

T/K: 274.02 - 312.76
P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
274.02	0.87	2.15	2.16
282.91	0.89	2.17	2.25
295.85	1.00	2.43	2.63
312.76	1.12	2.66	3.05

Smoothed Data: $\Delta G° = -RT \ln X_1 = 4917.5 + 59.956\ T$

Std. Dev. $\Delta G°$ = 43.8, Coef. Corr. = 0.9991

$\Delta H°/J\ mol^{-1}$ = 4917.5, $\Delta S°/J\ K^{-1}\ mol^{-1}$ = -59.956

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
273.15	0.847	21,294
278.15	0.881	21,594
283.15	0.914	21,894
288.15	0.948	22,194
293.15	0.982	22,494
298.15	1.02	22,793
303.15	1.05	23,093
308.15	1.08	23,393
313.15	1.12	23,693

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.
The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: A. Degasser (1). B. Absorption of gas in a thin film of liquid (2, 3).

APPARATUS/PROCEDURE: Degassing. The solvent is sprayed into an evacuated chamber of an all glass apparatus; it is stirred and heated until the pressure drops to the vapor pressure of the liquid. Solubility Determination. The degassed liquid passes in a thin film down a glass spiral tube at a total pressure of one atm of solute gas plus solvent vapor. The gas absorbed is measured in the attached buret system, and the solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. The Matheson Co., Inc. greater than 99 mol %.
2. 2-Methyl-1-propanol. Fisher Scientific Co., certified (99 mol %).

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Battino, R.; Evans, D. F. *Anal. Chem.* 1966, *38*, 1627.
2. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033.
3. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:

1. Helium; He; 7440-59-7
2. 1-Octanol; $C_8H_{18}O$; 111-87-5

ORIGINAL MEASUREMENTS:

Wilcock, R.S.; Battino, R.; Danforth, W.F; Wilhelm, E.

J.Chem.Thermodyn. 1978, 10, 817-822.

VARIABLES:

T/K: 282.45 - 298.17

P/kPa: 101.325 (1 atm)

PREPARED BY:

A.L. Cramer

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
282.45	1.105	1.585	1.639
298.17	1.207	1.709	1.866

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 3932.8 + 61.823\ T$

$\Delta H^o J\ mol^{-1} = 3932.8$, $\Delta S^o/J\ K^{-1}\ mol^{-1} = -61.823$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^o/J\ mol^{-1}$
283.15	1.110	21,438
288.15	1.142	21,747
293.15	1.175	22,056
298.15	1.207	22,365

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa by Henry's law.

The Bunsen coefficients were calculated by the compiler.

A preliminary report of this work appeared in Conf. Int. Thermodyn. Chim., {C.R.}, 4th 1975, 6, 122-128; Chem.Abstr. 1977, 86, 22375d.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The apparatus is based on the design of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3).

See the helium + octane data sheet for more details.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co. Inc. Purest commercially available grade.
2. 1-Octanol. Eastman Organic Chemicals. Distilled.

ESTIMATED ERROR:

$\delta T/K = 0.03$

$\delta P/mmHg = 0.5$

$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. J.Am.Oil Chem. Soc. 1968, 45, 830.
3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. Anal. Chem. 1971, 43, 806.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. 1-Decanol; $C_{10}H_{22}O$; 112-30-1	Wilcock, R.J.; Battino, R.; Danforth, W.F; Wilhelm, E. J.Chem.Thermodyn. 1978, 10, 817-822.
VARIABLES:	PREPARED BY:
T/K: 282.64 - 313.49 P/kPa: 101.325 (1 atm)	A.L. Cramer

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
282.64	1.338	1.587	1.642
298.11	1.512	1.770	1.932
313.49	1.736	2.006	2.302

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 6230.2 + 52.158\ T$

Std. Dev. ΔG^o = 22, Coef. Corr. = 0.9996

$\Delta H^o J\ mol^{-1} = 6230.2$, $\Delta S^o/J\ K^{-1}\ mol^{-1} = -52.158$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^o/J\ mol^{-1}$
283.15	1.337	20,999
288.15	1.400	21,259
293.15	1.464	21,520
298.15	1.528	21,780
303.15	1.592	22,041
308.15	1.658	22,303
313.15	1.723	22,563

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

The apparatus is based on the design of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3).

See the helium + octane data sheet for more details.

A preliminary report of this work appeared in Conf. Int. Thermodyn. Chim., {C.R.}, 4th, 1975, 6, 122-128; Chem. Abstr. 1977, 86, 22375d.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co. Inc. Purest commercially available grade.
2. 1-Decanol. Eastman Organic Chemicals. Distilled.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison,T.J.;Billett,F. J. Chem. Soc. 1948, 2033.
2. Battino,R.;Evans,F.D.;Danforth,W.F. J.Am.Oil Chem. Soc. 1968, 45, 830.
3. Battino,R.;Banzhof,M.;Bogan,M.; Wilhelm, E. Anal. Chem. 1971, 43, 806.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Cyclohexanol; $C_6H_{12}O$; 108-93-0

ORIGINAL MEASUREMENTS:

Lannung, A.

J. Am. Chem. Soc. 1930, 52, 68 - 80.

VARIABLES:

T/K: 298.15 - 310.15
He P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.15	0.468	0.99	1.08
298.15	0.482	1.02	1.11
303.15	0.484	1.02	1.13
303.15	0.532	1.12	1.24
310.15	0.558	1.17	1.33
310.15	0.578	1.21	1.37

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 11{,}532 + 44.122\ T$

Std. Dev. $\Delta G°$ = 84.9, Coef. Corr. = 0.9418

$\Delta H°/J\ mol^{-1} = 11{,}532$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -44.122$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
298.15	0.473	24,687
303.15	0.511	24,907
308.15	0.550	25,128
313.15	0.591	25,349

The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced.

APPARATUS/PROCEDURE: The apparatus is a modification of that of von Antropoff (1). A calibrated, combined all glass manometer and bulb is enclosed in an air thermostat. Mercury is used as the calibration and confining liquid. The solvent is degassed in the apparatus. The solvent and the gas are shaken together until equilibrium is established.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Linde's Liquid Air. Contained 0.5 per cent by volume neon.

2. Cyclohexanol. "pur", Poulenc Freres, fractionated twice *in vacuo*; used portion with m.p. = 23.6 - 23.9 °C.

ESTIMATED ERROR:

$\delta T/K = 0.03$

REFERENCES:

1. v. Antropoff, A.
Z. Electrochem. 1919, 25, 269.

COMPONENTS:

1. Helium; He; 7440-59-7
2. 2-Propanone (Acetone); C_3H_6O; 67-64-1

ORIGINAL MEASUREMENTS:

Lannung, A.

J. Am. Chem. Soc. 1930, *52*, 68 - 80.

VARIABLES:

T/K: 288.15 - 298.15

He P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.907	2.79	2.94
288.15	0.927	2.85	3.01
288.15	0.924	2.84	3.00
293.15	0.966	2.95	3.17
293.15	1.01	3.10	3.33
293.15	1.01	3.09	3.32
298.15	1.05	3.19	3.48
298.15	1.09	3.32	3.62
298.15	1.09	3.31	3.61

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 11{,}277 + 38.143\ T$

Std. Dev. $\Delta G°$ = 43.6, Coef. Corr. = 0.9669

$\Delta H^0/J\ mol^{-1} = 11{,}277$, $\Delta S^0/J\ K^{-1}\ mol^{-1} = -38.143$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^0/J\ mol^{-1}$
288.15	0.919	22,268
293.15	0.996	22,459
298.15	1.075	22,650

The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced.

APPARATUS/PROCEDURE: The apparatus is a modification of that of von Antropoff (1). A calibrated, combined all glass manometer and bulb is enclosed in an air thermostat. Mercury is used as the calibration and confining liquid. The solvent is degassed in the apparatus. The solvent and the gas are shaken together until equilibrium is established.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Linde's Liquid Air. Contained 0.5 percent by volume neon.
2. Acetone. Kahlbaum's "zur Analyse". Used after tests showed absence of water, acid and aldehyde.

ESTIMATED ERROR:

$\delta T/K = 0.03$

REFERENCES:

1. v. Antropoff, A. *Z. Electrochem.* 1919, *25*, 269.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Hexadecafluoroheptane; C_7F_{16}; 335-57-9

ORIGINAL MEASUREMENTS:

Kobatake, Y.; Hildebrand, J.H.

J. Phys. Chem. 1961, *65*, 331 - 335.

VARIABLES:

T/K: 291.40 - 303.23
He P/kPa: 101.325 (1 atm)

PREPARED BY:

C.E.Edelman, M.E.Derrick

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
291.40	8.314	8.29	8.85
295.47	8.58	8.50	9.20
299.24	8.991	8.86	9.70
303.23	9.294	9.10	10.10

Smoothed Data: $\Delta G^\circ/J\ mol^{-1} = -RT \ln X_1 = 7124.4 + 34.543T$

Std. Dev. ΔG° = 11.3, Coef. Corr. = 0.9979

$\Delta H^\circ/J\ mol^{-1} = 7124.4$, $\Delta S^\circ/J\ K^{-1}\ mol^{-1} = -34.543$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^\circ/J\ mol^{-1}$
288.15	8.02	17,078
293.15	8.44	17,251
298.15	8.86	17,423
303.15	9.29	17,596

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen and Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus consists of a gas measuring buret, an absorption pipet, and reservoir for solvent with suitable connections. The buret is thermostated at 25 °C, the pipet at any temperature from 5 to 30 °C. The pipet contains a glass-enclosed piece of iron to provide gentle, continuous magnetic stirring. Pure solvent is degassed by freezing with liquid nitrogen, evacuating, then boiling with a heat lamp. The degassing process is repeated three times. The solvent is then flowed into the pipet, where it is again boiled under low pressure for final degassing. Manipulation of the apparatus is such that the solvent never comes in contact with stopcock grease. The liquid in the pipet is sealed off by mercury. Its volume is the difference between the capacity of the pipet and the volume of mercury that confines it. Gas is admitted to the pipet. Its exact amount is determined by P-V measurements in the buret before and after introduction of gas into the pipet. The stirrer is set in motion. Equilibrium is attained within 24 hr.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Linde Oxygen Co. Purity 99.9 per cent.
2. Hexadecafluoroheptane. Source not given. Purified as described in reference 1.

ESTIMATED ERROR:

$\delta T/K = 0.02$
$\delta X_1/X_1 = 0.003$

REFERENCES:

1. Glew, D.N.; Reeves, L.W. *J. Phys. Chem.* 1956, *60*, 615.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Undecafluoro(trifluoromethyl)-cyclohexane (Perfluoromethyl-cyclohexane); C_7F_{14}; 355-02-2	Clever, H. L.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1958, 62, 89-91.
VARIABLES: T/K: 289.15 - 316.25 P/kPa: 101.325 (1 atm)	PREPARED BY: P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
289.15	7.05	8.17	8.65
303.15	7.85	8.93	9.91
316.25	8.23	9.16	10.6

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 4336.5 + 45.274\ T$

Std. Dev. $\Delta G°$ = 35.0, Coef. Corr. = 0.9984

$\Delta H°/J\ mol^{-1}$ = 4336.5, $\Delta S°/J\ K^{-1}\ mol^{-1}$ = -45.274

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	7.06	17,382
293.15	7.28	17,609
298.15	7.51	17,835
303.15	7.73	18,061
308.15	7.94	18,288
313.15	8.16	18,514
318.15	8.38	18,741

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. (1) The apparatus is a modification of that used by Morrison and Billett (2). Modifications include the addition of a spiral solvent storage tubing, a manometer for constant reference pressure, and an extra gas buret for highly soluble gases.

APPARATUS/PROCEDURE: (a) Degassing. 700ml of solvent is shaken and evacuated while attached to a cold trap, until no bubbles are seen; solvent is then transferred through a 1 mm. capillary tubing, released as a fine mist into a continuously evacuated flask.
(b) Solvent is saturated with gas as it flows through 8 mm x 180 cm of tubing attached to a gas buret. Pressure is maintained at 1 atm as the gas is absorbed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Both standard and research grades were used.

2. Perfluoromethylcyclohexane. du Pont FCS-326, shaken with concentrated H_2SO_4, washed, dried over Drierite and distilled b.p. 75.95 to 76.05° at 753 mm., lit. b.p. 76.14 °C at 760 mmHg.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/mm\ Hg = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.

2. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Hexafluorobenzene; C_6F_6; 392-56-3	Evans, F. D.; Battino, R. J. Chem. Thermodyn. 1971, 3, 753-760.
VARIABLES: T/K: 282.91 - 298.46 P/kPa: 101.325 (1 atm)	PREPARED BY: H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
282.91	1.43	2.82	2.92
283.10	1.41	2.79	2.89
297.63	2.13	4.13	4.50
298.46	2.13	4.13	4.51

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 18873 + 6.968\ T$

Std. Dev. $\Delta G°$ = 28.5, Coef. Corr. = 0.9049

$\Delta H°/J\ mol^{-1} = 18873$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -6.968$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
278.15	1.23	20,812
283.15	1.43	20,847
288.15	1.64	20,882
293.15	1.87	20,917
298.15	2.13	20,951
303.15	2.42	20,986

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

APPARATUS/PROCEDURE: Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns. Solubility Determination. The degassed solvent passes in a thin film down a glass spiral tube containing the solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final gas volume in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Either Air Products & Chemicals, Inc., or Matheson Co., Inc. Better than 99 mol per cent. (usually 99.9+).

2. Hexafluorobenzene. Imperial Smelting Co., Avonmouth, U.K. GC purity 99.7%, density at 25°C 1.60596 g cm^{-3}, Purified by see: Anal. Chem. 1968, 40, 224.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033.

2. Battino, R.; Evans, F. D.; Danforth, W. F. J. Am. Oil Chem. Soc. 1968, 45, 830.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Fluorobenzene; C_6H_5F; 462-06-6

ORIGINAL MEASUREMENTS:

Saylor, J. H.; Battino, R.

J. Phys. Chem. 1958, 62, 1334-1337.

VARIABLES:

T/K: 288.15 - 328.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	1.01	2.44	2.57
298.15	1.16	2.75	3.00
313.15	1.35	3.14	3.60
328.15	1.52	3.49	4.19

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 7936.8 + 48.830\ T$

Std. Dev. $\Delta G°$ = 35.4, Coef. Corr. = 0.9991

$\Delta H°/J\ mol^{-1} = 7936.8$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -48.830$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	1.02	22,007
293.15	1.08	22,251
298.15	1.15	22,496
303.15	1.21	22,740
308.15	1.27	22,984
313.15	1.34	23,228
318.15	1.40	23,472
323.15	1.47	23,716
328.15	1.53	23,960

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.
The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Clever, Battino, Saylor, and Gross (2).

APPARATUS/PROCEDURE: The solvent is degassed by evacuating the space above the liquid and shaking, followed by passage of the liquid as a fine mist into an evacuated container. The degassed liquid passes as a thin liquid film down a glass spiral tube containing the solute gas at a total pressure of one atm (1,2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Both standard and research grades were used.
2. Fluorobenzene. Eastman Kodak Co. white label, dried over P_4O_{10}, distilled, b.p. 84.28 - 84.68 °C.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 1$
$\delta X_1/X_1 = 0.04$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.

COMPONENTS:

1. Helium; He; 7440-59-7
2. 1,1,2,2-Tetrachloroethane; $C_2H_2Cl_4$; 79-34-5

ORIGINAL MEASUREMENTS:

de Wet, W. J.

J. S. Afr. Chem. Inst. 1964, *17*, 9-13.

VARIABLES:

T/K: 291.25 - 304.05

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
291.25	0.997	2.12	2.26
297.45	1.08	2.28	2.48
304.05	1.15	2.42	2.69

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 8,193.3 + 48.443\ T$

Std. Dev. $\Delta G°$ = 13.2, Coef. Corr. = 0.9991

$\Delta H°/J\ mol^{-1} = 8,193.3$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -48.443$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	0.964	22,152
293.15	1.02	22,395
298.15	1.08	22,637
303.15	1.14	22,879
308.15	1.20	23,121

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.

The mole fraction solubility and Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric.
To degas, the solvent is placed in a large continuously evacuated bulb until the solvent boils freely without further release of dissolved gases.

To saturate, the solvent is flowed in a thin film through a glass spiral containing the gas. The volume of gas absorbed is measured on an attached buret system.

APPARATUS/PROCEDURE:

The apparatus is a modification of that used by Morrison and Billett(1) and others (2). The degassed solvent is saturated with gas as it flows through a glass spiral containing the gas. The amount of solvent passing through the spiral is such that 10 - 25 ml of gas was absorbed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. No source given. The gas purified over activated charcoal at liquid air temperature. Impurities estimated to be less than 0.3 percent.
2. 1,1,2,2-Tetrachloroethane. No source given. 1,1,2,2-Tetrachloroethane distilled immediately before use.

ESTIMATED ERROR:

$\delta T/K = 0.05$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *Ibid.* 1952, 3819.
2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Chlorobenzene; C_6H_5Cl; 108-90-7	Saylor, J. H.; Battino, R. *J. Phys. Chem.* 1958, *62*, 1334 - 1337.
VARIABLES: T/K: 288.15 - 328.15 P/kPa: 101.325 (1 atm)	PREPARED BY: H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.597	1.32	1.39
298.15	0.696	1.52	1.66
313.15	0.853	1.84	2.11
328.15	0.990	2.11	2.53

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 9951.1 + 46.251\ T$

Std. Dev. $\Delta G°$ = 32.0, Coef. Corr. = 0.9992

$\Delta H°/J\ mol^{-1}$ = 9951.1, $\Delta S°/J\ K^{-1}\ mol^{-1}$ = -46.251

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	0.603	23,278
293.15	0.647	23,510
298.15	0.693	23,741
303.15	0.740	23,972
308.15	0.789	24,203
313.15	0.840	24,435
318.15	0.892	24,666
323.15	0.945	24,897
328.15	1.00	25,128

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.
The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Clever, Battino, Saylor, and Gross (2).

APPARATUS/PROCEDURE: The procedure is to flow a thin layer of degassed liquid through a spiral containing the gas. The gas dissolves rapidly and the saturated liquid flows into a buret system. The volume of gas dissolved is determined by the increase in the solution level at constant pressure. The volume of liquid the gas dissolves in is determined in the burets. For low solubilities extra solvent is run through the buret system and weighed. An auxiliary buret is used for high solubilities.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Research grade was used.
2. Chlorobenzene. Eastman Kodak Co. white label. Dried over P_4O_{10}, distilled b.p. 131.67 - 131.71 °C.

ESTIMATED ERROR:

$\delta T/K$ = 0.03
$\delta P/mmHg$ = 1
$\delta X_1/X_1$ = 0.04

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033.
2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:

1. Helium; He; 7440-59-7

2. Bromobenzene; C_6H_5Br; 108-86-1.

ORIGINAL MEASUREMENTS:

Saylor, J. H.; Battino, R.

J. Phys. Chem. 1958, *62*, 1334 - 1337.

VARIABLES:

T/K: 288.15 - 328.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.441	0.945	0.997
298.15	0.550	1.16	1.27
313.15	0.701	1.47	1.68
328.15	0.782	1.61	1.94

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 11183 + 44.244\ T$

Std. Dev. $\Delta G°$ = 115.6, Coef. Corr. = 0.9890

$\Delta H°/J\ mol^{-1} = 11183$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -44.244$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	0.459	23,932
293.15	0.497	24,153
298.15	0.537	24,374
303.15	0.578	24,596
308.15	0.621	24,817
313.15	0.666	25,038
318.15	0.713	25,259
323.15	0.761	25,480
328.15	0.811	25,702

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.
The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Clever, Battino, Saylor, and Gross (2).

APPARATUS/PROCEDURE: The procedure is to flow a thin layer of degassed liquid through a spiral containing the gas. The gas dissolves rapidly and the saturated liquid flows into a buret system. The volume of gas dissolved is determined by the increase in the solution level at constant pressure. The volume of liquid the gas dissolves in is determined in the burets. For low solubilities extra solvent is run through the buret system and weighed. An auxiliary buret is used for high solubilities.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Research grade was used.

2. Bromobenzene. Eastman Kodak Co., white label, dried over P_4O_{10}, distilled, b.p. 155.86 - 155.90°C.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 1$
$\delta X_1/X_1 = 0.04$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033.

2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Iodobenzene; C_6H_5I; 591-50-4	Saylor, J. H.; Battino, R. *J. Phys. Chem.* 1958, *62*, 1334 - 1337.
VARIABLES: T/K: 288.15 - 328.15 P/kPa: 101.325 (1 atm)	PREPARED BY: H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.298	0.601	0.634
298.15	0.385	0.770	0.840
313.15	0.504	0.994	1.14
328.15	0.592	1.16	1.39

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 13325 + 40.068\ T$

Std. Dev. $\Delta G°$ = 105.9, Coef. Corr. = 0.9888

$\Delta H°/J\ mol^{-1} = 13325$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -40.068$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	0.310	24,871
293.15	0.341	25,071
298.15	0.374	25,271
303.15	0.408	25,472
308.15	0.445	25,672
313.15	0.484	25,872
318.15	0.524	26,073
323.15	0.566	26,273
328.15	0.611	26,473

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.
The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Clever, Battino, Saylor, and Gross (2).

APPARATUS/PROCEDURE: The procedure is to flow a thin layer of degassed liquid through a spiral containing the gas. The gas dissolves rapidly and the saturated liquid flows into a buret system. The volume of gas dissolved is determined by the increase in the solution level at constant pressure. The volume of liquid the gas dissolves in is determined in the burets. For low solubilities extra solvent is run through the buret system and weighed. An auxiliary buret is used for high solubilities.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Research grade used.
2. Iodobenzene. Eastman Kodak Co., white label, shaken with dil. aq. thiosulfate, washed with water, dried over P_4O_{10}, distilled 77.40 - 77.60 °C under 20 mmHg.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 1$
$\delta X_1/X_1 = 0.04$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033.
2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Carbon Disulfide; CS_2; 75-15-0

ORIGINAL MEASUREMENTS:

Powell, R. J.

J. Chem. Eng. Data 1972, *17*, 302-304.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.15	0.39	1.44	1.57

The Bunsen and Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

APPARATUS/PROCEDURE: Dymond and Hildebrand (1) apparatus which uses an all glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is calculated from the initial and final gas pressures. The solvent is degassed by freezing and pumping followed by boiling under reduced pressure.

SOURCE AND PURITY OF MATERIALS:

1. Helium. No source given. Research grade, dried over $CaCl_2$ before use.
2. Carbon Disulfide. No source given. Spectrochemical grade.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.002$

REFERENCES:

1. Dymond, J. H.; Hildebrand, J. H. *Ind. Eng. Chem. Fundam.* 1967, *6*, 130.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Sulfinylbismethane (Dimethyl Sulfoxide); C_2H_6OS (CH_3SOCH_3); 67-68-5	Dymond, J.H. J. Phys. Chem. 1967, 71, 1829 - 1831.
VARIABLES:	PREPARED BY:
T/K: 298.15 He P/kPa: 101.325 (1 atm)	M.E.Derrick

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.15	0.284	0.893	0.975

The Bunsen and Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The liquid is saturated with the gas at a gas partial pressure of 1 atm.
The apparatus is that described by Dymond and Hildebrand (1). The apparatus uses an all-glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is calculated from the initial and final gas pressure.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Stuart Oxygen Co. Dried before use.
2. Dimethylsulfoxide. Matheson, Coleman, and Bell Co. Spectroquality reagent. Dried over 4A molecular seive and a fraction frozen out. Melting point 18.37 °C.

ESTIMATED ERROR:

REFERENCES:

1. Dymond, J.; Hildebrand, J.H. Ind. Eng. Chem. Fundam. 1967, 6, 130.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Methylhydrazine; CH_6N_2 ($NHCH_3NH_2$); 60-34-4

ORIGINAL MEASUREMENTS:

Chang, E. T.; Gokcen, N. A.

J. Phys. Chem. 1968, 72, 638 - 642.

VARIABLES:

T/K: 253.24 - 298.14
He P/kPa: 83.735 - 217.383
(0.8264 - 2.1454 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	P/Atm	Henry's Constant $K \times 10^4$	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
253.24	0.8264	1.39	0.115		
	1.9837	1.57	0.312		
	1.0000		0.147	0.65	0.60
273.15	1.1448	1.78	0.204		
	2.1454	1.95	0.418		
	1.0000		0.186	0.81	0.81
298.14	1.1272	2.46	0.278		
	2.0617	2.63	0.541		
	1.0000		0.254	1.07	1.17

The Henry's constant is defined as $K/\text{atm}^{-1} = X_1/P$. The solubility values at one atm were calculated from the average Henry's constant by the compiler.

Smoothed Data: The 101.325 kPa (1 atm) mole fraction solubilities were fitted to:

$\Delta G°/\text{J mol}^{-1} = -RT \ln X_1$
$= 7699.0 + 62.213\ T$

Std. Dev. $\Delta G°$ = 38.4, Coef. Corr. = 0.9996

$\Delta H°/\text{J mol}^{-1} = 7699.0$, $\Delta S°/\text{J K}^{-1}\text{ mol}^{-1} = -62.213$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/\text{J mol}^{-1}$
253.15	0.145	23,449
258.15	0.156	23,760
263.15	0.167	24,071
268.15	0.178	24,382
273.15	0.190	24,693
278.15	0.202	25,004
283.15	0.214	25,315
288.15	0.226	25,626
293.15	0.239	25,937
298.15	0.252	26,248

AUXILIARY INFORMATION

METHOD: The solvent was degassed under vacuum in the previously weighed apparatus. Apparatus and degassed solvent were weighed. Gas was introduced into the apparatus at a known P and T, the liquid stirred, and the pressure observed until there was no further change. Equilibrium was established within 10 m and the P was followed for 40 m. Substituted hydrazines appear to decompose with time. For decomposing solvents the P was followed for up to 2 h, and the solubility value was corrected for the gaseous decomp. prod.

APPARATUS/PROCEDURE: The apparatus was of all Pyrex glass construction. It consisted of three calibrated volumes for the measurement of the gas, a container for the solvent, which was stirred with a glass enclosed magnet, and a manometer with a microslide cathetometer for measuring the pressure. The solvent container had a capacity for 100 g of solvent with a 5 ml gas space above the liquid surface. The apparatus sections were calibrated to ± 0.0002 - 3 cm^3 (1).

SOURCE AND PURITY OF MATERIALS:

1. Helium. No information given.
2. Methylhydrazine. Used in initially distilled, pure state. No source or % purity given.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/\text{mmHg} = 0.01$
$\delta X_1/X_1 = 0.05$

REFERENCES:

1. Chang, E. T.; Gokcen, N. A. J. Phys. Chem. 1966, 70, 2394.

COMPONENTS:

1. Helium; He; 7440-59-7

2. 1,1-Dimethylhydrazine; $C_2H_8N_2$ ($NH_2N(CH_3)_2$); 57-14-7

ORIGINAL MEASUREMENTS:

Chang, E. T.; Gokcen, N. A.

J. Phys. Chem. 1968, 72, 638 - 642.

VARIABLES:

T/K: 253.05 - 293.16

He P/kPa: 118.743 - 228.093 (1.1719 - 2.2511 Atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	P/Atm	Henry's Constant $K \times 10^5$	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
253.05	1.1719	4.97	0.583		
	2.0347	4.93	1.003		
	1.0000		0.495	1.53	1.42
273.15	1.3684	6.72	0.919		
	2.2511	6.89	1.551		
	1.0000		0.680	2.05	2.05
293.16	1.4394	8.70	1.253		
	2.2158	8.94	1.981		
	1.0000		0.882	2.56	2.77

The Henry's constant is defined as $K/\text{atm}^{-1} = X_1/P$. The solubility values at one atm were calculated from the average Henry's constant by the compiler.

Smoothed Data: The 101.325 kPa (1 atm) mole fraction solubilities were fitted to:

$\Delta G°/\text{J mol}^{-1} = -RT \ln X_1$
$= 8787.8 + 47.667\ T$

Std. Dev. $\Delta G°$ = 13.0, Coef. Corr. = 0.9999

$\Delta H°/\text{J mol}^{-1} = 8787.8$, $\Delta S°/\text{J K}^{-1}\text{ mol}^{-1} = -47.667$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/\text{J mol}^{-1}$
248.15	0.457	20,616
253.15	0.498	20,855
258.15	0.539	21,093
263.15	0.583	21,331
268.15	0.628	21,570
273.15	0.676	21,808
278.15	0.724	22,046
283.15	0.774	22,285
288.15	0.826	22,523
293.15	0.880	22,761
298.15	0.934	23,000

AUXILIARY INFORMATION

METHOD: The solvent was degassed under vacuum in the previously weighed apparatus. Apparatus and degassed solvent were weighed. Gas was introduced into the apparatus at a known P and T, the liquid stirred, and the pressure observed until there was no further change. Equilibrium was established within 10 m and the P was followed for 40 m. Substituted hydrazines appear to decompose with time. For decomposing solvents the P was followed for up to 2 h, and the solubility value was corrected for the gaseous decomp. prod.

APPARATUS/PROCEDURE: The apparatus was of all Pyrex glass construction. It consisted of three calibrated volumes for the measurement of the gas, a container for the solvent, which was stirred with a glass enclosed magnet, and a manometer with a microslide cathetometer for measuring the pressure. The solvent container had a capacity for 100 g of solvent with a 5 ml gas space above the liquid surface. The apparatus sections were calibrated to ± 0.0002 - 3 cm^3 (1).

SOURCE AND PURITY OF MATERIALS:

1. Helium. No information given.

2. 1,1-Dimethylhydrazine. Used in initially distilled, pure state. No source or % purity given.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/\text{mmHg} = 0.01$
$\delta X_1/X_1 = 0.05$

REFERENCES:

1. Chang, E. T.; Gokcen, N. A. J. Phys. Chem. 1966, 70, 2394.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. 1,2-Dimethylhydrazine; $C_2H_8N_2$ $(NHCH_3NHCH_3)$; 540-73-8	Chang. E.T.; Gokcen, N.A. *J. Phys. Chem.* 1968, *72*, 638 - 642.
VARIABLES: T/K: 273.15 - 298.15 P/kPa: 101.325 (1 atm)	PREPARED BY: P. L. Long

EXPERIMENTAL VALUES:

The authors made no experimental measurements on this system. The authors do given an estimated Gibbs energy equation for the solution of helium in 1,2-dimethylhydrazine. They used logical assumptions to find a linear relationship between the Gibbs energy of solution of helium in hydrazine, methylhydrazine, and 1,1-dimethylhydrazine as a function of $1/r^{12}$, where r is the distance of approach of solvent and solute molecules. The value of r in each solvent was determined from a simple cell model. The linear relationship was extrapolated to obtain the estimated value of the Gibbs energy of solution of helium in 1,2-dimethylhydrazine. The estimated equation is

$$\Delta G^{o}/\text{cal mol}^{-1} = -RT \ln K/\text{atm}^{-1} = 2{,}490 + 7.70T$$

where K is the Henry's constant defined as $K/\text{atm}^{-1} = X_1/P$. The pressure is in atm.The mole fraction solubilities at 101.325 kPa (1 atm) tabulated below were calculated from the equation by the compiler.

T/K	Mol Fraction $X_1 \times 10^4$
273.15	0.0211
278.15	0.0229
283.15	0.0248
288.15	0.0268
293.15	0.0289
298.15	0.0310

AUXILIARY INFORMATION

METHOD:

Estimated data, see above.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

ESTIMATED ERROR:

REFERENCES:

COMPONENTS:

1. Helium; He; 7440-59-7
2. Hydrazine; N_2H_4; 302-01-2
3. 1,1-Dimethylhydrazine; $C_2H_8N_2$ ($NH_2N(CH_3)_2$); 57-14-7

ORIGINAL MEASUREMENTS:

Chang, E.T.; Gokcen, N.A.

J. Phys. Chem. 1968, *72*, 2556 - 2562.

VARIABLES:

T/K: 273.15 - 303.15

P/kPa: 50.663 (0.5 atm) - 253.313 (2.5 atm)

PREPARED BY:

P.L.Long, H.L.Clever

EXPERIMENTAL VALUES:

1,1-Dimethyl-hydrazine, X_3	$\Delta G^o = -RT \ln K$ 273.15 - 303.15 K Unit:cal mol^{-1}	Henry's Constant, $K = X_1/P$ Unit: atm^{-1} $K \times 10^6$ at 288.15 K	Mol Fraction $X_1 \times 10^4$ At 1 atm and 288.15 K
0.0	1,260 + 19.94T	4.86	0.0486
0.1	1,230 + 19.02T	8.14	0.0814
0.2	1,310 + 17.80T	13.07	0.1307
0.3	1,900 + 15.03T	18.80	0.1880
0.4	2,150 + 13.71T	23.6	0.236
0.5	2,210 + 13.09T	29.0	0.290
0.6	2,220 + 12.63T	36.0	0.360
0.7	2,200 + 12.29T	44.2	0.442
0.8	2,170 + 11.99T	54.2	0.542
0.9	2,140 + 11.67T	67.0	0.670
1.0	2,110 + 11.36T	82.6	0.826

The Gibbs energy equation was fitted to data taken in the 273.15 - 303.15 K temperature range.

The Henry's constant is based on data measured over the 0.5 - 2.5 atm pressure range. The value in the Table above is the Henry's constant at 288.15 K. Values at other temperatures can be calculated from the Gibbs energy equation.

The mole fraction solubility at 288.15 K and 101.325 kPa (1 atm) was calculated by the compiler.

The solubility of helium was measured in hydrazine, 1,1-dimethylhydrazine, and in four mixtures at three temperatures and several pressures. The data were smoothed to obtain the Gibbs energy equations at 0.1 mol fraction intervals.

AUXILIARY INFORMATION

METHOD: The solvent was degassed under vacuum in the previously weighed apparatus. Apparatus and degassed solvent were weighed. Gas was introduced into the apparatus at a known P and T, the liquid stirred, and the pressure observed until there was no further change. Equilibrium was established within 10 m and the P was followed for 40 m. Substituted hydrazines appear to decompose with time. For decomposing solvents the P was followed for up to 2 h, and the solubility value was corrected for the gaseous decomp.product.

APPARATUS/PROCEDURE: The apparatus was of all Pyrex glass construction. It consisted of three calibrated volumes for the measurement of the gas, a container for the solvent, which was stirred with a glass enclosed magnet, and a manometer with a microslide cathetometer for measuring the pressure. The solvent container had a capacity for 100 g of solvent with a 5 ml gas space above the liquid surface. The apparatus sections were calibrated to ± 0.0002 - 3 cm^3 (1).

SOURCE AND PURITY OF MATERIALS:

The source and purity of the materials were not given. The density and refractive index of the solvent components and several of their mixtures are given. The solvents were freshly distilled before use.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.01$
$\delta X_1/X_1 = 0.05$

REFERENCES:

1. Chang, E.T.; Gokcen, N.A. *J. Phys. Chem.* 1966, *70*, 2394.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Nitromethane; CH_3NO_2; 75-52-5

ORIGINAL MEASUREMENTS:

Friedman, H. L.

J. Am. Chem. Soc. 1954, 76, 3294-3297.

VARIABLES:

T/K: 298.00
P/kPa: 93.326 (700 mmHg)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.00			1.69
			1.76
			1.77
	0.386	1.60	1.75 av.

The author reports Ostwald coefficients measured at about 700 mmHg. The Bunsen coefficient and the mole fraction solubility at 101.325 kPa (1 atm) were calculated by the compiler with the assumptions that the gas is ideal, and that Henry's law is obeyed.

AUXILIARY INFORMATION

METHOD:

Gas absorption.The method was essentially that employed by Eucken and Herzberg (1). Modifications included a magnetic stirring device instead of shaking the saturation vessel, and balancing the gas pressure against a column of mercury with electrical contacts instead of balancing the gas pressure against the atmosphere.

APPARATUS/PROCEDURE: The solvent was degassed by vacuum. The procedure, repeated 5 - 10 times, was to alternate 5 - 15 s evacuation and rapid stirring to produce cavitation. In the solubility measurment, gas, pre-saturated with solvent vapor, was brought into contact with about 80 ml of solvent in the saturation vessel. Initial conditions were established by a time extrapolation. Solubility equilibrium was approached from both under- and supersaturation by varying the rate.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Air Reduction Co. Reagent grade, 99.8 per cent pure by mass spectroscopy.
2. Nitromethane. Source not given. Distilled, dried by filtering at 253 K.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/mmHg = 0.3$
$\delta L/L = 0.03$

REFERENCES:

1. Euken, A.; Herzberg, G. *Z. Phys. Chem.* 1950, 195, 1.

COMPONENTS:

1. Helium; He; 7440-59-7

2. N-Methylacetamide; C_3H_7NO ($CH_3CONHCH_3$); 79-16-3

ORIGINAL MEASUREMENTS:

Wood, R.H.; DeLaney, D.E.

J.Phys.Chem. 1968, 72, 4651 - 4654.

VARIABLES:

T/K: 308.15 - 343.15

He P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L.Long

EXPERIMENTAL VALUES:

The authors fitted their experimental data by the method of least squares to the equation

$$\ln X_1 = -1152.5/T - 6.0579$$

which arranges to $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = -RT(-1152.5/T - 6.0579)$

$$= 9{,}582.3 + 50.367T$$

and $\Delta H^o/J\ mol^{-1} = 9{,}582.3$, $\Delta S^o/J\ K^{-1}\ mol^{-1} = -50.367$

The experimental data was not included in the paper. It is available in a thesis (1). The smoothed mole fraction helium solubilities at 101.325 kPa and five degree interval from 308.15 to 343.15 K were given in the paper. The Bunsen and Ostwald coefficients and the Gibbs energy of solution were calculated by the compiler.

Smoothed Data:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$	$\Delta G^o/J\ mol^{-1}$
308.15	0.557	1.62	1.82	25,103
313.15	0.591	1.71	1.96	25,355
318.15	0.626	1.80	2.10	25,607
323.15	0.663	1.90	2.25	25,858
328.15	0.699	1.99	2.39	26,110
333.15	0.738	2.09	2.55	26,362
338.15	0.776	2.19	2.71	26,614
343.15	0.816	2.30	2.88	26,866

AUXILIARY INFORMATION

METHOD:

APPARATUS/PROCEDURE: A gas buret was connected to a solvent buret through a three-way capillary stopcock. A measured volume of gas was transferred to a known volume of solvent; when equilibrium was reached the total pressure and volume of the system was measured (1). The apparatus and procedure were checked by measuring the solubility of Ar in H_2O at 298.15 K. The Bunsen coefficient of 0.03105 checked well with the literature (2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Source not given. Purity 99.99 per cent.

2. N-Methylacetamide. Source not given. Recrystallized three times in a dry box. Typically had a water content of 0.04 mol per cent after a solubility run.

ESTIMATED ERROR:

Duplicate runs checked to within 0.5 percent.

REFERENCES:

1. DeLaney, D.E. M.S. Thesis, University of Delaware, 1968.

2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735; ibid. 1964, 60, 1736.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Nitrobenzene; $C_6H_5NO_2$; 98-95-3

ORIGINAL MEASUREMENTS:

Saylor, J. H.; Battino, R.

J. Phys. Chem. 1958, 62, 1334 - 1337.

VARIABLES:

T/K: 288.15 - 328.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.265	0.581	0.613
298.15	0.377	0.822	0.897
313.15	0.494	1.06	1.22
328.15	0.540	1.15	1.38

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 13508 + 39.990\ T$

Std. Dev. $\Delta G°$ = 229.4, Coef. Corr. = 0.9503

$\Delta H°/J\ mol^{-1} = 13508$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -39.990$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	0.290	25,031
293.15	0.319	25,231
298.15	0.350	25,431
303.15	0.383	25,631
308.15	0.418	25,831
313.15	0.455	26,031
318.15	0.494	26,231
323.15	0.534	26,431
328.15	0.577	26,631

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.
The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Clever, Battino, Saylor, and Gross (2).

APPARATUS/PROCEDURE: The procedure is to flow a thin layer of degassed liquid through a spiral containing the gas. The gas dissolves rapidly and the saturated liquid flows into a buret system. The volume of gas dissolved is determined by the increase in the solution level at constant pressure. The volume of liquid the gas dissolves in is determined in the burets. For low solubilities extra solvent is run through the buret system and weighed. An auxiliary buret is used for high solubilities.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Research grade was used.
2. Nitrobenzene. Eastman Kodak Co., white label, distilled from P_4O_{10}, reduced pressure of 10 mm of Hg, b.p. 81.0 - 81.2 °C.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 1$
$\delta X_1/X_1 = 0.04$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.

COMPONENTS:

1. Helium; He; 7440-59-7
2. 1,1,2,2,3,3,4,4,4-Nonafluoro-N,N-bis (nonafluorobutyl)-1-butanamine (Perfluorotributylamine) ;$C_{12}F_{27}N$; 311-89-7

ORIGINAL MEASUREMENTS:

Powell, R.J.

J.Chem. Eng. Data 1972, 17, 302-304.

VARIABLES:

T/K: 288.15 - 313.15
He P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L.Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$	$R\frac{\Delta \log X_1}{\Delta \log T} = N$
298.15	11.67	7.34	8.01	4.13

The author states that solubility measurements were made between 288.15 and 313.15 K, but only the solubility at 298.15 K was given in the paper. The slope $R(\Delta \log X_1/\Delta \log T)$ was given. The smoothed data below were calculated by the compiler from the slope in the form:

$$\log X_1 = \log(11.67 \times 10^{-4}) + (4.13/R) \log(T/298.15)$$

with $R = 1.9872$ cal K^{-1} mol^{-1}.

Smoothed Data:

T/K	Mol Fraction $X_1 \times 10^4$
288.15	10.87
293.15	11.27
298.15	11.67
303.15	12.08
308.15	12.50
313.15	12.92

The Bunsen and Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

APPARATUS/PROCEDURE: Dymond and Hildebrand (1) apparatus which uses an all glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is calculated from the initial and final gas pressures. The solvent is degassed by freezing and pumping followed by boiling under reduced pressure.

SOURCE AND PURITY OF MATERIALS:

1. Helium. No source given. Research grade, dried over $CaCl_2$ before use.
2. Perfluorotributylamine. Minnesota Mining & Manufacturing Co. Distilled, used portion boiling between 447.85-448.64 K which gave a single GLC peak. $d_{298.15} = 1.880$ g cm^{-3}.

ESTIMATED ERROR:

δN/cal K^{-1} mol^{-1} = 0.1
$\delta X_1/X_1 = 0.002$

REFERENCES:

1. Dymond, J.H.; Hildebrand, J.H. Ind. Eng. Chem. Fundam. 1967, 6, 130

COMPONENTS:

1. Helium-3; ^3He; 14762-55-1
2. 1,1,2,2,3,3,4,4,4-nonafluoro-N,N-bis(nonafluorobutyl)-1-butanamine (Perfluorotributylamine); $C_{12}F_{27}N$ 311-89-7

ORIGINAL MEASUREMENTS:

Powell, R. J.

J. Chem. Eng. Data 1972, *17*, 302-304.

VARIABLES:

T/K: 273.15 - 318.15
He P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$	$R\frac{\Delta \log X_1}{\Delta \log T} = N$
298.15	11.02	6.93	7.56	4.24

The author states that solubility measurements were made between 288.15 and 313.15 K, but only the solubility at 298.15 was given in the paper. The slope $R(\Delta \log X_1/\Delta \log T)$ was given. The smoothed data below were calculated by the compiler from the slope in the form:

$$\log X_1 = \log(11.02 \times 10^{-4}) + (4.24/R)\log(T/298.15)$$

with R = 1.9872 cal K^{-1} mol^{-1}.

Smoothed Data:

T/K	Mol Fraction $X_1 \times 10^4$
288.15	10.25
293.15	10.63
298.15	11.02
303.15	11.42
308.15	11.82
313.15	12.24
318.15	12.66

The Bunsen and Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

APPARATUS/PROCEDURE: Dymond and Hildebrand (1) apparatus which uses an all glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is calculated from the initial and final gas pressures. The solvent is degassed by freezing and pumping followed by boiling under reduced pressure.

SOURCE AND PURITY OF MATERIALS:

1. Helium-3. Lawrence Radiation Laboratory, Berkeley, through the efforts of B. J. Alder.
2. Perfluorotributylamine. Minnesota Mining & Mfg. Co., column distilled, used portion with b.p.=447.85-448.64K, & single peak GC.

ESTIMATED ERROR:

δN/cal K^{-1} mol^{-1} = 0.1
$\delta X_1/X_1$ = 0.002

REFERENCES:

1. Dymond, J. H.; Hildebrand, J. H. *Ind. Eng. Chem. Fundam.* 1967, *6*, 130.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Octamethylcyclotetrasiloxane; $C_8H_{24}O_4Si_4$; 556-67-2	Wilcock, R.J.; McHale, J.L.; Battino, B.; Wilhelm, E. Fluid Phase Equilib. 1978, 2, 225-230.
VARIABLES: T/K: 292.15 - 313.15 P/kPa: 101.325 (1 atm)	PREPARED BY: H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
292.15	5.20	3.763	4.025
298.48	5.57	4.005	4.376
313.15	6.25	4.408	5.054

The solubility values were adjusted to a gas partial pressure of 101.325 kPa by Henry's law.

The Bunsen coefficients were calculated by the compiler.

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 6,558.5 + 40.381\ T$

Std. Dev. $\Delta G^o = 14.8$, Coef. Corr. = 0.9994

$\Delta H^o/J\ mol^{-1} = 6,5585$, $\Delta S^o/J\ K^{-1}\ mol^{-1} = -40.381$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^o/J\ mol^{-1}$
293.15	5.27	18,396
298.15	5.52	18,598
303.15	5.76	18,800
308.15	6.01	19,002
313.15	6.26	19,204

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The apparatus is based on the design of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3).

Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm. deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.

Solubility Determination. The degassed solvent is passed in a thin film down a glass spiral tube containing the solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. Minimum mole per cent purity 99.995.
2. Octamethylcyclotetrasiloxane. General Electric Co. Distilled density of 298.15 K was 0.9500 g cm^{-3}.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. J. Am. Oil Chem. Soc. 1968, 45, 830.
3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. Anal. Chem. 1971, 43, 806.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Karasz, F.E.; Halsey, G.D.Jr.

J. Chem. Phys. 1958, 29, 173 - 179.

VARIABLES:

T/K: 84.54 - 86.89
He P/kPa: 2.666 - 21.332
(2 - 16 cmHg)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Henry's Constant $10^{-5}K$/cmHg	Mol Fraction At He P = 1 cmHg $X_1 \times 10^4$	Mol Fraction At He P = 76 cmHg $X_1 \times 10^4$
84.54	4.25	0.0235	1.79
86.11	3.53	0.0283	2.15
86.89	3.40	0.0294	2.23

The authors did not present numerical values of their solubility data. The data were shown in two graphs: one was a Henry's law plot of He P/cmHg against mole fraction He dissolved in argon; the other was a log K against 1/T plot. The compiler took log K values from the points on the second graph to obtain the Henry's constant values given in the Table above. The compiler calculated the mole fraction solubility of He in liquid Ar at pressures of one and 76 cmHg from Henry's law.

The Henry's constant is $K/\text{cmHg} = (P_1/\text{cmHg})/X_1$.

AUXILIARY INFORMATION

METHOD:

A measured amount of helium gas was placed in the cell with a measured amount of liquid argon. The pressure was recorded as a function of the amount of gas (isotherm) or as a function of temperature (isostere). Only the results from the isotherm runs are given above.

APPARATUS/PROCEDURE:

A stainless steel cell with one compartment for the solution and one compartment containing pure liquid argon as a reference. The cell was mounted so that movement in one direction by an electromagnet agitated the solution. The argon vapor pressure checked with literature values (1).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Air Reduction Co. Used as received in glass sealed bulbs.
2. Argon. Air Reduction Co. Used as received in glass sealed bulbs for reference compartment. The actual solvent was tank argon purified with titanium metal.

ESTIMATED ERROR:

$\delta T/K = 0.01$
$\delta P/\text{cmHg} = 0.002$
$\delta X_1/X_1 = 0.001$

REFERENCES:

1. Mallett, M. W. Ind. Eng. Chem. 1950, 42, 2045.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Nitrogen Oxide; N_2O_4; 10544-72-6	Chang, E. T.; Gokcen, N. A. J. Phys. Chem. 1966, 70, 2394-2399.
VARIABLES: T/K: 262.02 - 303.16 He P/kPa: 39.689 - 193.784 (0.3917 - 1.925 atm)	PREPARED BY: P. L. Long

EXPERIMENTAL VALUES:

T/K	P/Atm	Henry's Constant $K \times 10^4$	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
262.02	0.5261	0.55	0.289		
	1.0149	0.59	0.599		
	1.2393	0.56	0.694		
	1.8346	0.61	1.12		
	1.9125	0.55	1.05		
	1.0000		0.572	2.11	2.03
273.15	0.4951	0.73	0.361		
	0.6624	0.68	0.453		
	0.9566	0.73	0.698		
	1.2315	0.69	0.852		
	1.4186	0.67	0.950		
	1.8770	0.69	1.30		
	1.0000		0.698	2.54	2.54
288.10	0.9773	0.89	0.870		
	1.3153	0.86	1.13		
	1.0000		0.877	3.11	3.28
298.15	0.3917	1.02	0.401		
	0.3963	1.02	0.404		
	0.7836	1.06	0.830		
	1.0192	0.98	1.00		
	1.1195	0.99	1.11		
	1.1455	1.07	1.23		
	1.0000		1.02	3.57	3.89

AUXILIARY INFORMATION

METHOD: The solvent was degassed under vacuum in the previously weighed apparatus. Apparatus and degassed solvent were weighed. Gas was introduced into the apparatus at a known P and T, the liquid stirred, and the pressure observed until there was no further change. Equilibrium was established within 10 m and the P was followed for 40 m.

APPARATUS/PROCEDURE: The apparatus was of all glass construction. It consisted of three calibrated volumes for the measurement of the gas, a container for the solvent, which was stirred with a glass enclosed magnet, and a manometer for measuring the pressure with a microslide cathetometer. The solvent container had a capacity for 100 g of solvent with a 5 ml gas space above the liquid surface. The apparatus sections were calibrated to ± 0.0002-3 cm^3.

SOURCE AND PURITY OF MATERIALS:

1. Helium. No source given.
2. Nitrogen Oxide. Research grade. 99.5% min. purity, source not given.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.01$
$\delta X_1/X_1 = 0.05$

REFERENCES:

COMPONENTS:

1. Helium; He; 7440-59-7

2. Nitrogen Oxide; N_2O_4; 10544-72-6

ORIGINAL MEASUREMENTS:

Chang, E. T.; Gokcen, N. A.

J. Phys. Chem. 1966, *70*, 2394-2399.

VARIABLES:

T/K: 262.02 - 303.16
He P/kPa: 39.689 - 193.784

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	P/Atm	Henry's Constant $K \times 10^4$	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
303.16	0.5759	1.07	0.615		
	0.8867	1.03	0.909		
	1.0000		1.05	3.64	4.04

The Henry's constant is defined as $K/\text{atm}^{-1} = X_1/P$. The solubility values at one atm were calculated from the average Henry's constant by the compiler.

Smoothed Data: The 101.325 kPa (1 atm) mole fraction solubilities were fitted to:

$$\Delta G°/\text{J mol}^{-1} = -RT \ln X_1 = 9933.2 + 43.241\ T$$

Std. Dev. $\Delta G°$ = 35.5, Coef. Corr. = 0.9989

$\Delta H°/\text{J mol}^{-1}$ = 9933.2, $\Delta S°/\text{J K}^{-1}\text{ mol}^{-1}$ = -43.241

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/\text{J mol}^{-1}$
258.15	0.539	21,096
263.15	0.588	21,312
268.15	0.640	21,528
273.15	0.695	21,745
278.15	0.751	21,961
283.15	0.811	22,177
288.15	0.872	22,393
293.15	0.936	22,609
298.15	1.00	22,825
303.15	1.07	23,042
308.15	1.14	23,258

AUXILIARY INFORMATION

METHOD:

See preceding page.

SOURCE AND PURITY OF MATERIALS:

See preceding page.

APPARATUS/PROCEDURE:

See preceding page.

ESTIMATED ERROR:

See preceding page.

REFERENCES:

See preceding page.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Hydrazine; H_4N_2; 302-01-2	Chang, E.T.; Gokcen, N.A.; Poston, T.M. *J. Phys. Chem.* 1968, *72*, 638 - 642.

VARIABLES:	PREPARED BY:
T/K: 278.15 - 308.18 He P/kPa: 110.465 (1.09 Atm) - 233.757 (2.307 Atm)	P. L. Long

EXPERIMENTAL VALUES:

T/K	P/Atm	Henry's Constant $K \times 10^5$	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
278.15	1.2333	0.41	0.051		
	2.1927	0.49	0.108		
	1.0000		0.045	0.321	0.327
293.16	1.1411	0.46	0.052		
	2.0451	0.54	0.110		
	1.0000		0.050	0.352	0.378
308.18	1.0902	0.52	0.057		
	1.3121	0.52	0.068		
	1.9941	0.59	0.117		
	2.3070	0.62	0.144		
	1.0000		0.056	0.390	0.439

The Henry's constant is defined as $K/\text{atm}^{-1} = X_1/P$. The solubility values at one atm were calculated from the average Henry's constant by the compiler.

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^o/\text{J mol}^{-1}$
278.15	0.045	28,479
283.15	0.047	28,898
288.15	0.048_5	29,316
293.15	0.050	29,735
298.15	0.052	30,153
303.15	0.054	30,572
308.15	0.056	30,990
313.15	0.058	31,409

Smoothed Data: The 101.325 kPa (1 atm) mole fraction solubilities were fitted to:

$\Delta G^0/\text{J mol}^{-1} = -RT \ln X_1$
$= 5198.0 + 83.701T$

Std Dev ΔG^o = 13.4, Coef. Corr.= 0.9999

$\Delta H^o/\text{J mol}^{-1} = 5198.0$, $\Delta S^o/\text{J K}^{-1}\text{ mol}^{-1} = -83.701$

AUXILIARY INFORMATION

METHOD: The solvent was degassed under vacuum in the previously weighed apparatus. Apparatus and degassed solvent weighed. Gas was introduced into the apparatus at a known P and T. The liquid was stirred, and the pressure was observed until there was no further change. The substituted hydrazines appear to decompose with time. When this happened the pressure was followed for up to two hours, and the solubility value was corrected for the presence of the gaseous decomposition product.

APPARATUS/PROCEDURE: The apparatus was of all glass construction. It consisted of three calibrated volumes for the measurement of the gas, a container for the solvent, which was stirred with a glass enclosed magnet, and a manometer for measuring the pressure with a microslide cathetometer. The solvent container had a capacity for 100 g of solvent with a 5 ml gas space above the liquid surface. The apparatus sections were calibrated to ± 0.0002-3 cm^3 (1).

SOURCE AND PURITY OF MATERIALS:

1. Helium. No information given.
2. Hydrazine. No information on source. It was freshly distilled before use. The density was measured, and fitted to the equation:
   $\rho/\text{g ml}^{-1} = 1.02492 - 0.000865t/C$.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/\text{mmHg} = 0.01$
$\delta X_1/X_1 = 0.05$

REFERENCES:

1. Chang, E.T.; Gokcen, N.A. *J. Phys. Chem.* 1966, *70*, 2394.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Hydrogenated Fuel

ORIGINAL MEASUREMENTS:

Logvinyuk, V.P.; Makarenkov, V.V.; Malyshev, V.V.; Panchenko, G.M.

Khim. Tekhnol. Topl. Masel 1970, 15(5), 27 - 29.

Chem. Technol. Fuels Oils (Engl.transl.) 1970, 15, 353 - 355.

VARIABLES:

T/K: 293.15
He P/kPa: 101.325 (1 atm)

PREPARED BY:

S.A.Johnson

EXPERIMENTAL VALUES:

T/K	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
293.15	2.1	2.3

The Ostwald coefficient was calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Described in reference (1).

APPARATUS/PROCEDURE:

No description given.

SOURCE AND PURITY OF MATERIALS:

1. Helium. No information given.
2. Hydrogenated Fuel. Source not given. Density/g cm^{-3} 0.832.

ESTIMATED ERROR:

$\delta L/L = 0.06$

REFERENCES:

1. Gogitidze, L.D.; Logvinyuk, V.P.; Makarenkov, V.V.; Panchenkov, G.M.; Malyshev, V.V.; Yakovlevskii, V.V. "Method of Evaluating the Operating Properties of Jet Fuels and Lubricating Materials"(Russian), Mashinostroenie, 1966.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Amsco 123-15	Steinberg, M.; Manowitz, B. *Ind. Eng. Chem.* 1959, *51*, 47 - 51.
VARIABLES:	**PREPARED BY:**
T/K: 218.15 - 297.15 P/kPa: 101.325 (1 atm)	H.L.Clever

EXPERIMENTAL VALUES:

T/K	Absorption Coefficient* x 10^2
218.15	6.6
297.15	4.3

*The authors define the absorption coefficient as the volume of gas, corrected to 288.15 K and 101.325 kPa (1 atm),absorbed under a total system pressure of 101.325 kPa (1 atm) per unit volume of solvent,corrected to 288.15 K. The authors incorrectly identify their absorption coefficient as an Ostwald coefficient.

AUXILIARY INFORMATION

METHOD:

Van Slyke method (1).

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

1. Helium. No information given.

2. Amsco 123-15. American Mineral Spirits Solvent Co., No. 140. The composition is stated to be 59.6 wt % paraffin, 27.2 wt % naphthene, and 13.2 wt % aromatics.

ESTIMATED ERROR:

10 per cent.

REFERENCES:

1. Van Slyke, D.D. *J. Biol. Chem.* 1939, *130*, 545.

   Van Slyke, D.D.; Neill, J.M. *J. Biol. Chem.* 1924, *61*, 523.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Apiezon GW oil

ORIGINAL MEASUREMENTS:

Burrows, G.; Preece. F. H.

J. Appl. Chem. 1953, *3*, 451 - 462.

VARIABLES:

T/K: 293.15 - 356.15
He P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$	-log L
293.15	1.33	1.43	1.846
295.15	1.45	1.57	1.805
298.15	1.49	1.63	1.789*
307.15	1.82	2.05	1.689
320.65	2.27	2.67	1.574
321.65	2.26	2.67	1.574
341.65	2.65	3.31	1.480
342.15	2.64	3.30	1.481
355.15	2.85	3.71	1.431
356.15	2.76	3.60	1.444

The authors reported the helium solubilities as -log(Ostwald coefficient), the compiler calculated Bunsen and Ostwald coefficients from the log L.

*The -log L value is from a graphical interpolation by the authors.

AUXILIARY INFORMATION

METHOD: Volumetric. Helium gas and solvent brought into contact. The solvent stirred until Hg levels in helium buret indicate no more absorption of gas.

The density, viscosity, and surface tension of the solvent was determined at temperatures of 293.15, 313.15, 333.15, and 353.15 K. The 293.15 K values are given in the Source and Purity of Materials.

APPARATUS/PROCEDURE: The mixing chamber was all glass with a capacity of 306 cm^3. Stirring was accomplished by a magnetically driven disc. The solvent was degassed by boiling in a heated flask fitted with a water-cooled reflux condenser. The degassed solvent was transferred to the mixing chamber evacuated to 0.005 mmHg without breaking the vacuum. The helium and solvent were brought into contact at a predetermined temperature and pressure.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Source not given. 99.8 per cent purity.
2. Apiezon GW oil.

density/g cm^3	0.878
viscosity/cpoise	160.5
surface tension/ dyne cm^{-1}	31.7

Above properties at 293.15 K.

ESTIMATED ERROR:

$\delta L/L = 0.05$

REFERENCES:

COMPONENTS:

1. Helium; He; 7440-59-7
2. Silicone Oils

ORIGINAL MEASUREMENTS:

Burrows, G.; Preece, F.H.

J. Appl. Chem. 1953, 3, 451 - 462.

VARIABLES:

T/K: 293.15 - 358.15

He P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L.Long

EXPERIMENTAL VALUES:

T/K	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$	-log L
Silicone oil, Dow Corning 200			
293.15	2.90	3.11	1.507
"	3.10	3.33	1.478
298.15	3.30	3.61	1.443*
303.15	3.52	3.91	1.408
318.15	3.80	4.43	1.354
320.15	4.36	5.10	1.292
337.15	4.80	5.93	1.227
339.65	4.79	5.96	1.225
352.65	5.08	6.56	1.183
357.15	4.90	6.41	1.193
Silicone oil, Dow Corning 702			
293.15	1.46	1.57	1.805
294.15	1.53	1.64	1.784
298.15	1.59	1.74	1.760*
303.15	1.65	1.83	1.737
319.15	2.05	2.40	1.620
326.15	1.99	2.38	1.624
339.65	2.39	2.97	1.527
357.65	2.35	3.08	1.512
358.15	2.37	3.11	1.507

The authors reported the helium solubilities as -log(Ostwald coefficient), the compiler calculated Bunsen and Ostwald coefficients from the log L.
* The -log L value is from a graphical interpolation by the authors.

AUXILIARY INFORMATION

METHOD: Volumetric. Helium gas and solvent brought into contact. The solvent stirred until Hg levels in helium buret indicate no more absorption of gas.

The density, viscosity, and surface tension of the solvent were determined at temperatures of 293.15, 313.15, 333.15, and 353.15 K. The 293.15 K values are given in the Source and Purity of Materials.

APPARATUS/PROCEDURE: The mixing chamber was all glass with a capacity of 306 cm^3. Stirring was accomplished by a magnetically driven disc. The solvent was degassed by boiling in a heated flask fitted with a water-cooled reflux condenser. The degassed solvent was transferred to the mixing chamber, evacuated to 0.005 mmHg, without breaking the vacuum. The helium and solvent were brought into contact at a predetermined temperature and pressure.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Source not given. 99.8 per cent purity.
2. Silicone Oils.

	DC 200	DC 702
density/g cm^{-3}	0.971	1.072
viscosity/cpoise	104.4	39.8
surface tension/ dyne cm^{-1}	26.7	29.1

Above properties at 293.15 K.

ESTIMATED ERROR:

$\delta L/L = 0.05$

REFERENCES:

COMPONENTS:

1. Helium; He; 7440-59-7
2. Olive Oil

ORIGINAL MEASUREMENTS:

Behnke, A.R.; Yarbrough, O.D.

U.S. Naval Med. Bull. 1938, *36*, 542-548.

VARIABLES:

T/K: 311.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L.Long

EXPERIMENTAL VALUES:

T/K	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
311.15	1.489	
	1.482	
	1.477	
	1.485	
	1.467	
	1.48 Av.	1.69

Pressure is 101.325 kPa (1 atm).

The Ostwald coefficient was calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Gas-liquid equilibrium was established at 311.15 K by bubbling the helium through the olive oil for periods of up to 1½ hours.

APPARATUS/PROCEDURE:

After establishment of equilibrium the gas was extracted from the saturated solution in vacuo by repeated shaking in a Van Slyke apparatus. The procedure and calculations were similar to those developed by Van Slyke (1,2).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Source not given. 97.65 per cent pure. Passed through H_2SO_4 and pyrogallic acid to remove O_2 and CO_2. Dried.
2. Olive oil. Source not given. U.S.P. grade. The composition is about 72 % olein and 28 % palmitin.

ESTIMATED ERROR:

REFERENCES:

1. Van Slyke, D.D.; Stadie, W.C. *J. Biol. Chem.* 1021, *56*, 765.
2. Van Slyke, D.D.; Dillon, R.T.; Margaria, R. *J. Biol. Chem.* 1934, *105*, 571.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Olive Oil

ORIGINAL MEASUREMENTS:

Battino, R.; Evans, F. D.; Danforth, W. F.

J. Am. Oil Chem. Soc. 1968, *45*, 830 - 833.

VARIABLES:

T/K: 297.84 - 327.93

P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
297.84	7.01	1.60	1.75
307.86	6.88	1.57	1.76
317.98	6.61	1.49	1.74
327.93	6.47	1.45	1.75

Smoothed Data: $\Delta G°/\text{J mol}^{-1} = - RT \ln X_1 = -2273.7 + 67.990\ T$

Std. Dev. $\Delta G°$ = 13.9, Coef. Corr. = 0.9999

$\Delta H°/\text{J mol}^{-1} = -2273.7$, $\Delta S°/\text{J K}^{-1}\text{ mol}^{-1} = -67.990$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/\text{J mol}^{-1}$
293.15	7.14	17,658
298.15	7.03	17,998
303.15	6.92	18,338
308.15	6.82	18,678
313.15	6.73	19,017
318.15	6.64	19,357
323.15	6.55	19,697
328.15	6.46	20,037

The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.
The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is a modification of the apparatus of Clever, Battino, Saylor, and Gross (2).

APPARATUS/PROCEDURE: Degassing. The solvent is sprayed into an evacuated chamber of an all glass apparatus; it is stirred and heated until the pressure drops to the vapor pressure of the liquid. Solubility Determination. The degassed liquid passes in a thin film down a glass spiral tube at a total pressure of one atm of solute gas plus solvent vapor. The gas absorbed is measured in the attached buret system, and the solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., Inc. 99.9995 Min. Vol % Purity.
2. Olive Oil. A. U.S.P., Fisher Scientific Co., 0.58% free fatty acid.
   B. Nutritional Biochemicals Corp., 0.30% free fatty acid.
   The density was measured and fitted to the equation $\rho/\text{g cm}^{-3} = 0.9152 - 0.000468t/C$. The average mol wt is 884 ± 45.

ESTIMATED ERROR:

$\delta T/K = 0.03$

$\delta P/\text{mmHg} = 0.5$

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033.
2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Human Lung Homogenate	Cander, L. *J. Appl. Physiol.* 1959, *14*, 538 - 540.
VARIABLES: T/K: 310.15 He P/kPa: 101.325 (1 atm)	**PREPARED BY:** P.L.Long, A.L.Cramer

EXPERIMENTAL VALUES:

T/K	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
310.15	0.92	1.04
	0.90	1.02
	0.94	1.07
	0.94	1.07

The four values are for lung samples from four deceased patients who had no history of acute or chronic lung disease. The mean Bunsen coefficient is 0.0092 with a range of ± 2 per cent.

The Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Lung sample were obtained from deceased patients. The lung was removed, perfused with isotonic saline until blood free, minced, blended, and homogenized. The homogenate was pressed through several layers of gauze to remove any large shreds of connective tissue. The fluid homogenate was deaerated.

APPARATUS/PROCEDURE: The manometric Van Slyke apparatus was used. The tissue homogenate was equilibrated for five minutes by shaking. Excess gas was expelled, and the dissolved gas extracted (1).

SOURCE AND PURITY OF MATERIALS:

1. Helium. Matheson Co., East Rutherford, NJ.Pure grade.
2. Human Lung Homogenate. Lung from four deceased patients who had no history of acute or chronic lung disease. See Method for details of preparation.

ESTIMATED ERROR:

Reproducibility was ± 2 percent.

REFERENCES:

1. Van Slyke, D.D.; Neill, J.M. *J. Biol. Chem.* 1924, *61*, 523.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Rat Abdominal Muscle

ORIGINAL MEASUREMENTS:

Campos Carles, A.;Kawashiro, T.; Piiper, J.

Pflugers Arch. 1975, 359, 209 - 218.

VARIABLES:

T/K: 310.15

PREPARED BY:

A.L.Cramer

EXPERIMENTAL VALUES:

T/K	Solubility Coefficient μmol l^{-1} $torr^{-1}$	Corrected Solubility Coefficient μmol l^{-1} $torr^{-1}$	Bunsen Coefficient $\alpha \times 10^2$
310.15	0.521 ± 0.012*	0.608	1.03

*Mean value and standard error of 13 measurements.
The corrected solubility coefficient and the Bunsen coefficient were corrected for unextracted gas in the sample and for gas lost during transfer of the sample.

Another report (1) from this Laboratory gives Krogh's diffusion constant, K = 1.42 ± 0.02, and the diffusion coefficient, D = 39.0, for helium in rat abdominal muscle at 310.15 K.

AUXILIARY INFORMATION

METHOD: The helium gas was presaturated with water vapor, then passed through an equilibration chamber containing the muscle sample resting on a screen to expose all sides. The gas was passed through the equilibration chamber for one hour at a rate of 8 ml m^{-1}. The muscle was transferred to an extraction chamber filled with air, for the same length of time as equilibration. The gas in the extraction chamber was then forced into a gas chromatograph by mercury entering the chamber.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

1. Helium. No source given. Purity better than 99.9 per cent.
2. Rat Abdominal Muscle. Flat abdominal wall muscle layer of about 1.6 g, 1.4 mm thickness, and surface area of 10 cm^2 on one side taken from 250 - 430 g rat.

ESTIMATED ERROR:

REFERENCES:

1. Kawashiro, T.;Campos Carles, A.; Perry, S.F.; Piiper, J. Pflugers Arch. 1975, 359, 219.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Water; H_2O; 7732-18-5 3. Components of infusion solutions, and some other mixtures.	Lange, P.; Nyström, O.; Röckert, H. Foersvarsmedicin 1975, 11, 230 - 234.
VARIABLES: T/K: No information given. He P/kPa: 607.950 (6 atm)	PREPARED BY: H.L.Clever

EXPERIMENTAL VALUES:

Liquid	Cm³ of He / cm³ of Liq x 10^2	Standard Error of the Mean	Number of Determinations	Ostwald Coefficient L x 10^2
Blood with added ascorbic acid, citrate, and dextrose.	4	0.6	11	0.8
Water + 0.9 wt % NaCl	4	0.7	8	0.8
Macrodex with NaCl (Pharmacia), 100 ml contain 6 g Dextran 70, and 0.9 g NaCl.	2	0.6	10	0.4
Macrodex with glucose (Pharmacia), 100 ml contain 6 g Dextran 70, and 5 g glucose.	3	0.1	6	0.6
Rheomacrodex with NaCl (Pharmacia), 100 ml contain 10 g Dextran 70, and 0.9 g NaCl.	2	0.4	11	0.4
Rheomacrodex with glucose (Pharmacia), 100 ml contain 10 g Dextran 70, and 5 g glucose.	4	0.1	5	0.8
Aminosol 10% (Vitrum), 100 ml contain 10 g amino acids and low mol wt peptides obtained by enzymatic hydrolysis and dialysis of casein.	2	0.2	10	0.4

Table continued on next page.

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE: The solvent was kept under 6 atm absolute pressure of the gas for seven hours while constantly agitated with a magnetic stirrer. The gas evolved on decompression from 6 to 1 atm was measured by one of two methods. A. The solution under pressure was transferred to a closed pipet. The pressure was decreased from 6 to 1 atm, and the gas evolved from the known solution volume was measured in a calibrated part of the pipet (1). B. The gas that collected in an inverted test tube from a known volume of the saturated solution on decompression from 6 to 1 atm was measured by mercury displacement.

There was no mention of either degassing the solvent or of the temperature of the measurement in the paper.

The compiler estimated an Ostwald coefficient by assuming a 5 atm pressure change and dividing (v gas/v solvent) x 100 by 500. The results are useful only as relative solubilities in solvents reported in this paper.

SOURCE AND PURITY OF MATERIALS:

1. Helium. No information given.
2. Solvents. Information in text above.

ESTIMATED ERROR:

$\delta L/L \geq 0.25$

REFERENCES:

1. Lange, P.W.; Martinsson, A.; Rockert, H.O.E. "Underwater Physiology" Lambertsen, C. J., Editor Academic Press, NY, 1971, p. 239.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Helium; He; 7440-59-7 2. Water; H_2O; 7732-18-5 3. Components of infusion solutions, and some other mixtures.	Lange, P.; Nyström, O.; Röckert, H. Foersvarsmedicin 1975, 11, 230 - 234. Continued from previous page.
VARIABLES: T/K: No information given. He P/kPa: 607.950 (6 atm)	PREPARED BY: H.L.Clever

EXPERIMENTAL VALUES:

Liquid	Cm³ of He / cm³ of Liq x 10^2	Standard Error of the Mean	Number Determinations	Ostwald Coefficient L x 10^2
Vamin N (Vitrum), 100 ml contain a total of 6.995 g of 18 different amino acids. See complete list below.*	5	0.5	10	1.0
Intralipid 20% (Vitrum), 100 ml contain 20 g fractionated soybean oil, 12 g fractionated egg lecithin, and 25 g dilute glycerol (Ph. Int.).	6	0.3	11	1.2
Water + 5.5 wt % glucose.	5	0.1	5	1.0
Water + 20 wt % fructose.	2	0.3	10	0.4
Ethanol, 99.5 %.	9	0.6	11	1.8

* 100 ml Vamin N contain:

L-Alanine	0.300 g	L-Histidine	0.240 g	L-Serine	0.750 g
L-Arginine	0.330 g	L-Isoleucine	0.390 g	L-Threonine	0.300 g
L-Aspartic acid	0.405 g	L-Leucine	0.525 g	L-Tryptophan	0.100 g
L-Cysteine and L-Cystine	0.140 g	L-Lysine	0.385 g	L-Tyrosine	0.050 g
L-Glutamic acid	0.900 g	L-Methionine	0.190 g	L-Valine	0.425 g
Glycine	0.210 g	L-Phenylalanine	0.545 g		
		L-Proline	0.810 g		

AUXILIARY INFORMATION

METHOD:	SOURCE AND PURITY OF MATERIALS:
See previous page.	See previous page.
APPARATUS/PROCEDURE:	ESTIMATED ERROR:
	REFERENCES:

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5	Rubin Battino Department of Chemistry Wright State University Dayton, Ohio 45431 USA May 1977

CRITICAL EVALUATION:

The experimental solubility data produced by nine workers were considered to be sufficiently reliable to use for the smoothing equation. In fitting the data to the equation, those points which differed by about two standard deviations or more from the smoothed values were rejected. We thus used 59 points which were obtained as follows (reference - number of data points used from that reference): 1-9; 2-8; 3-20;4-2; 5-10; 13-3; 14-4; 15-2; 16-1. The fitting equation used was

$$\ln X_1 = A + B/(T/100K) + C \ln (T/100K) + DT/100K \qquad (1)$$

Using T/100K as the variable rather than T/K gives coefficients of approximately equal magnitude. The best fit for the 59 data points gave

$$\ln X_1 = -52.8573 + 61.0494/(T/100K) + 18.9157 \ln (T/100K) \qquad (2)$$

where X_1 is the mole fraction solubility of neon at 101.325 kPa (1 atm) partial pressure gas. The fit in ln X_1 gave a standard deviation of 0.47% taken at the middle of the temperature range. Table 1 gives smoothed values of the mole fraction solubility at 101.325 kPa (1 atm) partial pressure of gas and the Ostwald coefficient at 5K intervals.

Table 1 also gives the thermodynamic functions $\Delta\bar{G}^\circ_1$, $\Delta\bar{H}^\circ_1$, $\Delta\bar{S}^\circ_1$, and $\Delta\bar{C}^\circ_{p_1}$ for the transfer of gas from the vapor phase at 101.325 kPa partial gas pressure to the (hypothetical) solution phase of unit mole fraction. These thermodynamic properties were calculated from the smoothing equation according to the following equations:

$$\Delta\bar{G}^\circ_1 = - RAT - 100RB - RCT \ln (T/100) - RDT^2/100 \qquad (3)$$

$$\Delta\bar{S}^\circ_1 = RA + RC \ln (T/100) = RC + 2RDT/100 \qquad (4)$$

$$\Delta\bar{H}^\circ_1 = - 100 RB + RCT + RDT^2/100 \qquad (5)$$

$$\Delta\bar{C}^\circ_{p_1} = RC + 2RDT/100 \qquad (6)$$

Several sets of data from other workers were rejected for various reasons. Ikel's data (6) was 3% too low. König's experimental points were all about 6% too low (7). Antropoff's data (8) ranged from a few percent low to very high values at the higher temperatures he investigated. Clever, <u>et al</u>.'s single test value (9) was 5% low. The data of Krestov and Patsatsiya (10) were between 6 and 13% low. This was also the case for another set of data by Krestov (11). The values of Borina, <u>et al</u>. (12) were low. Strakhov, <u>et al</u>. (17) had measurements which were 1.4% low, but showed a high reproducibility (0.2%). An independent set of measurements by the same group (18) was about 5% high. In general, values which are too low result from poor equilibration, a most common source of error in gas solubility determinations.

Figure 1 shows the temperature dependence of solubility for neon. The points were obtained from the smoothing equation. There is a pronounced minimum at about 323 K.

No report of the partial molal volume of neon in water was found. Alexander (19) measured the enthalpy of solution of neon in water at 298.15 K and reported values of -3.8, -4.6, -8.8, and -6.7 kJ mol^{-1}, average $-5.8_5 \pm 1.7$ kJ mol^{-1}. The average calorimetric enthalpy of solution and the enthalpy of solution from the fit of the least square equation of -3.868 kJ mol^{-1} differ by just a little more than the estimated experimental error. The agreement is considered satisfactory.

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5	Rubin Battino Department of Chemistry Wright State University Dayton, Ohio 45431 USA May 1977

CRITICAL EVALUATION:

TABLE 1. Smoothed Values of Solubility of Neon in Water, and Thermodynamic Functions[a] at 5K Intervals Using Equation 1 at 101.325kPa Partial Pressure of Gas.

T/K	Mol Fraction $X_1 \times 10^6$	Ostwald Coefficient $L \times 10^2$	$\Delta\bar{G}_1^\circ$/kJ mol^{-1}	$\Delta\bar{H}_1^\circ$/kJ mol^{-1}	$\Delta\bar{S}_1^\circ$/J K^{-1}mol^{-1}
273.15	10.133	1.261	26.12	-7.800	-124.2
278.15	9.566	1.211	26.73	-7.013	-121.3
283.15	9.085	1.171	27.33	-6.227	-118.5
288.15	8.702	1.141	27.92	-5.440	-115.8
293.15	8.395	1.119	28.49	-4.654	-113.1
298.15	8.152	1.104	29.05	-3.868	-110.4
303.15	7.966	1.095	29.59	-3.081	-107.8
308.15	7.829	1.092	30.12	-2.295	-105.2
313.15	7.737	1.095	30.64	-1.508	-102.7
318.15	7.685	1.103	31.15	-0.723	-100.2
323.15	7.670	1.115	31.65	0.064	- 97.73
328.15	7.690	1.133	32.13	0.850	- 95.32
333.15	7.742	1.155	32.60	1.636	- 92.94
338.15	7.827	1.182	33.06	2.423	- 90.59
343.15	7.941	1.214	33.50	3.209	- 88.29
348.15	8.087	1.250	33.94	3.996	- 86.01

[a]$\Delta\bar{C}_{p_1}^\circ$ was independent of temperature and has the value 157.3 J K^{-1} mol^{-1}.

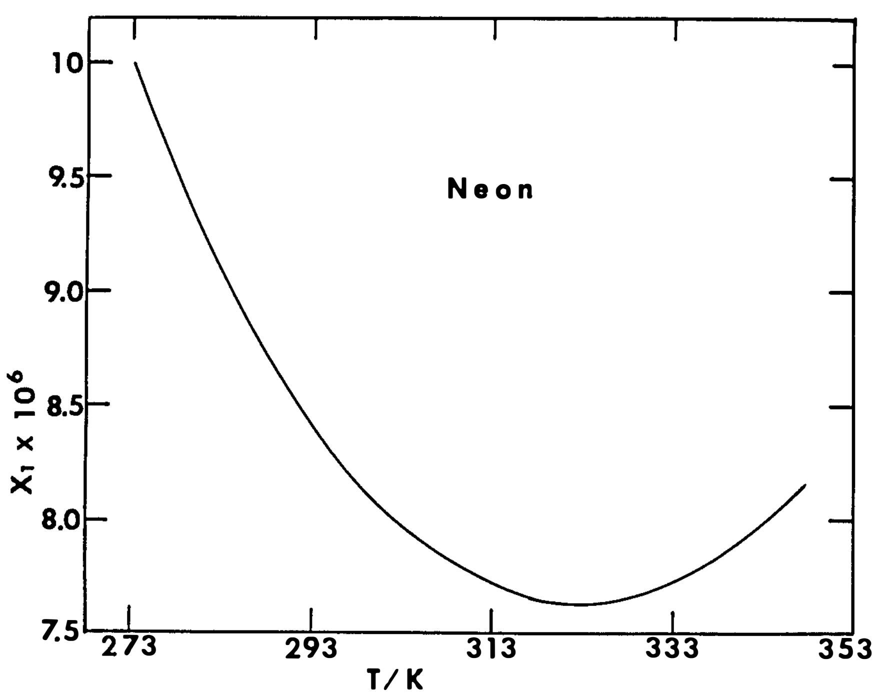

FIGURE 1. The mole fraction solubility of neon in water 101.325 kPa (1 atm).

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5	Rubin Battino Department of Chemistry Wright State University Dayton. Ohio 45431 USA May, 1977

CRITICAL EVALUATION:

References

1. Morrison, T. J.; Johnstone, N. B. J. Chem. Soc. 1954, 3441.
2. Lannung, A. J. Am. Chem. Soc. 1930, 52, 68.
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7. König, H. Z. Naturforsch. 1963, 18a, 363.
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13. Borina, A. F. Zh. Fiz. Khim. 1977, 51, 138.
14. Borina. A. F. Zh. Fiz. Khim. 1977, 51, 406.
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18. Abrosimov, V. K.; Strakhov, A. N.; Krestov, G. A. Izv. Vyssh. Uchebn. Zaved., Khim. Khim. Tekhnol. 1974, 17, 1463.
19. Alexander, D. M. J. Phys. Chem. 1959, 63, 994.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Lannung, A.

J. Am. Chem. Soc. 1930, 52, 68 - 80.

VARIABLES:

T/K: 278.15 - 318.15

Ne P/kPa: 101.325 (1 atm)

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient α
278.15	0.09565	0.0119*
278.15	0.09404	0.0117
278.15	0.09565	0.0119*
283.15	0.09246	0.0115
283.15	0.08924	0.0111
283.15	0.09085	0.0113*
293.15	0.08293	0.0103
293.15	0.08293	0.0103
293.15	0.08454	0.0105*
298.15	0.08222	0.0102
310.15	0.07768	0.0096*
310.15	0.07768	0.0096*
310.15	0.07929	0.0098
318.15	0.07630	0.0094*
318.15	0.07630	0.0094*

The mole fraction solubility at 101.325 kPa (1 atm) partial pressure of the gas. The mole fraction solubility was calculated by the compiler.

*Solubility values which were used in the final smoothing equation for the recommended values given in the critical evaluation.

AUXILIARY INFORMATION

METHOD:

Manometric/volumetric procedure. Water is degassed while over mercury. Gas uptake measured on gas buret.

APPARATUS/PROCEDURE:

The apparatus is based on the design of v. Antropoff (1). The entire apparatus is designed to be shaken inside of a thermostat.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Linde.

2. Water. Distilled. The specific conductivity was 2×10^{-7}.

ESTIMATED ERROR:

$\delta T/K = 0.03$

REFERENCES:

1. v. Antropoff, A.
Z. Elektrochem. 1919, 25, 269.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Morrison, T. J.; Johnstone, N. B.

J. Chem. Soc. 1954, 3441 - 3446.

VARIABLES:

T/K: 282.25 - 347.25

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Kuenen Coefficient $S \times 10^3$	T/K	Mol Fraction $X_1 \times 10^4$	Kuenen Coefficient $S \times 10^3$
282.25	0.09406	11.7	322.65	0.07645*	9.40
284.65	0.09086	11.3	331.95	0.07728*	9.46
288.15	0.08769	10.9	334.15	0.07721*	9.44
292.95	0.08535	10.6	337.55	0.07825*	9.55
297.55	0.08221*	10.2	338.55	0.07813*	9.53
301.95	0.08150	10.1	339.75	0.07851*	9.57
304.45	0.08019	9.93	345.65	0.08101	9.84
305.25	0.08021	9.93	347.25	0.08108	9.84
315.25	0.07686*	9.48			

The original paper reports the neon solubility in water, S_o, as cm^3 of neon at a partial pressure 760 torr, reduced to 760 torr and 273.15 K, dissolved by 1 kg water. The same solubility value is reported above as the Kuenen coefficient x 10^3 at a neon partial pressure of 101.325 kPa (1 atm)

The mole fraction solubility at a neon partial pressure of 101.325 kPa (1 atm) was calculated by the compiler.

*Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

The authors fitted their solubility data to the equation $\log_{10} S_o = -59.412 + 2890/(T/K)$.

AUXILIARY INFORMATION

METHOD:

The previously degassed solvent is flowed in a thin film through the gas in a glass absorption spiral. Volume changes are measured in burets.

SOURCE AND PURITY OF MATERIALS:

1. Neon. British Oxygen Co. Ltd. Spectroscopically pure.

2. Water. No information given.

APPARATUS/PROCEDURE:

The apparatus described by Morrison and Billett (1) was used.

ESTIMATED ERROR:

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1952, 3819.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

de Wet, W. J.

J. S. Afr. Chem. Inst. 1964, 17, 9-13.

VARIABLES:

T/K: 291.35 - 306.55

P/kPa: 101.325 (1 atm)

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$
291.35	0.08290	0.0103
298.75	0.08143*	0.0101
306.55	0.07920*	0.0098

Mole fraction solubility at 101.325 kPa (1 atm) partial pressure of the neon calculated by the compiler.

*Solubility value which was used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

AUXILIARY INFORMATION

METHOD:

Degassed liquid is flowed in a thin film through a glass spiral containing the gas. Volumes determined via calibrated burets.

APPARATUS/PROCEDURE:

Used modification of Morrison and Billett(1) apparatus. Degassing as modified by Clever, et al. (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures.

2. Water. Distilled.

ESTIMATED ERROR:

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid 1952, 3819.

2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Krestov, G.A.; Patsatsiya, G.M.

Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol. 1969, *12*, 1333 - 1337.

VARIABLES:

T/K: 283.15 - 313.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
283.15	0.08779	1.092	1.132
293.15	0.08414*	1.045	1.122
303.15	0.08089	1.002	1.112
313.15	0.07631	0.942	1.080

*Solubility value which was used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

The mole fraction solubility values at 101.325 kPa (1 atm) and the Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Modification of the apparatus used by Ben-Naim and Baer (1). Also measured solubility in ethanol-water mixtures.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

No information given.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.01$ (Compiler)

REFERENCES:

1. Ben-Naim, A.; Baer, S. *Trans. Faraday Soc.* 1963, *59*, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Weiss, R. F.

J. Chem. Eng. Data 1971, 16, 235-241.

VARIABLES:

T/K: 273.80 - 313.29
P/kPa: 101.325 (1 atm)

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$
273.80	0.09922	1.2343	293.31	0.08395*	1.0426
273.80	0.09935	1.2359	293.32	0.08355*	1.0376
273.80	0.09892	1.2306	303.43	0.07908*	0.9796
273.80	0.09974	1.2408	303.45	0.07973*	0.9876
273.79	0.09877	1.2287	303.47	0.07913*	0.9802
283.39	0.08993	1.1186	303.46	0.07869	0.9747
283.43	0.09041*	1.1245	303.46	0.07924*	0.9815
283.43	0.09014*	1.1212	303.46	0.07890*	0.9773
283.39	0.09028*	1.1229	303.45	0.07955*	0.9853
283.39	0.09013*	1.1210	313.27	0.07759*	0.9578
283.39	0.09002*	1.1196	313.29	0.07712*	0.9520
293.31	0.08389*	1.0419	313.29	0.07766*	0.9587
293.30	0.08387*	1.0416	313.27	0.07710*	0.9517
293.31	0.08418*	1.0454	313.29	0.07707*	0.9514

The mole fraction solubility is at 101.325 kPa (1 atm) partial pressure of the neon. The mole fraction solubility was calculated by the compiler.

*Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

AUXILIARY INFORMATION

METHOD:

The Scholander micro-gasometric technique as adapted by Douglas (1) was used. The gas is dissolved in previously degassed water over mercury. All volumes are read on a micrometer which displaces mercury.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

1. Neon. Air Reduction. Better than 99.99 per cent neon.
2. Water. Distilled.

ESTIMATED ERROR:

$\delta T/K = 0.01$

REFERENCES:

1. Douglas, E.
   J. Phys. Chem. 1964, 68, 169;
   ibid. 1965, 69, 2608.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Borina, A. F.; Lyashchenko, A. K.

Zh. Fiz. Khim. 1972, 46, 249 - 250.
Russ. J. Phys. Chem. (Engl. Trans) 1972, 46, 150.

VARIABLES:

T/K: 293.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Ostwald Coefficient $L \times 10^2$
293.15	0.08335	1.111

The neon solubility in water was adjusted to 101.325 kPa (1 atm) by Henry's law.

AUXILIARY INFORMATION

METHOD:

APPARATUS/PROCEDURE:

Used method of Ben-Naim and Baer (1). Procedure described in ref. 2. Paper includes data on salting out of neon from potassium and ammonium chloride aqueous solutions.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Less than 0.1 per cent impurities.
2. Water. Double distilled.

ESTIMATED ERROR:

REFERENCES:

1. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735
2. Borina, A. F.; Lyashchenko, A. K. Zh. Fiz. Khim. 1971, 45, 1316.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Borina, A. F.; Samoilov, O. Ya.

Zh. Strukt. Khim. 1974, 15, 395-402.
J. Struct. Chem. 1974, 15, 336-342.

VARIABLES:

T/K: 288.15 - 298.15
Total P/kPa: 98.659 (740 mmHg)

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^9$ at 1 mmHg	Mol Fraction $X_1 \times 10^4$ at 1 atm	Ostwald Coefficient $L \times 10^2$
288.15	11.39	0.08656*	1.135
293.15	10.98	0.08345*	1.112
298.15	10.58	0.08041	1.089

*Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

The mole fraction solubility at 101.325 kPa (1 atm) and the Ostwald coefficients were calculated by the compiler.

The mole fraction solubility values at 1 mmHg were calculated as the inverse of Henry's constant from the experimentally measured Ostwald coefficients by the author. The inverse of the mole fraction solubility at 1 mmHg is $K/\text{mmHg} = P/X_1$.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete,with the gas and solvent in contact at constant pressure. The total pressure of neon + water vapor at its saturation value was always 740 mmHg during the measurement.

The author assumed that the gas behaved ideally and that Henry's law is obeyed to convert the experimentally measured Ostwald coefficient to the inverse of Henry's constant.

SOURCE AND PURITY OF MATERIALS:

1. Neon. "Specially pure" grade. Contained less than 0.1 per cent of other gases.
2. Water. Distilled.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.005$ (author)

REFERENCES:

1. Lyashchenko, A.K.; Borina, A.F. Zh. Strukt. Khim. 1971, 12, 964.
2. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Benson, B. B.; Krause, D.

J. Chem. Phys. 1976, *64*, 689.

VARIABLES:

T/K: 274.155 - 323.148
P/kPa: 101.325 (1 atm)

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$
274.155	0.10088	1.2560
278.151	0.095785*	1.1926
279.157	0.094733*	1.1795
283.149	0.091149*	1.1347
288.149	0.087474*	1.0883
288.150	0.087550*	1.0892
293.148	0.084488*	1.0502
293.152	0.084467*	1.0498
298.144	0.082406	1.0231
298.158	0.082427	1.0233
303.150	0.080360	0.9963
308.142	0.078771*	0.9751
313.150	0.078260	0.9669
318.151	0.077036*	0.9499
323.148	0.077184*	0.9497

The mole fraction solubility at 101.325 kPa (1 atm) partial pressure of neon was calculated by the compiler.

*Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

AUXILIARY INFORMATION

METHOD: Gas-free water and the pure gas are equilibrated, and volumetric samples of the liquid and gaseous phases are isolated. The gas dissolved in the water is extracted and the number of moles determined on a special mercury manometer. After removal of water vapor, the number of moles of neon in the gaseous phase sample is measured with the same manometer. The pressure (and fugacity) above the solution may be calculated from the neon analysis. Real gas corrections are made. Predicted maximum error is 0.02 per cent.

APPARATUS/PROCEDURE:

No drawings of the apparatus are given in the original paper.

SOURCE AND PURITY OF MATERIALS:

1. Neon. No information given.
2. Water. No information given.

ESTIMATED ERROR: Smoothed data fit to 0.12 per cent rms in the solubility. Calculated error from measurements is 0.02 per cent.

REFERENCES:

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Borina, A. F.

Zh. Fiz. Khim. 1977, 51, 138 - 142
Russ. J. Phys. Chem. 1977, 51, 76 - 78

VARIABLES:

T/K: 288.15 - 303.15
Total P/kPa: 98.659 (740 mmHg)

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^9$ at 1 mmHg	Mol Fraction $X_1 \times 10^4$ at 1 atm	Ostwald Coefficient $L \times 10^2$
288.15	11.39	0.08656*	1.135
293.15	10.98	0.08345*	1.112
298.15	10.58	0.08041*	1.089
303.15	10.54	0.08010*	1.101

*Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

The mole fraction solubility at 101.325 kPa (1 atm) and the Ostwald coefficients were calculated by the compiler.

The mole fraction solubility values at 1 mmHg were calculated as the inverse of Henry's constant from the experimentally measured Ostwald coefficients by the author. The inverse of the mole fraction solubility at 1 mmHg is K/mmHg = P/X_1.

AUXILIARY INFORMATION

METHOD/APPARATUS PROCEDURE:

The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of neon + water vapor at its saturation value was always 740 mmHg during the measurement.

The author assumed that the gas behaved ideally and that Henry's law is obeyed to convert the experimentally measured Ostwald coefficient to the inverse of Henry's constant.

SOURCE AND PURITY OF MATERIALS:

1. Neon. "Specially pure" grade. Contained less than 0.1 per cent of other gases.
2. Water. Distilled.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.005$ (author)

REFERENCES:

1. Lyashchenko, A.K.; Borina, A.F. Zh. Strukt. Khim. 1971, 12, 964.
2. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5	Borina, A. F. Zh. Fiz. Khim. 1977, 51, 406 - 409. Russ. J. Phys. Chem. 1977, 51, 235-237
VARIABLES: T/K: 293.15 - 309.15 Total P/kPa: 98.659 (740 mmHg)	PREPARED BY: R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^9$ at 1 mmHg	Mol Fraction $X_1 \times 10^4$ at 1 atm	Ostwald Coefficient $L \times 10^2$	Number of Determinations
293.15	11.07	0.08413*	1.121	5
299.15	10.64	0.08086*	1.098	5
305.15	10.40	0.07904*	1.093	4
309.15	10.35	0.07866*	1.101	5

*Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation.

The mole fraction solubility at 101.325 kPa (1 atm) and the Ostwald coefficients were calculated by the compiler.

The mole fraction solubility values at 1 mmHg were calculated as the inverse of Henry's constant from the experimentally measured Ostwald coefficients by the author. The inverse of the mole fraction solubility at 1 mmHg is $K/\text{mmHg} = P/X_1$.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of neon + water vapor at its saturation value was always 740 mmHg during the measurement.

The author assumed that the gas behaved ideally and that Henry's law is obeyed to convert the experimentally measured Ostwald coefficient to the inverse of Henry's constant.

SOURCE AND PURITY OF MATERIALS:

1. Neon. "Specially pure" grade. Contained less than 0.1 per cent of other gases.
2. Water. Double distilled.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.005$ (author)

REFERENCES:

1. Lyashchenko, A.K.; Borina, A.F. Zh. Strukt. Khim. 1971, 12, 964.
2. Borina. A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
3. Ben-Naim. A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. Water-d_2; D_2O; 7789-20-0

ORIGINAL MEAS REMENTS:

Abrosimov, V.K.; Strakhov, A.N.; Krestov, G.A.

Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol. 1974, 17, 1463-1465.

VARIABLES:

T/K: 283.38 - 318.45
P/kPa: 101.325 (1 atm)

PREPARED BY:

R. Battino

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$
283.38	0.10927	1.352
292.72	0.09920	1.227
298.15	0.09466	1.170
308.25	0.08898	1.097
318.45	0.08735	1.073

Mole fraction solubility at 101.325 kPa (1 atm) partial pressure of gas calculated by compiler.

AUXILIARY INFORMATION

METHOD:

The authors also measured the solubility of neon in pure water and mixtures of H_2O and D_2O.

APPARATUS/PROCEDURE:

The apparatus (1) is a modification of the apparatus used by Ben-Naim and Baer (2).

SOURCE AND PURITY OF MATERIALS:

No information given.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.01$ (compiler)

REFERENCES:

1. Patsatsiya, K.M.; Krestov, G.A. Zh. Fiz. Khim. 1970, 44, 1835.

2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Sea Water	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA February 1978

CRITICAL EVALUATION:

There are two reports of the solubility of neon in sea water (1,2). König (1) reports neon solubility values at six temperatures between 273.15 and 298.15 K which he estimates to have an uncertainty of three percent. Weiss (2) reports four to five neon solubility values at each of six temperatures which he estimates to have an accuracy of ± 0.5% and a relative precision of ± 0.3%. The data of König fall consistently about 4 percent below the values of Weiss.

Presented here are the neon Bunsen solubility values of Weiss in water, sea water, and one dilution of sea water. Weiss has fitted his data by the method of least squares to an equation for the natural logarithm of the Bunsen coefficient, α, which is consistent with both the integrated form of the vant Hoff equation and the Setschenow salt effect equation. The equation, which is valid for the temperature range of 273.15 to 323.15 K and salinity range of 0 to 40 S‰, reproduced Weiss' neon Bunsen values with a root-mean-square deviation of 4×10^{-5}. The equation is

$$\ln \alpha = -39.1971 + 51.8031(100/T) + 15.7699 \ln (T/100)$$
$$+ S‰ [-0.124695 + 0.078374(T/100) - 0.0127972(T/100)^2]$$

Weiss gives equations for the solubility of neon from moist air at one atm total pressure in units of ml Ne (STP) dm^{-3} sea water and ml Ne (STP) kg^{-1} sea water assuming that neon behaves as an ideal gas and has a mol fraction of 1.818×10^{-5} (3) in dry air. The equations are

$$\ln[\text{ml Ne(STP) } dm^{-3}] = -160.2630 + 211.0969(100/T) + 132.1657 \ln(T/100)$$
$$- 21.3165(T/100) + S‰[-0.122883 + 0.077055(T/100) - 0.0125568(T/100)^2]$$

and

$$\ln[\text{ml Ne(STP) } kg^{-1}] = -170{\cdot}6018 + 225.1946(100/T) + 140{,}8863 \ln(T/100)$$
$$- 22.6290(T/100) + S‰[-0.127113 + 0.079277(T/100) - 0.0129095(T/100)^2]$$

where S‰ is the salinity.

The Weiss paper gives extensive tables of neon Bunsen coefficients and of ml Ne(STP) kg^{-1} as a function of temperature and salinity as calculated from the above equations.

1. König, H. Z. Naturforsch. 1963, 18a, 363.
2. Weiss, R. F. J. Chem. Eng. Data 1971, 16, 235.
3. Gluckauf, E. Proc. Roy. Soc. A. 1946, 185, 98; also Compendium of Meteorology, Amer. Meteorological Soc., Boston, MA 1951, 3 - 11.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Sea Water	Weiss, R. F. *J. Chem. Eng. Data* 1971, *16*, 235-241.
VARIABLES: T/K: 273.22 - 313.63 Ne P/kPa: 101.325 (1 atm) Salinity: 0 - 36.425 ‰	**PREPARED BY:** H. L. Clever, S. A. Johnson

EXPERIMENTAL VALUES:

Salinity ‰

0.0		18.152		36.425	
T/K	Bunsen x 10^3	T/K	Bunsen x 10^3	T/K	Bunsen x 10^3
273.79	12.287			273.22	9.926
278.80	12.343			273.23	9.971
273.80	12.359			273.23	10.003
273.80	12.306	278.22	10.653	273.23	9.957
273.80	12.408	278.22	10.605		
		278.23	10.556	276.20	9.705
283.39	11.186	278.23	10.597	276.20	9.697
283.39	11.229			276.21	9.754
283.39	11.210			276.21	9.699
283.39	11.196				
283.43	11.245			283.70	9.170
283.43	11.212			283.70	9.193
				283.71	9.144
293.30	10.416			283.72	9.188
293.31	10.419				
293.31	10.454			293.28	8.763
293.31	10.426	298.29	9.197	293.28	8.744
293.32	10.376	298.29	9.205	293.28	8.687
		298.29	9.216	293.29	8.728
303.43	9.796	298.30	9.200	293.29	8.732
303.45	9.876				
303.45	9.853			303.29	8.225
303.46	9.747			303.30	8.257
303.46	9.815			303.30	8.257
303.46	9.773			303.30	8.275
303.47	9.802				

Continued on next page.

AUXILIARY INFORMATION

METHOD: Solubility determinations by the Scholander microgasometric technique as used by Douglas (1), with minor modifications.

APPARATUS/PROCEDURE: An equilibrium chamber, containing pure gas saturated with water vapor, is separated by mercury from a closed side chamber containing degassed water. The apparatus is tipped on its side allowing degassed water to flow into the equilibrium chamber. Dissolution is aided by mechanical shaking.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Air Reducation Co. Specified > 99.99% pure. Gas chromatographic checks showed ≤ 0.01% air.
2. Sea Water. Passed through 0.45 μ Millipore filter and poisoned with 1 mg/l of $HgCl_2$.

ESTIMATED ERROR:

δT/K = 0.01
δsalinity = 0.004

REFERENCES:

1. Douglas, E. *J. Phys. Chem.* 1964 *68*, 169.
Ibid. 1965, *69*, 2608.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Sea Water	Weiss, R. F. *J. Chem. Eng. Data* 1971, *16*, 235-241.
VARIABLES: T/K: 273.22 - 313.63 Ne P/kPa: 101.325 (1 atm) Salinity: 0 - 36.425 ‰	PREPARED BY: H. L. Clever, S. A. Johnson

EXPERIMENTAL VALUES:

Salinity ‰					
0.0		18.152		36.425	
T/K	Bunsen x 10^3	T/K	Bunsen x 10^3	T/K	Bunsen x 10^3
				313.59	7.970
				313.59	8.023
313.27	9.578			313.61	8.006
313.27	9.517			313.63	8.066
313.29	9.520				
313.29	9.587				
313.29	9.514				

AUXILIARY INFORMATION

METHOD:	SOURCE AND PURITY OF MATERIALS:
See previous page.	See previous page.
APPARATUS/PROCEDURE: See previous page.	ESTIMATED ERROR: See previous page. REFERENCES: See previous page.

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Electrolytes	H. L. Clever Chemistry Department Emory University Atlanta, GA 30322 U. S. A. May 1978

CRITICAL EVALUATION:

Until recently the only neon solubility data in aqueous electrolyte solutions were the 1954 measurements of Morrison and Johnstone (1) in aqueous LiCl, NaCl, and KI solutions. Between 1971 and 1974 Samoilov, Borina, Lyashchenko and Alekseeva (2, 3, 4, 5, 6, 7, 8) of the N. S. Kurnakov Institute of Inorganic Chemistry, Moscow, reported the solubility of neon in 30 different aqueous electrolyte solutions. They investigated the effect of temperature, pressure and electrolyte concentration on the neon solubility.

The Russian workers discuss the neon solubility data in terms of their interest in the structure of water and aqueous electrolyte solutions. They have used three different solubility units in their different papers: units of volume of gas per unit volume of solution, volume of gas per unit weight of solvent, and Henry's law constant. They have not used the Setschenow salt parameter in their calculations or discussions.

In order to be able to compare the neon solubility behavior in aqueous electrolyte solutions with the behavior of other gases in aqueous electrolyte solutions, the results were recalculated as Setschenow salt parameters on a salt molality basis. When necessary aqueous electrolyte density values were interpolated from International Critical Tables(9) density tables. The Setschenow salt effect parameter was fitted by the method of least squares to an equation linear in molality, $k_s = a + bm$. The use of a linear function is not intended to imply that the Setschenow parameter is linear in molality. Feillolay and Lucas (10) have presented evidence for a maximum in k_s as a function of molality. Presently available salt effect data are not of sufficient accuracy to test the Feillolay and Lucas theory at present. The linear equations are collected in Table 1.

The value of k_s in the limit $m \rightarrow 0$ would be desirable, but the k_s values at low salt concentration are difficult to measure accurately. The linear equations do not give as consistent a set of k_s values in the limit of $m \rightarrow 0$ as the set of values at unit molality. Thus Table 1 contains k_s values at unit molality. In addition, values of the Setschenow salt effect parameter $k_{sx} = (1/m)\log(X°/X)$ at unit salt molality are given in Table 1. In the equation m is the salt molality, and the X°/X ratio is the mole fraction gas solubility ratio with respect to gas, water and all salt ions. The definition is discussed in more detail in the discussion of salt effects on helium solubility.

Lyaschchenko and Borina (5) studied the effect of pressure on the solubility of neon in aqueous HCl, $Mg(NO_3)_2$, $Ca(NO_3)_2$ and $Ba(NO_3)_2$ solutions. In Table 1 two values of k_s and k_{sx} are given for these solutions. The first are from the solubility values measured at atmospheric pressure and the second are from the combination of solubility values at all pressures.

The Setschenow parameters reported by Morrison and Johnstone (1) for LiCl, NaCl, and KI solutions were based on only two solubility measurements, water and one molal salt solution, and were stated to have an uncertainty of 0.01. In all three cases the more recent salt effect parameters based on the Kurnakov Institute solubility data agree with the Morrison and Johnstone data within that uncertainty.

Several generalizations about the salt effect parameter can be observed from the data in Table 1. (1) The Setschenow salt parameter decreases as temperature increases; (2) In alkali halide solutions for a given alkali metal cation the Setschenow salt parameter decreases in the order $Cl^- > Br^- > I^-$; (3) For a given halide ion the Setschenow salt parameter decreases in the order $Li^+ > Na^+ > K^+ > Rb > Cs^+$; In alkaline earth halide solutions (4) for a given halide ion the Setschenow salt parameter decreases in the order $Ba^{2+} > Sr^{2+} > Ca^{2+} > Mg^{2+}$; (5) For a given alkaline earth cation the pattern is not clear from present data, there is some evidence that the Br^- ion is more effective at salting out than either the Cl^- or I^- ions.

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Electrolytes	H. L. Clever Chemistry Department Emory University Atlanta, GA 30322 USA May 1978

CRITICAL EVALUATION:

TABLE 1. Summary of Setschenow salt effect parameters for neon dissolved in aqueous electrolyte solutions.

Solution Ne + H_2O + salt	T/K	Equation Parameters $k_s = a + b\ m$	Setschenow Parameter at one molal electrolyte $k_s = (1/m) \log(S^o/S)$	$k_{sX} = (1/m) \log(X^o/X)$	Reference
HCl	293.15	0.0602 - 0.0082 m	0.0520	0.0586	5
		0.0719 - 0.0123 m	0.0596	0.0662	
NH_4Cl	293.15	0.0748 - 0.0042 m	0.0706	0.0691	4
$FeCl_3$	293.15	0.2569 - 0.0815 m	0.1754	0.189	6
$MgCl_2$	293.15	0.1871 - 0.0056 m	0.1815	0.194	6
$MgSO_4$	293.15	0.2487 - 0.0181 m	0.2306	0.242	2
$Mg(NO_3)_2$	293.15	0.1531 + 0.0294 m	0.1825	0.185	5
		0.1386 + 0.0417 m	0.1803	0.183	
	298.15	0.206 - 0.023 m	0.183	0.185	7
	303.15	0.1527	0.1527	0.154	7
$CaCl_2$	293.15	0.2073 - 0.0012 m	0.2061	0.218	6
$CaBr_2$	293.15	0.2208 - 0.0062 m	0.2146	0.219	6
CaI_2	293.15	0.2135 + 0.0080 m	0.2215	0.215	6
$Ca(NO_3)_2$	293.15	0.2082 + 0.0002 m	0.2084	0.209	5
		0.2222 - 0.0088 m	0.2133	0.214	
$SrCl_2$	293.15	0.2265 - 0.0005 m	0.2260	0.237	6
$SrBr_2$	293.15	0.2259 - 0.0018 m	0.2241	0.226	6
$BaCl_2$	293.15	0.2359 + 0.0077 m	0.2436	0.251	6
$BaBr_2$	293.15	0.2227 + 0.0558 m	0.2785	0.276	6
BaI_2	293.15	0.3240 - 0.0620 m	0.2620	0.247	6
$Ba(NO_3)_2$	293.15	0.1783 + 0.2105 m	0.3889	0.376	5
		0.1527 + 0.2590 m	0.4116	0.399	
LiCl	298.15		0.059	0.074	1
	293.15	0.0725 - 0.0007 m	0.0718	0.0872	3
	288.15	0.0858 - 0.00075 m	0.0851	0.0928	8
	293.15	0.0826 - 0.0022 m	0.0804	0.0881	8
	298.15	0.0774 - 0.0009 m	0.0765	0.0842	8
LiI	288.15	0.0979 - 0.00445 m	0.0934	0.101	8
	293.15	0.1021 - 0.0099 m	0.0922	0.100	8
	298.15	0.0884 - 0.0078 m	0.0806	0.088	8
$LiNO_3$	293.15	0.0833 + 0.0055 m	0.0888	0.0905	7
	303.15	0.0822 - 0.0107 m	0.0715	0.0718	7
NaCl	298.15		0.097	0.112	1
	293.15	0.1040 + 0.0003 m	0.1043	0.119	3
	288.15	0.1265 - 0.00375 m	0.1228	0.131	8
	293.15	0.1118 + 0.0001 m	0.1119	0.120	8
	298.15	0.1076 - 0.0020 m	0.1056	0.113	8
	303.15	0.1036 + 0.00045 m	0.1041	0.112	8
NaBr	293.15	0.0985 + 0.0001 m	0.0986	0.114	3
NaI	293.15	0.0965 - 0.0003 m	0.0968	0.112	3
	288.15	0.1303 - 0.0053 m	0.1250	0.133	8
	293.15	0.1045 - 0.0005 m	0.1040	0.112	8
	298.15	0.1014 - 0.0011 m	0.1003	0.108	8

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Electrolytes	H. L. Clever Chemistry Department Emory University Atlanta, GA 30322 USA May 1978

CRITICAL EVALUATION:

TABLE 1. Summary of Setschenow salt effect parameters for neon dissolved in aqueous electrolyte solutions (continued).

Solution Ne + H_2O + salt	T/K	Equation Parameters $k_s = a + b\,m$	Setschenow Paramters at One Molal Electrolyte $k_s = (1/m)\log(S^o/S)$	$k_{sx} = (1/m)\log(X^o/X)$	Reference
$NaNO_3$	293.15	0.1166 - 0.0043 m	0.1123	0.114	7
	298.15	0.0929 + 0.0017 m	0.0946	0.0952	7
	303.15	0.0773 + 0.0058 m	0.0831	0.0827	7
KOH	293.15	0.1791 - 0.0079 m	0.1712	0.183	2
KF	293.15	0.1276 - 0.0071 m	0.1205	0.132	2
KCl	293.15	0.1276 - 0.0140 m	0.1136	0.116	4
	288.15	0.1144 - 0.0048 m	0.1096	0.117	8
	290.65	0.1164 - 0.0069 m	0.1095	0.117	8
	293.15	0.1160 - 0.0074 m	0.1086	0.116	8
	295.65	0.1041 - 0.0032 m	0.1009	0.109	8
	298.15	0.0893 - 0.0006 m	0.0887	0.0964	8
KBr	293.15	0.0853 + 0.0025 m	0.0878	0.103	3
KI	298.15		0.080	0.095	1
	293.15	0.0968 - 0.0062 m	0.0906	0.106	3
	288.15	0.1252 - 0.0078 m	0.1174	0.125	8
	290.65	0.1112 - 0.0051 m	0.1061	0.114	8
	293.15	0.1053 - 0.0063 m	0.0991	0.107	8
	295.65	0.1001 - 0.00405 m	0.0960	0.104	8
	298.15	0.0975 - 0.0029 m	0.0946	0.102	8
RbCl	293.15	0.1146 - 0.0097 m	0.1049	0.103	2
CsCl	293.15	0.0791 - 0.0011 m	0.0780	0.0934	3
$CsNO_3$	293.15	0.1030 + 0.0046 m	0.1076	0.0961	7
	303.15	0.0691 + 0.0098 m	0.0789	0.0660	7

Presently there are more salt effect data of consistent good quality for neon than for any other of the noble gases.

1. Morrison, T. J.; Johnstone, N. B. J. Chem. Soc. 1955, 3655.
2. Lyashchenko, A.K.; Borina, A.F. Zh. Strukt. Khim. 1971, 12, 964.
3. Borina, A.F.; Samoilov, O.Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
4. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1972, 46, 249.
5. Lyashchenko, A.K.; Borina, A.F. Zh. Strukt. Khim. 1973, 14, 978.
6. Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S. Zh. Fiz. Khim. 1973, 47, 1748.
7. Lyashchenko, A.K. Dokl. Akad. Nauk. SSSR 1974, 217 (2), 380.
8. Borina, A.F.; Samoilov, O.Ya. Zh. Strukt. Khim. 1974, 15, 395.
9. International Critical Tables , Washburn, E. W., Editor, McGraw-Hill Book Co., Inc., New York, 1928, Volume III.
10. Feillolay, A.; Lucas, M. J. Phys. Chem. 1972, 76, 3068.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Hydrochloric Acid; HCl; 7647-01-0

ORIGINAL MEASUREMENTS:

Lyashchenko, A.K.; Borina, A.F.

Zh. Strukt. Khim. 1973, *14*, 978 - 981.
J. Struct. Chem. 1973, *14*, 924 - 927.

VARIABLES:

T/K: 293.15
Total P/kPa: 84.73 (635.5 mmHg) - 98.525 (739 mmHg)
HCl/mol kg^{-1} H_2O: 0 - 2.935

PREPARED BY:

T. D. Kittredge, H. L. Clever

EXPERIMENTAL VALUES:

T/K	Hydrochloric Acid mol kg^{-1} H_2O	P/mmHg	Neon Solubility* $S/cm^3\ dm^{-3}$	Setschenow Parameter $k_s = (1/m)\log(S^o/S)$
293.15	0	739	11.11	-
	1.72	737	9.26	0.0460
	1.72	700.3	8.64	(0.0498)
	1.72	676.8	8.27	(0.0523)
	1.72	635.5	7.68	(0.0552)
	2.935	737	8.71	0.0360
	2.935	701.3	8.29	(0.0355)
	2.935	671.5	7.90	(0.0363)

$k_s = 0.0602 - 0.0082\ m$ (from the two values at 737 mmHg).

At one molal HCl, $k_s = 0.0520$ and $k_{sX} = 0.0586$.

$k_s = 0.0719 - 0.0123\ m$ (from all data points with S corrected to 739 mmHg).

At one molal HCl, $k_s = 0.0596$ and $k_{sX} = 0.0662$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The Setschenow parameter k_s and k_{sX} were calculated by the compiler. The neon solubility in water, S^o, is from references 1 and 2.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of HCl in the solution was determined after the experiment by titration with KOH.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Hydrochloric acid. Chemically pure grade.

ESTIMATED ERROR:

$\delta S/S = 0.0035 - 0.005$.

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. *Zh. Fiz. Khim.* 1971, *45*, 1316.
2. Borina, A.F.; Samoilov, O.Ya.; Alekseeva, L.S. *Zh. Fiz. Khim.* 1971, *45*, 2554.
3. Ben-Naim, A.; Baer, S. *Trans. Faraday Soc.* 1963, *59*, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Ammonium Chloride; NH_4Cl; 12125-02-9

ORIGINAL MEASUREMENTS:

Borina, A.F.; Lyashchenko, A.K.

Zh. Fiz. Khim. 1972, 46, 249 - 250.

Russ.J. Phys. Chem. 1972, 46,150-151.

VARIABLES:

T/K: 293.15
Total P/kPa: 98.525 (739 mmHg)
NH_4Cl/mol kg^{-1} H_2O: 0 - 2.647

PREPARED BY:

T.D.Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Ammonium Chloride mol kg^{-1} H_2O	Neon Solubility* $S/cm^3\ dm^{-3}$	Setschenow Parameter $k_S = (1/m)\ \log\ (S^o/S)$
293.15	0	11.11 (S^o)	-
	0.161	10.80	0.0763
	0.163	10.85	0.0631
	0.339	10.41	0.0834
	0.343	10.44	0.0788
	0.642	10.04	0.0685
	0.652	9.98	0.0714
	1.315	9.05	0.0677
	1.315	9.09	0.0663
	2.647	7.56	0.0632
	2.647	7.45	0.0656

$k_S = 0.0748 - 0.0042\ m$

At one molal NH_4Cl, $k_S = 0.0706$ and $k_{SX} = 0.0691$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.
The neon solubility in water, S^o, is from reference 1.
The values of k_S and k_{SX} were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k_{SX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of NH_4Cl in the solution was determined after the experiment by titration of the Cl^- by $Hg(NO_3)_2$.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Ammonium chloride. Chemically pure grade.

ESTIMATED ERROR:

$\delta S/cm^3\ dm^{-3} = 0.04$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Iron Chloride; $FeCl_3$; 7705-08-0	Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S. Zh. Fiz. Khim. 1973, 47, 1748 - 1751. Russ. J.Phys.Chem. 1973, 47, 987 - 989.
VARIABLES: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) $FeCl_3$/mol kg^{-1} H_2O: 0 - 0.735	PREPARED BY: T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Ferric Chloride mol kg^{-1} H_2O	Neon solubility* $S/cm^3\ dm^{-3}$	$k_s = (1/m) \log (S^o/S)$
293.15	0.0	11.11 (S^o)	-
	0.080	10.30	0.4110
	0.530	8.56	0.2137
	0.735	7.96	0.1970

$k_s = 0.2569 - 0.0815m$ (value at 0.080m omitted)

At one molal $FeCl_3$, $k_s = 0.1754$ and $k_{sX} = 0.189$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The neon solubility in water, S^o, is from reference 1.

The values of k_s and k_{sX} were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of $FeCl_3$ was determined after degassing from the density of the solution. The authors point out that there is evidence the iron is in the form of a $FeCl^{2+}$ complex in the solution.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Specially pure grade. Contained 0.1 per cent of other gases.
2. Water. Distilled.
3. Iron Chloride. Chemically pure.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, B. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Magnesium Chloride; $MgCl_2$; 7786-30-3

ORIGINAL MEASUREMENTS:

Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S.

Zh. Fiz. Khim. 1973, 47, 1748-1751.
Russ. J. Phys. Chem. 1973, 47, 987-989.

VARIABLES:

T/K: 293.15
Total P/kPa: 98.525 (739 mmHg)
$MgCl_2$/mol kg^{-1} H_2O: 0 - 2.266

PREPARED BY:

T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Magnesium Chloride mol kg^{-1} H_2O	Neon solubility* S/cm^3 dm^{-3}	$k_s = (1/m) \log (S^o/S)$
293.15	0.0	11.11 (S^o)	-
	0.272	10.21	0.1349
	0.476	9.13	0.1790
	1.017	7.09	0.1918
	1.138	6.97	0.1779
	2.266	4.52	0.1724

$k_s = 0.1871 - 0.0056m$ (value at 0.272m omitted)

At one molal $MgCl_2$, $k_s = 0.1815$ and $k_{sX} = 0.194$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The neon solubility in water, S^o, is from reference 1.

The values of k_s and k_{sX} were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of $MgCl_2$ was determined after degassing by titration of Mg^{2+} with a chelating agent.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Specially pure grade. Contained 0.1 per cent of other gases.
2. Water. Distilled.
3. Magnesium Chloride. Chemically pure.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, B. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Magnesium Sulfate; $MgSO_4$; 7487-88-9	Lyashchenko, A.K.; Borina, A.F. Zh. Strukt. Khim. 1971, 12, 964-968. J. Struct. Chem. 1971, 12, 889-891.
VARIABLES: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) $MgSO_4$/mol kg^{-1} H_2O: 0 - 1.347	PREPARED BY: T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Magnesium Sulfate mol kg^{-1} H_2O	Neon Solubility* S/cm^3 dm^{-3}	k_s = (1/m) log (S^o/S)
293.15	0	11.11 (S^o)	
	0.304	9.39	0.240
	0.492	8.42	0.245
	0.624	7.92	0.236
	1.016	6.49	0.230
	1.347	5.55	0.224

$$k_s = 0.2487 - 0.0181\ m$$

At one molal $MgSO_4$, k_s = 0.2306 and k_{sX} = 0.242.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The neon solubility in water, S^o, is from references 1 and 2.

The Setschenow parameters k_s and k_{sX} were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg The neon partial pressure is 721.5. The value of k_{sX} was calculated by the compiler assuming that gas behavior is ideal and that Henry's law is obeyed.

The $MgSO_4$ concentration after degassing was determined by titration of Mg^{2+} by a chelating agent.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Specially pure grade. Contained 0.1 percent of other gases.
2. Water. Doubly distilled.
3. Magnesium sulfate. Chemically pure reagent grade.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Lyashchenko, A.K. Dokl. Akad. Nauk. SSSR 1974, 217, 380.
3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Magnesium Nitrate; $Mg(NO_3)_2$; 10377-60-3

ORIGINAL MEASUREMENTS:

Lyashchenko, A.K.; Borina, A.F.

Zh. Strukt. Khim. 1973, 14, 978-981.
J. Struct. Chem. 1973, 14, 924-927.

VARIABLES: T/K: 293.15
Total P/kPa: 89.27 (669.6 mmHg) - 98.525 (739 mmHg)
$Mg(NO_3)_2$/ mol kg^{-1} H_2O: 0 - 1.477

PREPARED BY:

T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Magnesium Nitrate mol kg^{-1} H_2O	P/mmHg	Neon Solubility* S/cm^3 dm^{-3}	Setschenow** Parameter k_s = (1/m) log(S^o/S)
293.15	0.0	739	11.11 (S^o)	-
	0.186	739	10.46	0.1408
	0.186	705.8	9.99	(0.1408)
	0.186	683.5	9.69	(0.1363)
	0.186	669.6	9.50	(0.1363)
	0.325	739	9.77	0.1717
	0.325	727	9.62	(0.1704)
	0.325	692.5	9.35	(0.1433)
	0.325	679.5	9.18	(0.1433)
	0.726	739	8.07	0.1912
	1.477	739	5.85	0.1886

k_s = 0.1531 + 0.0294 m (from the four values at 739 mmHg).

At one molal $Mg(NO_3)_2$, k_s = 0.1825 and k_{sX} = 0.185.

k_s = 0.1386 + 0.0417 m (all values).

At one molal $Mg(NO_3)_2$, k_s = 0.1803 and k_{sX} = 0.183.

The neon solubility in water, S^o, is from references 1 and 2.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of $Mg(NO_3)_2$ in the solution after degassing was determined by titration of the Mg^{2+} ion with a chelating agent.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.
The Setschenow parameters k_s and k_{sX} were calculated by the compiler.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Magnesium nitrate. Chemically pure grade.

ESTIMATED ERROR:

$\delta S/S$ = 0.0035 - 0.005.

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59,2735.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Magnesium Nitrate; $Mg(NO_3)_2$; 10377-60-3	Lyashchenko, A.K. *Dokl. Akad. Nauk SSSR* 1974, *217* (2), 380-382; *Dokl. Phys. Chem. (Engl. trans.)* 1974, *217*, 645 - 647.
VARIABLES: T/K: 293.15 - 303.15 Total P/kPa: 98.525 (739 mmHg) $MgNO_3$/mol kg^{-1} H_2O: 0 - 1.50	PREPARED BY: T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Magnesium Nitrate mol kg^{-1} H_2O	Neon Solubility* S/cm^3 dm^{-3}	Setschenow Parameter $k_s = (1/m) \log (S^o/S)$
293.15	0	11.11 (S^o)	-
	0.60	8.52	0.192
	1.50	6.15	0.171

$$k_s = 0.206 - 0.023\ m$$

At one molal $Mg(NO_3)_2$, $k_s = 0.183$ and $k_{sX} = 0.185$.

T/K	Magnesium Nitrate mol kg^{-1} H_2O	Neon Solubility* S/cm^3 dm^{-3}	Setschenow Parameter $k_s = (1/m) \log (S^o/S)$
303.15	0	10.59 (S^o)	-
	0.70	8.28	0.1527
	1.45	6.36	0.1527

$$k_s = 0.1527$$

At one molal $Mg(NO_3)_2$, $k_s = 0.1527$ and $k_{sX} = 0.154$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.
The Setschenow parameters k_s and k_{sX} were calculated by the compiler.

The neon solubility in water, S^o, is from references 1 and 2.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The $Mg(NO_3)_2$ concentration in the solution after degassing and at the end of the solubility experiment was determined by comparison of the solution density with standard density tabulations.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Magnesium nitrate. Chemically pure grade.

ESTIMATED ERROR:

$\delta T/K = 0.02$
$\delta P/mmHg = 1.5$
$\delta S/cm^3\ dm^{-3} = 0.04$
$\delta m/m = 0.02$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. *Zh. Fiz. Khim.* 1971, *45*, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. *Zh. Fiz. Khim.* 1971, *45*, 2554.
3. Ben-Naim, A.; Baer, S. *Trans. Faraday Soc.* 1963, *59*, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Calcium Chloride; $CaCl_2$; 10043-52-4

ORIGINAL MEASUREMENTS:

Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S.

Zh. Fiz. Khim. 1973, 47, 1748-1751.
Russ. J.Phys.Chem. 1973, 47, 987-989.

VARIABLES:

T/K: 293.15
Total P/kPa: 98.525 (739 mmHg)
$CaCl_2$/mol kg^{-1} H_2O: 0 - 2.580

PREPARED BY:

T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Calcium Chloride mol kg^{-1} H_2O	Neon solubility* S/cm^3 dm^{-3}	$k_s = (1/m) \log (S^o/S)$
293.15	0.0	11.11 (S^o)	-
	0.349	9.40	0.2080
	0.751	7.76	0.2075
	1.004	7.02	0.1986
	1.484	5.38	0.2122
	2.580	3.33	0.2028

$$k_s = 0.2073 - 0.0012m$$

At one molal $CaCl_2$, $k_s = 0.2061$ and $k_{sX} = 0.218$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The neon solubility in water, S^o, is from reference 1.

The values of k_s and k_{sX} were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of $CaCl_2$ was determined after degassing by titration of the Ca^{2+} by a chelating agent.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Specially pure grade. Contained 0.1 per cent of other gases.
2. Water. Distilled.
3. Calcium Chloride. Chemically pure.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, B. Trans. Faraday Soc. 1963, 59,2735

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Calcium Bromide; $CaBr_2$;7789-41-5

ORIGINAL MEASUREMENTS:

Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S.

Zh. Fiz. Khim. 1973, 47, 1748-1751.
Russ. J.Phys. Chem. 1973, 47, 987-989.

VARIABLES:

T/K: 293.15
Total P/kPa: 98.525 (739 mmHg)
$CaBr_2$/mol kg^{-1} H_2O: 0 - 1.831

PREPARED BY:

T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Calcium Bromide mol kg^{-1} H_2O	Neon solubility* $S/cm^3\ dm^{-3}$	$k_s = (1/m) \log (S^o/S)$
293.15	0.0	11.11 (S^o)	-
	0.161	10.21	0.2278
	0.407	9.46	0.1716
	0.578	8.37	0.2128
	0.935	7.09	0.2086
	1.161	6.33	0.2104
	1.831	4.48	0.2154

k_s = 0.2208 - 0.0062m (value at 0.407m omitted)

At one molal $CaBr_2$, k_s = 0.2146 and k_{sX} = 0.219.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The neon solubility in water, S^o, is from reference 1.

The values of k_s and k_{sX} were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 $\pm$ 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of $CaBr_2$ was determined after degassing by titration of the Ca^{2+} by a chelating agent.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Specially pure grade. Contained 0.1 per cent of other gases.
2. Water. Distilled.
3. Calcium Bromide. Chemically pure.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, B. Trans. Faraday Soc. 1963, 59,2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Calcium Iodide; CaI_2; 10102-68-8

ORIGINAL MEASUREMENTS:

Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S.

Zh. Fiz. Khim. 1973, 47, 1748 - 1751.
Russ. J.Phys.Chem. 1973, 47,987 -989.

VARIABLES:

T/K: 293.15
Total P/kPa: 98.525 (739 mmHg)
CaI_2/mol kg^{-1} H_2O: 0 - 1.742

PREPARED BY:

T.D.Kittredge, H.L.Clever

EXPERIMENTAL VALUES:

T/K	Calcium Iodide mol kg^{-1} H_2O	Neon Solubility* $S/cm^3\ dm^{-3}$	$k_s = (1/m) \log (S^o/S)$
293.15	0	11.11 (S^o)	-
	0.162	10.29	0.2055
	0.566	8.19	0.2340
	1.187	6.16	0.2158
	1.742	4.45	0.2281

$$k_s = 0.2135 + 0.0080\ m$$

At one molal CaI_2, $k_s = 0.2215$ and $k_{sX} = 0.215$

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The neon solubility in water, S^o, is from reference 1.

The values of k_s and k_{sX} were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.
The Ca^{2+} concentration was determined after degassing by titration with a chelating agent.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Specially pure grade. Contained 0.1 per cent of other gases.
2. Water. Distilled.
3. Calcium iodide. Chemically pure.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59,2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Calcium Nitrate; $Ca(NO_3)_2$; 10124-37-5

ORIGINAL MEASUREMENTS:

Lyashchenko, A.K.; Borina, A.F.

Zh. Strukt. Khim. 1973, 14, 978-981.
J. Struct. Chem. 1973, 14, 924-927.

VARIABLES:

T/K: 293.15
Total P/kPa: 89.25 (669.4 mmHg) - 98.525 (739 mmHg)
$Ca(NO_3)_2$/mol kg^{-1} H_2O: 0 - 1.85

PREPARED BY:

T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Calcium Nitrate mol kg^{-1} H_2O	P/mmHg	Neon Solubility* $S/cm^3\ dm^{-3}$	Setschenow Parameter $k_s = (1/m)\log(S^o/S)$
293.15	0.0	739	11.11 (S^o)	-
	0.195	739	10.08	0.2167
	0.195	669.4	9.01	(0.2456)
	0.409	739	9.14	0.2073
	0.830	739	7.64	0.1959
	1.85	739	4.82	0.1960
	1.85	715.9	4.51	(0.2040)
	1.85	739	4.24	0.2261

k_s = 0.2082 + 0.0002 m (from the five values at 739 mmHg)

At one molal $Ca(NO_3)_2$, k_s = 0.2084 and k_{sX} = 0.209.

k_s = 0.2222 - 0.0088 m (all values)

At one molal $Ca(NO_3)_2$, k_s = 0.2133 and k_{sX} = 0.214.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.
The Setschenow parameters k_s and k_{sX} were calculated by the compiler.
The neon solubility in water, S^o, is from references 1 and 2.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of $Ca(NO_3)_2$ in the solution after degassing was determined by titration of the Ca^{2+} ion with a chelating agent.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Calcium nitrate. Chemically pure grade.

ESTIMATED ERROR:

$\delta S/S$ = 0.0035 - 0.005.

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. *Zh. Fiz. Khim.* 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. *Zh. Fiz. Khim.* 1971, 45, 2554.
3. Ben-Naim, A.; Baer, S. *Trans. Faraday Soc.* 1963, 59, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Strontium Chloride; $SrCl_2$; 10476-85-4

ORIGINAL MEASUREMENTS:

Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S.

Zh. Fiz. Khim. 1973, 47, 1748 - 1751.
Russ. J.Phys. Chem. 1973, 47, 987-989.

VARIABLES:

T/K: 293.15
Total P/kPa: 98.525 (739 mmHg)
$SrCl_2$/mol kg^{-1} H_2O: 0 - 2.474

PREPARED BY:

T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Strontium Chloride mol kg^{-1} H_2O	Neon solubility* S/cm^3 dm^{-3}	$k_s = (1/m) \log (S^o/S)$
293.15	0.0	11.11 (S^o)	-
	0.351	9.23	0.2294
	0.495	8.62	0.2226
	1.029	6.59	0.2204
	1.094	6.10	0.2380
	2.015	4.04	0.2180
	2.474	3.01	0.2292

$$k_s = 0.2265 - 0.0005M$$

At one molal $SrCl_2$, $k_s = 0.2260$ and $k_{sX} = 0.237$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The neon solubility in water, S^o, is from reference 1.

The values of k_s and k_{sX} were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 $\pm$ 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of $SrCl_2$ was determined after degassing by titration of the Cl^- with $Hg(NO_3)_2$.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Specially pure grade. Contained 0.1 per cent of other gases.
2. Water. Distilled.
3. Strontium Chloride. Chemically pure.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, B. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Strontium Bromide; $SrBr_2$; 10476-81-0

ORIGINAL MEASUREMENTS:

Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S.

Zh. Fiz. Khim. 1973, 47, 1748 - 1751.
Russ. J.Phys.Chem. 1973, 47, 987-989.

VARIABLES:

T/K: 293.15
Total P/kPa: 98.525 (739 mmHg)
$SrBr_2$/mol kg^{-1} H_2O: 0 - 1.345

PREPARED BY:

T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Strontium Bromide mol kg^{-1} H_2O	Neon solubility* S/cm^3 dm^{-3}	k_s = (1/m) log (S^o/S)
293.15	0.0	11.11 (S^o)	-
	0.340	9.39	0.2148
	0.438	8.75	0.2368
	0.635	9.41	(0.1136)
	1.345	5.58	0.2224

$$k_s = 0.2259 - 0.0018m$$

At one molal $SrBr_2$, k_s = 0.2241 and k_{sX} = 0.226.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.
The neon solubility in water, S^o, is from reference 1.

The values of k_s and k_{sX} were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of $SrBr_2$ was determined gravimetrically as $SrSO_4$, after degassing.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Specially pure grade. Contained 0.1 per cent of other gases.
2. Water. Distilled.
3. Strontium Bromide. Chemically pure.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, B. Trans. Faraday Soc. 1963, 59,2735.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Barium Chloride; $BaCl_2$; 10361-37-2	Borina, A.F.; Lyashchenko, A K.; Alekseeva, L.S. Zh. Fiz. Khim. 1973, 47, 1748-1751. Russ. J.Phys. Chem. 1973, 47, 987-989.
VARIABLES: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) $BaCl_2$/mol kg^{-1} H_2O: 0 - 1.214	PREPARED BY: T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Barium Chloride mol kg^{-1} H_2O	Neon solubility* S/cm^3 dm^{-3}	k_s = (1/m) log (S^o/S)
293.15	0.0	11.11 (S^o)	-
	0.319	9.34	0.2363
	0.599	7.94	0.2436
	0.866	6.85	0.2425
	1.214	5.61	0.2444

$$k_s = 0.2359 + 0.0077m$$

At one molal $BaCl_2$, k_s = 0.2436 and k_{sX} = 0.251.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The neon solubility in water, S^o, is from reference 1.

The values of k_s and k_{sX} were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of $BaCl_2$ was determined after degassing by titration of Cl^- by $Hg(NO_3)_2$.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Specially pure grade. Contained 0.1 per cent of other gases.
2. Water. Distilled.
3. Barium Chloride. Chemically pure.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, B. Trans. Faraday Soc. 1963,59,2735.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Barium Bromide; $BaBr_2$; 10553-31-8	Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S. *Zh. Fiz. Khim.* 1973, *47*, 1748-1751. *Russ. J. Phys. Chem.* 1973, *47*, 987-989.
VARIABLES: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) $BaBr_2$/mol kg^{-1} H_2O: 0 - 0.923	PREPARED BY: T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Barium Bromide mol kg^{-1} H_2O	Neon solubility* S/cm^3 dm^{-3}	$k_s = (1/m) \log (S^o/S)$
293.15	0.0	11.11 (S^o)	-
	0.189	10.09	0.2213
	0.450	8.43	0.2664
	0.923	6.29	0.2676

$$k_s = 0.2227 + 0.0558m$$

At one molal $BaBr_2$, k_s = 0.2785 and k_{sX} = 0.276.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The neon solubility in water, S^o, is from reference 1.

The values of k_s and k_{sX} were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 $\pm$ 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of $BaBr_2$ was determined gravimetrically as $BaSO_4$ after degassing.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Specially pure grade. Contained 0.1 per cent of other gases.
2. Water. Distilled.
3. Barium Chloride. Chemically pure.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. *Zh. Fiz. Khim.* 1971, *45*, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. *Zh. Fiz. Khim.* 1971, *45*, 2554.
3. Ben-Naim, A.; Baer, B. *Trans. Faraday Soc.* 1963, *59*, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Barium Iodide; BaI_2;13718-50-8

ORIGINAL MEASUREMENTS:

Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S.

Zh. Fiz. Khim. 1973, 47, 1748-1751.
Russ.J.Phys.Chem. 1973, 47, 987-989.

VARIABLES:

T/K: 293.15
Total P/kPa: 98.525 (739 mmHg)
BaI_2/mol kg^{-1} H_2O: 0 - 0.995

PREPARED BY:

T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Barium Iodide mol kg^{-1} H_2O	Neon solubility* S/cm^3 dm^{-3}	$k_s = (1/m) \log (S^o/S)$
293.15	0.0	11.11 (S^o)	-
	0.240	9.21	0.3394
	0.460	8.50	0.2528
	0.995	5.92	0.2748

$$k_s = 0.324 - 0.062m$$

At one molal BaI_2, $k_s = 0.2620$ and $k_{sX} = 0.247$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The neon solubility in water, S^o, is from reference 1.

The values of k_s and k_{sX} were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 $\pm$ 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of BaI_2 was determined gravimetrically as $BaSO_4$ after degassing.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Specially pure grade. Contained 0.1 per cent of other gases.
2. Water. Distilled.
3. Barium Iodide. Chemically pure.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, B. Trans. Faraday Soc. 1963, 59,2735

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Barium Nitrate; $Ba(NO_3)_2$; 10022-31-8

ORIGINAL MEASUREMENTS:

Lyashchenko, A.K.; Borina, A.F.

Zh. Strukt. Khim. 1973, *14*, 978-981.
J. Struct. Chem. 1973, *14*, 924-927.

VARIABLES: T/K: 293.15
Total P/kPa: 91.12 (683.9 mmHg) - 98.525 (739 mmHg)
$Ba(NO_3)_2$/mol kg^{-1} H_2O: 0 - 0.354

PREPARED BY:

T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Barium Nitrate mol kg^{-1} H_2O	P/mmHg	Neon Solubility* S/cm^3 dm^{-3}	Setschenow Parameter $k_s = (1/m)\log(S^o/S)$
293.15	0.0	739	11.11 (S^o)	-
	0.111	739	10.54	0.2061
	0.232	739	10.00	0.1970
	0.232	719	9.85	(0.1747)
	0.232	701.9	9.61	(0.1747)
	0.232	683.9	9.37	(0.1747)
	0.252	739	9.57	0.2572
	0.252	693.6	8.89	(0.2753)
	0.354	739	9.04	0.2530

$k_s = 0.1783 + 0.2105$ m (from the four values at 739 mmHg)

At one molal $Ba(NO_3)_3$, $k_s = 0.3889$ and $k_{sX} = 0.376$.

$k_s = 0.1527 + 0.2590$ m (all values)

At one molal $Ba(NO_3)_3$, $k_s = 0.4116$ and $k_{sX} = 0.399$.

The neon solubility in water, S^o, is from references 1 and 2.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of the $Ba(NO_3)_2$ in the solution after degassing was determined gravimetrically as $BaSO_4$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.

The Setschenow parameters k_s and k_{sX} were calculated by the compiler.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Barium nitrate. Chemically pure grade.

ESTIMATED ERROR:

$\delta S/S = 0.0035 - 0.005$.

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. *Zh. Fiz. Khim.* 1971, *45*, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. *Zh. Fiz. Khim.* 1971, *45*, 2554.
3. Ben-Naim, A.; Baer, S. *Trans. Faraday Soc.* 1963, *59*, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Lithium Chloride; LiCl; 7447-41-8

ORIGINAL MEASUREMENTS:

Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S.

Zh. Fiz. Khim. 1971, 45, 2554 - 2558.
Russ. J. Phys. Chem. 1971, 45, 1445-1447.

VARIABLES:

T/K 293.15
Total P/kPa: 98.525 (739 mmHg)
LiCl/mol kg^{-1} H_2O: 0 - 2.138

PREPARED BY:

T.D.Kittredge, H.L.Clever

EXPERIMENTAL VALUES:

T/K	Lithium Chloride mol kg^{-1} H_2O	Neon Solubility* S/cm^3 dm^{-3}	Neon Solubility S'/cm^3 kg^{-1} H_2O	Setschenow Parameter $k_{S'} = (1/m)\log(S'^{o}/S')$
293.15	0	11.11 (S^o)	11.13 (S'^o)	-
	0.483	10.20	10.30	0.0681
	0.864	9.36	9.53	0.0771
	1.162	8.95	9.16	0.0721
	1.288	8.77	9.00	0.0710
	2.138	7.56	7.88	0.0698

$$k_{S'} = 0.0725 - 0.0007\ m$$

At one molal LiCl, $k_{S'} = 0.0718$ and $k_{SX} = 0.0872$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.

The values of $k_{S'}$ and k_{SX} were calculated by the compiler. The values of $k_{S'}$ are based on the neon solubility ratio per kg H_2O.

The neon solubility in water, S^o, is from reference 1.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (2). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of $k_{S'}$ was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of LiCl in the solution was determined after the experiment by titration of the Cl^- with $Hg(NO_3)_2$.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Lithium chloride. Chemically pure grade.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Lithium Nitrate; $LiNO_3$; 7790-69-4

ORIGINAL MEASUREMENTS:

Lyashchenko, A. K.

Dokl. Akad. Nauk SSSR 1974, 217 (2), 380 - 382; Dokl. Phys. Chem. (Engl. trans.) 1974, 217, 645 - 647.

VARIABLES:

T/K: 293.15 - 303.15
Total P/kPa: 98.525 (739 mmHg)
$LiNO_3$/mol kg^{-1} H_2O: 0 - 2.40

PREPARED BY:

T. D. Kittredge, H. L. Clever

EXPERIMENTAL VALUES:

T/K	Lithium Nitrate mol kg^{-1} H_2O	Neon Solubility* S/cm^3 dm^{-3}	Setschenow Parameter $k_S = (1/m) \log (S^o/S)$
293.15	0	11.11 (S^o)	-
	0.84	9.44	0.0842
	1.21	8.53	0.0948
	2.40	6.56	0.0953

$k_S = 0.0833 + 0.0055\ m$

At one molal $LiNO_3$, $k_S = 0.0888$ and $k_{SX} = 0.0905$

T/K	Lithium Nitrate mol kg^{-1} H_2O	Neon Solubility* S/cm^3 dm^{-3}	Setschenow Parameter $k_S = (1/m) \log (S^o/S)$
303.15	0	10.59 (S^o)	-
	1.23	8.71	0.0690
	1.80	8.16	0.0629

$k_S = 0.0822 - 0.0107\ m$

At one molal $LiNO_3$, $k_S = 0.0715$ and $k_{SX} = 0.0718$

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The Setschenow parameters k_S and k_{SX} were calculated by the compiler.

The neon solubility in water, S^o, is from references 1 and 2.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k_{SX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of $LiNO_3$ in the solution was determined after the experiment by comparison of the solution density with tabulated density data.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Lithium nitrate. Chemically pure grade.

ESTIMATED ERROR:

$\delta T/K = 0.02$
$\delta P/mmHg = 1.5$
$\delta S/cm^3\ dm^{-3} = 0.04$
$\delta m/m = 0.02$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O.Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Sodium Chloride; NaCl; 7647-14-5	Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554-2558. Russ.J.Phys.Chem. 1971, 45, 1445-1447.
VARIABLES: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) NaCl/mol kg^{-1} H_2O: 0 - 2.188	**PREPARED BY:** T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Sodium Chloride mol kg^{-1} H_2O	Neon Solubility* S/cm^3 dm^{-3}	Neon Solubility S'/cm^3 kg^{-1} H_2O	Setschenow Parameter $k_{s'} = (1/m)\log(S'^{o}/S')$
293.15	0.0	11.11 (S^o)	11.13 (S'^o)	-
	0.248	10.44	10.50	0.0989
	0.658	9.31	9.44	0.1075
	1.065	8.55	8.72	0.0988
	1.701	7.00	7.25	0.1090
	2.188	6.38	6.66	0.1016

$$k_{s'} = 0.1040 + 0.0003\ m$$

At one molal NaCl, $k_{s'} = 0.1043$ and $k_{sX} = 0.119$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.

The values of $k_{s'}$ and k_{sX} were calculated by the compiler. The values of $k_{s'}$ are based on the neon solubility ratio per kg H_2O.

The neon solubility in water, S^o, is from reference 1.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (2). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of NaCl in the solution after the solubility experiment was determined by titration of the Cl^- with $Hg(NO_3)_2$.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Sodium chloride. Chemically pure grade.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Sodium Bromide; NaBr; 7647-15-6

ORIGINAL MEASUREMENTS:

Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S.

Zh. Fiz. Khim. 1971, 45, 2554-2558.
Russ.J.Phys.Chem. 1971, 45, 1445-1447.

VARIABLES:

T/K: 293.15
Total P/kPa: 98.525 (739 mmHg)
NaBr/mol kg^{-1} H_2O: 0 - 2.010

PREPARED BY:

T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Sodium Bromide mol kg^{-1} H_2O	Neon Solubility* $S/cm^3\ dm^{-3}$	Neon Solubility $S'/cm^3\ kg^{-1}\ H_2O$	Setschenow Parameter $k_{s'} = (1/m)\log(S'^{o}/S')$
293.15	0	11.11 (S^o)	11.13 (S'^o)	-
	0.630	9.43	9.59	0.1027
	0.894	8.89	9.11	0.0973
	1.253	8.13	8.41	0.0971
	2.010	6.60	6.95	0.1017

$$k_{s'} = 0.0985 + 0.0001\ m$$

At one molal NaBr, $k_{s'} = 0.0986$ and $k_{sX} = 0.114$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.

The values of $k_{s'}$ and k_{sX} were calculated by the compiler. The values of $k_{s'}$ are based on the neon solubility ratio per kg H_2O.

The neon solubility in water, S^o, is from reference 1.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (2). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of NaBr in the solution after the solubility experiment was determined gravimetrically as AgBr.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Sodium bromide. Chemically pure grade.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Sodium Iodide; NaI; 7681-82-5

ORIGINAL MEASUREMENTS:

Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S.

Zh. Fiz. Khim. 1971, 45, 2554-2558.
Russ.J.Phys.Chem. 1971, 45, 1445-1447.

VARIABLES:

T/K: 293.15
Total P/kPa: 98.525 (739 mmHg)
NaI/mol kg^{-1} H_2O: 0 - 2.023

PREPARED BY:

T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Sodium Iodide mol kg^{-1} H_2O	Neon Solubility* S/cm^3 dm^{-3}	Neon Solubility S'/cm^3 kg^{-1} H_2O	Setschenow Parameter $k_{s'} = (1/m)\log(S'^{o}/S')$
293.15	0.0	11.11 (S^o)	11.13 (S'^o)	-
	0.327	10.18	10.32	0.1004
	0.651	9.51	9.76	0.0876
	1.038	8.39	8.71	0.1026
	1.549	7.51	7.94	0.0947
	2.023	6.61	7.11	0.0962

$$k_{s'} = 0.0965 - 0.0003\ m$$

At one molal NaI, $k_{s'} = 0.0962$ and $k_{sX} = 0.112$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.

The values of $k_{s'}$ and k_{sX} were calculated by the compiler. The values of $k_{s'}$ are based on the neon solubility ratio per kg H_2O.

The neon solubility in water, S^o, is from reference 1.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (2). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of NaI in the solution after the solubility experiment was determined gravimetrically as AgI.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Sodium iodide. Chemically pure grade.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.

2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Sodium Nitrate; $NaNO_3$; 7631-99-4	Lyashchenko, A.K. Dokl. Akad. Nauk SSSR 1974, 217 (2), 380-382; Dokl. Phys. Chem. (Engl.trans. 1974, 217, 645 - 647.
VARIABLES: T/K: 293.15 - 303.15 Total P/kPa: 98.525 (739 mmHg) $NaNO_3$/mol kg^{-1} H_2O: 0 - 3.10	PREPARED BY: T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Sodium Nitrate mol $kg^{-1}H_2O$	Neon Solubility* $S/cm^3\ dm^{-3}$	Setschenow Parameter $k_s = (1/m)\ \log (S^o/S)$
293.15	0	11.11 (S^o)	-
	0.80	9.03	0.1125
	1.25	8.06	0.1115
	1.82	7.02	0.1095
	3.10	5.33	0.1029

$$k_s = 0.1166 - 0.0043\ m$$

At one molal $NaNO_3$, $k_s = 0.1123$ and $k_{sX} = 0.1136$.

T/K	Sodium Nitrate mol $kg^{-1}H_2O$	Neon Solubility* $S/cm^3\ dm^{-3}$	Setschenow Parameter k_s
298.15	0	10.90 (S^o)	-
	1.05	8.67	0.09467
	3.10	5.41	0.09814

$$k_s = 0.0929 + 0.0017\ m$$

At one molal $NaNO_3$, $k_s = 0.0946$ and $k_{sX} = 0.0952$.

T/K	Sodium Nitrate mol $kg^{-1}H_2O$	Neon Solubility* $S/cm^3\ dm^{-3}$	Setschenow Parameter k_s
303.15	0	10.59 (S^o)	-
	0.56	9.56	0.0793
	1.67	7.50	0.0897
	2.72	5.96	0.0918

$$k_s = 0.0773 + 0.0058\ m$$

At one molal $NaNO_3$, $k_s = 0.0831$ and $k_{sX} = 0.0827$.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The $NaNO_3$ concentration in the solution after degassing and at the end of the solubility experiment was determined by comparison of the solution density with standard density tabulations.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The Setschenow parameters k_s and k_{sX} were calculated by the compiler.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Sodium nitrate. Chemically pure grade.

ESTIMATED ERROR:

$\delta T/K = 0.02$
$\delta P/mmHg = 1.5$
$\delta S/cm^3\ dm^{-3} = 0.04$
$\delta m/m = 0.02$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Potassium hydroxide; KOH; 1310-58-3	Lyashchenko, A.K.; Borina, A.F. Zh. Strukt. Khim. 1971, 12, 964-968. J. Struct. Chem. 1971, 12, 889-891.
VARIABLES:	PREPARED BY:
T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) KOH/mol kg^{-1} H_2O: 0 - 2.905	T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Potassium hydroxide mol kg^{-1} H_2O	Neon Solubility* $S/cm^3\ dm^{-3}$	$k_s = (1/m)\log(S^o/S)$
293.15	0	11.11 (S^o)	-
	0.259	10.02	0.1732
	0.507	9.01	0.1795
	0.955	7.51	0.1781
	1.790	5.91	0.1531
	2.905	3.79	0.1608

$$k_s = 0.1791 - 0.0079\ m$$

At one molal KOH, $k_s = 0.1712$ and $k_{sX} = 0.183$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The neon solubility in water, S^o, is from references 1 and 2.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg The neon partial pressure is 721.5. The value of k_{sX} was calculated by the compiler assuming that gas behavior is ideal and that Henry's law is obeyed.

The KOH concentration after degassing was determined by titration with HCl.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Specially pure grade. Contained 0.1 percent of other gases.
2. Water. Doubly distilled.
3. Potassium hydroxide. Chemically pure reagent grade.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Lyashchenko, A.K. Dokl. Akad. Nauk. SSSR 1974, 217, 380.
3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Potassium Chloride; KCl; 7447-40-7

ORIGINAL MEASUREMENTS:

Borina, A.F.; Lyashchenko, A.K.

Zh. Fiz. Khim. 1972, 46, 249-250.
Russ.J.Phys.Chem. 1972, 46, 150-151.

VARIABLES:

T/K: 293.15
Total P/kPa: 98.525 (739 mmHg)
KCl/mol kg^{-1} H_2O: 0 - 1.892

PREPARED BY:

T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Potassium Chloride mol kg^{-1} H_2O	Neon Solubility* S/cm^3 dm^{-3}	Setschenow Parameter $k_s = (1/m) \log (S^o/S)$
293.15	0.0	11.11 (S^o)	-
	0.121	10.68	0.1417
	0.225	10.44	0.1201
	0.223	10.40	0.1286
	0.431	9.94	0.1121
	0.437	9.87	0.1176
	0.915	8.82	0.1096
	0.915	8.78	0.1117
	1.890	7.08	0.1035
	1.892	7.03	0.1050

$$k_s = 0.1276 - 0.0140\ m$$

At one molal KCl, $k_s = 0.1136$ and $k_{sX} = 0.116$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.

The values of k_s and k_{sX} were calculated by the compiler.

The neon solubility in water, S^o, is from references 1 and 2.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of KCl in the solutions after degassing was determined by titrating the Cl^- ion with $Hg(NO_3)_2$.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Potassium chloride. Chemically pure grade.

ESTIMATED ERROR:

$$\delta S/cm^3\ dm^{-3} = 0.04$$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554.
3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Potassium Bromide; KBr; 7758-02-3

ORIGINAL MEASUREMENTS:

Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S.

Zh. Fiz. Khim. 1971, 45, 2554-2558.
Russ.J.Phys.Chem. 1971, 45, 1445-1447.

VARIABLES:

T/K: 293.15
Total P/kPa: 98.525 (739 mmHg)
KBr/mol kg^{-1} H_2O: 0 - 1.971

PREPARED BY:

T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Potassium Bromide mol kg^{-1} H_2O	Neon Solubility* $S/cm^3\ dm^{-3}$	Neon Solubility $S'/cm^3\ kg^{-1}\ H_2O$	Setschenow Parameter $k_{s'} = (1/m)\log(S'^o/S')$
293.15	0.0	11.11(S^o)	11.13 (S'^o)	-
	0.222	10.59	10.69	0.0789
	0.668	9.43	9.67	0.0914
	0.887	8.89	9.18	0.0943
	1.697	7.47	7.93	0.0868
	1.971	6.93	7.43	0.0890

$$k_{s'} = 0.0853 + 0.0025\ m$$

At one molal KBr, $k_{s'} = 0.0878$ and $k_{sX} = 0.103$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.

The values of $k_{s'}$ and k_{sX} were calculated by the compiler. The values of $k_{s'}$ are based on the neon solubility ratio per kg H_2O.

The neon solubility in water, S^o, is from reference 1.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (2). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of KBr in the solution after the solubility experiment was determined gravimetrically as AgBr.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Potassium bromide. Chemically pure grade.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Potassium Iodide; KI; 7681-11-0	Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554-2558. Russ.J.Phys.Chem. 1971, 45, 1445-1447.
VARIABLES: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) KI/mol kg^{-1} H_2O: 0 - 2.682	PREPARED BY: T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Potassium Iodide mol kg^{-1} H_2O	Neon Solubility* S/cm^3 dm^{-3}	Neon Solubility S'/cm^3 kg^{-1} H_2O	Setschenow Parameter $k_{s'}$ = (1/m) log(S'^{o}/S')
293.15	0.0	11.11 (S^o)	11.13 (S'^o)	-
	0.398	9.93	10.13	0.1027
	0.763	9.21	9.56	0.0865
	1.081	8.52	8.96	0.0871
	1.534	7.70	8.27	0.0841
	2.682	5.88	6.64	0.0836

$$k_{s'} = 0.0968 - 0.0062\ m$$

At one molal KI, $k_{s'}$ = 0.906 and k_{sX} = 0.106.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.

The values of $k_{s'}$ and k_{sX} were calculated by the compiler. The values of $k_{s'}$ are based on the neon solubility ratio per kg H_2O.

The neon solubility in water, S^o, is from reference 1.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (2). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of KI in the solution after the solubility experiment was determined gravimetrically as AgI.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Potassium iodide. Chemically pure grade.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Cesium Chloride; CsCl; 7647-17-8	Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554-2558. Russ.J.Phys.Chem. 1971, 45, 1445-1447.
VARIABLES: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) CsCl/mol kg^{-1} H_2O: 0 - 2.612	PREPARED BY: T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Cesium Chloride mol kg^{-1} H_2O	Neon Solubility* S/cm^3 dm^{-3}	Neon Solubility S'/cm^3 kg^{-1} H_2O	Setschenow Parameter $k_{s'} = (1/m)\log(S'^o/S')$
293.15	0.0	11.11 (S^o)	11.13 (S'^o)	-
	0.428	10.13	10.32	0.0767
	0.559	9.81	10.04	0.0801
	0.669	9.50	9.77	0.0846
	1.066	8.88	9.28	0.0741
	1.269	8.33	8.77	0.0781
	2.612	6.26	6.96	

$$k_{s'} = 0.0791 - 0.0011\ m$$

At one molal CsCl, $k_{s'} = 0.0780$ and $k_{sX} = 0.0934$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3.

The values of $k_{s'}$ and k_{sX} were calculated by the compiler. The values of $k_{s'}$ are based on the neon solubility ratio per kg H_2O.

The neon solubility in water, S^o, is from reference 1.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (2). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The concentration of CsCl in the solution after the solubility experiment was determined by titration of the Cl^- by $Hg(NO_3)_2$.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Cesium chloride. Chemically pure grade.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Cesium Nitrate; $CsNO_3$; 7789-18-6	Lyashchenko, A.K. *Dokl. Akad. Nauk SSSR* 1974, *217* (2), 380-382; *Dokl. Phys. Chem.* (*Engl. trans.*) 1974, 217, 645 - 647.
VARIABLES:	PREPARED BY:
T/K: 293.15 - 303.15 Total P/kPa: 98.525 (739 mmHg) $CsNO_3$/mol kg^{-1} H_2O: 0 - 1.15	T.D. Kittredge, H.L. Clever

EXPERIMENTAL VALUES:

T/K	Cesium Nitrate mol kg^{-1} H_2O	Neon Solubility* $S/cm^3\ dm^{-3}$	Setschenow Parameter $k_s = (1/m) \log (S^o/S)$
293.15	0	11.11 (S^o)	-
	0.48	9.89	0.1052
	1.15	8.34	0.1083

$$k_s = 0.1030 + 0.0046\ m$$

At one molal $CsNO_3$, $k_s = 0.1076$ and $k_{sX} = 0.0961$.

T/K	Cesium Nitrate mol kg^{-1} H_2O	Neon Solubility* $S/cm^3\ dm^{-3}$	Setschenow Parameter $k_s = (1/m) \log (S^o/S)$
303.15	0	10.59 (S^o)	-
	0.48	9.76	0.0738
	1.10	8.65	0.0799

$$k_s = 0.0691 + 0.0098\ m$$

At one molal $CsNO_3$, $k_s = 0.0789$ and $k_{sX} = 0.0660$.

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The Setschenow parameters k_s and k_{sX} were calculated by the compiler.

The neon solubility in water, S^o, is from references 1 and 2.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k_{sX} was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed.

The $CsNO_3$ concentration in the solution after degassing and at the end of the solubility experiment was determined by comparison of the solution density with standard density tabulations.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Doubly distilled.
3. Cesium nitrate. Chemically pure grade.

ESTIMATED ERROR:

$\delta T/K = 0.02$
$\delta P/mmHg = 1.5$
$\delta S/cm^3\ dm^{-3} = 0.04$
$\delta m/m = 0.02$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. *Zh. Fiz. Khim.* 1971, *45*, 1316.
2. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. *Zh. Fiz. Khim.* 1971, *45*, 2554.
3. Ben-Naim, A.; Baer, S. *Trans. Faraday Soc.* 1963, *59*, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Alkali Halides

ORIGINAL MEASUREMENTS:

Morrison, T.J.; Johnstone, N.B.B.

J. Chem. Soc. 1955, 3655 - 3659.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

T.D.Kittredge

EXPERIMENTAL VALUES:

T/K	$k_s = (1/m) \log (S^o/S)$	$k_{sX} = (1/m) \log (X^o/X)$
Lithium Chloride; LiCl; 7447-41-8		
298.15	0.059	0.074
Sodium Chloride; NaCl; 7647-14-5		
298.15	0.097	0.112
Potassium Iodide; KI; 7681-11-0		
298.15	0.080	0.095

The values of the Setschenow salt effect parameter, k_s, were apparently determined from only two solubility measurements. They were the solubility of neon in pure water, S^o, and the solubility of neon in a near one equivalent of salt per kg of water solution,S. No solubility values are given in the paper. The S^o/S ratio was referenced to a solution containing one kg of water. The compiler calculated the the salt effect parameter k_{sX} from the mole fraction solubility ratio X^o/X. The electrolytes were assumed to be 100 per cent dissociated and both cation and anion were used in the mole fraction calculation.

AUXILIARY INFORMATION

METHOD:

Gas absorption in a flow system.

APPARATUS/PROCEDURE:

The previously degassed solvent flows in a thin film down an absorption spiral containing neon gas plus solvent vapor at a total pressure of one atm. The volume of gas absorbed is measured in attached calibrated burets (1).

SOURCE AND PURITY OF MATERIALS:

1. Neon. British Oxygen Co. Ltd.
2. Water. No information given.
3. Electrolyte. No information given.

ESTIMATED ERROR:

$\delta k_s = 0.010$

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1952, 3819.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Alkali Halides

ORIGINAL MEASUREMENTS:

Lvashchenko, A.K.; Borina, A.F.

Zh. Strukt. Khim. 1971, 12, 964 - 968.
J. Struct. Chem. 1971, 12, 889 - 891.

VARIABLES:

T/K: 293.15
Total P/kPa: 98.525 (739 mmHg)

PREPARED BY:

T.D.Kittredge, H.L.Clever

EXPERIMENTAL VALUES:

T/K	Alkali Halide mol kg^{-1} H_2O	Neon Solubility* $S/cm^3\ dm^{-3}$	$k_S = (1/m) \log (S^o/S)$
	Potassium Fluoride; KF; 7789-23-3		
293.15	0	11.11	-
	0.57	9.36	0.1306
	1.39	7.66	0.1162
	1.57	7.33	0.1050
	1.72	7.00	0.1166
	3.07	5.10	0.1101

$$k_S = 0.1276 - 0.0071\ m$$

At one molal KF, $k_S = 0.121$ and $k_{SX} = 0.132$.

T/K	Alkali Halide mol kg^{-1} H_2O	Neon Solubility* $S/cm^3\ dm^{-3}$	$k_S = (1/m) \log (S^o/S)$
	Rubidium Chloride; RbCl; 7791-11-9		
293.15	0	11.11	-
	0.172	10.62	0.1139
	0.474	9.82	0.1131
	0.577	9.69	0.1029
	1.018	8.61	0.1088
	1.14	8.51	0.1017

$$k_S = 0.1146 - 0.0097\ m$$

At one molal RbCl, $k_S = 0.105$ and $k_{SX} = 0.103$

*The neon solubility, S, is the same as the Ostwald coefficient x 10^3. The neon solubility in water, S^o, is from references 1 and 2.

AUXILIARY INFORMATION

METHOD:

The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5. The value of k_{SX} was calculated by the compiler assuming that gas behavior is ideal and that Henry's law is obeyed.

The KF concentration was determined after degassing by titration of the F^- with $Al(NO_3)_3$. The RbCl concentration was determined after degassing by titration with $Hg(NO_3)_2$.

The Setschenow parameters k_S and k_{SX} were calculated by the compiler.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Especially pure grade. Contained 0.1 percent of other gases.
2. Alkali halides. Chemical pure reagent grade.

ESTIMATED ERROR:

$\delta S/S = 0.005$

REFERENCES:

1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
2. Lyashchenko, A.K. Dokl. Akad. Nauk. SSSR 1974, 217, 380.
3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. Water; H_2O; 7732-18-5

3. Alkali Halides

ORIGINAL MEASUREMENTS:

Borina, A.F.; Samoilov, O. Ya.

Zh. Strukt. Khim. 1974, 15, 395 - 402.
J. Struct. Chem. 1974, 15, 336 - 342.

VARIABLES:
T/K: 288.15 - 298.15
Total P/kPa: 98.659 (740 mmHg)
Salt/mol kg^{-1} H_2O: 0 - 4.377

PREPARED BY:
H. L. Clever
T. D. Kittredge

EXPERIMENTAL VALUES:

T/K	Alkali Halide mol kg^{-1} H_2O	Mol Fraction $X_1 \times 10^9$ at 1 mmHg	Mol Fraction $X_1 \times 10^4$ at 1 atm	Setschenow Salt Parameter $k_s = (1/m)\log(X^o/X)$
Lithium Chloride; LiCl; 7447-41-8				
288.15	0	11.39	0.0866	-
	0.426	10.24	0.0778	0.1085
	0.800	9.74	0.0740	0.0850
	1.155	9.07	0.0689	0.0856
	1.489	8.55	0.0650	0.0837
	1.589	8.34	0.0634	0.0852
	3.088	6.29	0.0478	0.0835
293.15	0	10.98	0.08345	-
	0.483	10.08	0.0766	0.0769
	0.864	9.25	0.0703	0.0862
	1.162	8.86	0.0673	0.0802
	1.288	8.67	0.0659	0.0796
	2.138	7.49	0.0569	0.0777
	2.987	6.54	0.0497	0.0753
298.15	0	10.58	0.0804	-
	0.330	10.06	0.0765	0.0663
	0.935	8.97	0.0682	0.0767
	1.270	8.52	0.0648	0.0741
	1.590	7.94	0.0603	0.0784
	3.277	6.05	0.0460	0.0741

Table continued on next page.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete with the gas and solvent in contact at ccnstant pressure.The total pressure of neon + water vapor was always 740 mmHg during the measurement

The authors assume ideal gas behavior and that Henry's law is obeyed to convert the experimentally measured Ostwald coefficient to the inverse of Henry's constant.

See the last page of the compilation of data from this paper for the compilers'values of k_s and k_{sx} at one molal electrolyte concentration.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Specially pure grade. Contained 0.1 per cent of other gases.

2. Water. Distilled.

3. Salts. No information given.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.0035$

REFERENCES:

1. Lyashchenko, A.K.; Borina, A.F. Zh. Strukt. Khim. 1971, 12, 964.
2. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59,2735.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Alkali Halides	Borina, A.F.; Samoilov, O. Ya. *Zh. Strukt. Khim.* 1974, *15*, 395 - 402. Continued from previous page.

T/K	Alkali Halide mol kg^{-1} H_2O	Mol Fraction $X_1 \times 10^9$ at 1 mmHg	Mol Fraction $X_1 \times 10^4$ at 1 atm	Setschenow Salt Parameter $k_S = (1/m)\log(X^o/X)$
Lithium Iodide; LiI; 10377-51-2				
288.15	0	11.39	0.0866	-
	0.533	10.20	0.0775	0.0899
	0.654	9.82	0.0746	0.0985
	0.955	9.18	0.0698	0.0981
	1.233	8.80	0.0669	0.0909
	2.358	7.11	0.0540	0.0868
293.15	0	10.98	0.08345	-
	1.083	8.78	0.0667	0.0897
	1.346	8.19	0.0622	0.0946
	1.701	7.77	0.0591	0.0883
	2.350	7.23	0.0550	0.0772
298.15	0	10.58	0.0804	-
	0.433	9.72	0.0739	0.0850
	0.433	9.67	0.0735	0.0902
	0.695	9.31	0.0708	0.0799
	1.020	8.84	0.0672	0.0765
	2.330	7.20	0.0547	0.0717
Sodium Chloride; NaCl; 7647-14-5				
288.15	0	11.39	0.0866	-
	0.349	10.28	0.0781	0.1276
	0.715	9.33	0.0709	0.1211
	1.952	6.67	0.0507	0.1190
	2.341	6.02	0.0458	0.1183
	4.377	3.75	0.0285	0.1102
293.15	0	10.98	0.08345	-
	0.248	10.31	0.0784	0.1103
	0.658	9.20	0.0699	0.1167
	1.065	8.47	0.0644	0.1058
	1.701	6.93	0.0527	0.1175
	2.188	6.32	0.0480	0.1096
298.15	0	10.58	0.0804	-
	0.530	9.37	0.0712	0.0995
	0.590	9.19	0.0698	0.1036
	1.075	8.20	0.0623	0.1030
	1.465	7.28	0.0553	0.1108
	2.070	6.40	0.0486	0.1055
	3.070	5.27	0.0401	0.0986
303.15	0	10.54	0.0801	-
	1.184	7.68	0.0584	0.1161
	1.616	7.14	0.0543	0.1047
	2.519	5.79	0.0440	0.1032
	2.824	5.29	0.0402	0.1060
Sodium Iodide; NaI; 7681-82-5				
288.15	0	11.39	0.0866	-
	0.578	9.51	0.0723	0.1355
	0.666	9.36	0.0711	0.1280
	1.117	8.29	0.0630	0.1235
	2.430	5.98	0.0455	0.1152
	2.879	5.24	0.0398	0.1171
293.15	0	10.98	0.08345	-
	0.327	10.12	0.0769	0.1083
	0.651	9.52	0.0724	0.0952
	1.038	8.44	0.0641	0.1101
	1.550	7.62	0.0579	0.1024
	2.023	6.78	0.0515	0.1035

Table continued on next page.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9	Borina, A.F.; Samoilov, O. Ya.
2. Water; H_2O; 7732-18-5	Zh. Strukt. Khim. 1974, 15, 395 - 402.
3. Alkali Halides	Continued from previous page.

T/K	Alkali Halide mol kg^{-1} H_2O	Mol Fraction $X_1 \times 10^9$ at 1 mmHg	Mol Fraction $X_1 \times 10^4$ at 1 atm	Setschenow Salt Parameter $k_s = (1/m)\log(X^o/X)$
Sodium Iodide; NaI; 7681-82-5 (continued)				
298.15	0	10.58	0.0804	-
	0.540	9.34	0.0710	0.1003
	0.890	8.61	0.0654	0.1005
	1.255	7.88	0.0599	0.1020
	1.500	7.53	0.0572	0.0985
	3.200	5.14	0.0391	0.0980
Potassium Chloride; KCl; 7447-40-7				
288.15	0	11.39	0.0866	-
	0.535	9.97	0.0758	0.1091
	1.010	8.73	0.0664	0.1144
	1.556	7.89	0.0600	0.1025
	2.300	6.47	0.0492	0.1068
	2.934	5.71	0.0434	0.1022
	3.369	5.44	0.0413	0.0953
290.65	0	11.19	0.0850	-
	1.234	8.22	0.0625	0.1085
	2.227	6.71	0.0510	0.0997
	3.031	5.72	0.0435	0.0962
293.15	0	10.98	0.08345	-
	0.122	10.57	0.0803	0.1355
	0.225	10.33	0.0785	0.1178
	0.439	9.79	0.0744	0.1135
	0.915	8.80	0.0669	0.1050
	1.892	7.09	0.0539	0.1004
	3.485	5.25	0.0399	0.0919
295.65	0	10.78	0.0819	-
	1.255	8.06	0.0613	0.1006
	1.971	6.96	0.0529	0.0964
	2.430	6.26	0.0476	0.0971
298.15	0	10.58	0.0804	-
	0.500	9.57	0.0727	0.0871
	0.965	8.71	0.0662	0.0875
	1.455	7.82	0.0594	0.0902
	1.865	7.17	0.0545	0.0906
	3.182	5.58	0.0424	0.0873
	4.051	4.77	0.0363	0.0854
Potassium Iodide; KI; 7681-11-0				
288.15	0	11.39	0.0866	-
	0.573	9.66	0.0734	0.1249
	0.981	8.77	0.0667	0.1157
	1.870	7.27	0.0553	0.1043
	2.828	5.67	0.0431	0.1071
290.65	0	11.19	0.0850	-
	1.630	7.62	0.0579	0.1024
	2.350	6.52	0.0496	0.0998
	3.200	5.58	0.0424	0.0944
293.15	0	10.98	0.08345	-
	0.398	9.93	0.0755	0.1097
	0.763	9.30	0.0707	0.0945
	1.534	7.93	0.0603	0.0921
	2.682	6.25	0.0475	0.0912

Table continued on next page.

COMPONENTS:	
1. Neon; Ne; 7440-01-9	Borina, A.F.; Samoilov, O.Ya.
2. Water; H_2O; 7732-18-5	Zh. Strukt. Khim. 1974, 15, 395 - 402.
3. Alkali Halides	Continued from previous page.

T/K	Alkali Halide mol kg^{-1} H_2O	Mol Fraction $X_1 \times 10^9$ at 1 mmHg	Mol Fraction $X_1 \times 10^4$ at 1 atm	Setschenow Salt Parameter $k_s = (1/m)\log(X^o/X)$
Potassium Iodide; KI; 7681-11-0 (continued)				
295.65	0	10.78	0.0819	-
	1.252	8.02	0.0610	0.1026
	1.777	7.37	0.0560	0.0929
	2.887	5.99	0.0455	0.0884
298.15	0	10.58	0.0804	-
	0.555	9.43	0.0717	0.0900
	0.845	8.74	0.0664	0.0982
	1.525	7.53	0.0572	0.0968
	1.900	7.02	0.0534	0.0938
	3.270	5.55	0.0422	0.0857

The mole fraction solubility of neon at 101.325 kPa (1 atm) and the Setschenow salt effect parameters were calculated by the compiler.

The values of the solubility of neon in water at 290.65 and 295.65 K were interpolated from the authors solubility values at the other temperature values by the compiler.

Solution Ne + H_2O + salt	T/K	Equation Parameters $k_s = a + b\,m$	Setschenow Parameters at one molal electrolyte $k_s = (1/m)\log(S^o/S)$	$k_{sx} = (1/m)\log(X^o/X)$
NaCl	288.15	0.1265 - 0.00375 m	0.123	0.131
	293.15	0.1118 + 0.0001 m	0.112	0.120
	298.15	0.1076 - 0.0020 m	0.106	0.113
	303.15	0.1036 + 0.00045 m	0.104	0.112
NaI	288.15	0.1303 - 0.0053 m	0.1250	0.133
		(omitted value at 0.578 m)		
	293.15	0.1045 - 0.0005 m	0.1040	0.112
	298.15	0.1014 - 0.0011 m	0.1003	0.108
LiCl	288.15	0.0858 - 0.00075 m	0.0851	0.0928
	293.15	0.0826 - 0.0022 m	0.0804	0.0881
	298.15	0.0774 - 0.0009 m	0.0765	0.0842
		(omitted k_s value at 0.330 m)		
LiI	288.15	0.0979 - 0.00445 m	0.0934	0.101
	293.15	0.1021 - 0.0099 m	0.0922	0.100
		(omitted k_s value at 1.346 m)		
	298.15	0.0884 - 0.0078 m	0.0806	0.088
KCl	288.15	0.1144 - 0.0048 m	0.1096	0.117
	290.65	0.1164 - 0.0069 m	0.1095	0.117
	293.15	0.1160 - 0.0074 m	0.1086	0.116
		(omitted k_s value at 0.122 m)		
	295.65	0.1041 - 0.0032 m	0.1009	0.109
	298.15	0.0893 - 0.0006 m	0.0887	0.0964
KI	288.15	0.1252 - 0.0078 m	0.1174	0.125
	290.65	0.1112 - 0.0051 m	0.1061	0.114
	293.15	0.1053 - 0.0063 m	0.0991	0.107
	295.65	0.1001 - 0.00405 m	0.0960	0.104
		(omitted k_s value at 1.252 m)		
	298.15	0.0975 - 0.0029 m	0.0946	0.102

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Methanol (Methyl Alcohol); CH_4O; 67-56-1

ORIGINAL MEASUREMENTS:

Krestov, G.A.; Patsatsiya, K.M.

Zh. Fiz. Khim. 1971, 45, 1768 - 1770.
Russ. J. Phys. Chem. (Engl. Transl.) 1971, 45, 1000 - 1001.

VARIABLES:

T/K: 283.15 - 313.15
Total P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction Methanol x_3	Bunsen Coefficient at 1 atm Total Pressure $\alpha \times 10^2$	Bunsen Coefficient at 1 atm Ne Pressure $\alpha \times 10^2$
283.15	0.00	1.092	1.105
	0.05	1.162	1.190
	0.10	1.118	1.138
	0.20	1.074	1.100
	0.40	1.360	1.409
	0.60	2.000	2.086
	0.80	2.778	2.920
293.15	0.00	1.045	1.085
	0.05	1.100	1.132
	0.10	1.084	1.124
	0.20	1.075	1.127
	0.40	1.377	1.470
	0.60	2.035	2.205
	0.80	2.812	3.085
303.15	0.00	1.002	1.044
	0.05	1.050	1.110
	0.10	1.048	1.125
	0.20	1.075	1.170
	0.40	1.406	1.582
	0.60	2.074	2.395
	0.80	2.850	3.410

Continued on next page.

AUXILIARY INFORMATION

METHOD:

The apparatus (1) is a modification of the apparatus of Ben-Naim and Baer (2). Modifications include the use of a larger water thermostat, the addition of an attached degassing device, and a bubbler to presaturate the gas with solvent vapor.

The authors label their solubility values as Ostwald coefficients, γ^0. However, comparison of their results with the results of other authors for water, and the careful reading of other papers from the Ivanovo Laboratory convince the Evaluator that the solubility values are Bunsen coefficients measured at a total pressure of gas + solvent vapor pressure of one atm.

The authors do not quote a reference for the vapor pressure of the water + methanol mixtures. Thus we could not check the conversion of the Bunsen coefficent from a total pressure of one atm to one atm Ne.

SOURCE AND PURITY OF MATERIALS:

No information given.

ESTIMATED ERROR:

$\delta\alpha/\alpha = 0.01$ (Compiler)

REFERENCES:

1. Patsatsiya, K.M.; Krestov, G.A. Zh. Fiz. Khim. 1970, 44, 1835.
2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Methanol (Methyl Alcohol); CH_4O; 67-56-1

ORIGINAL MEASUREMENTS:

Krestov, G.A.; Patsatsiya, K.M.

Zh. Fiz. Khim. 1971, *45*, 1768-1770.
Russ. J. Phys. Chem. (*Engl. Transl.*) 1971, *45*, 1000-1001.

VARIABLES:

T/K: 283.15 - 313.15
Total P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction Methanol x_3	Bunsen Coefficient at 1 atm Total Pressure $\alpha \times 10^2$	Bunsen Coefficient at 1 atm Ne Pressure $\alpha \times 10^2$
313.15	0.00	0.942	1.011
	0.05	0.995	1.088
	0.10	1.017	1.177
	0.20	1.077	1.244
	0.40	1.438	1.737
	0.60	2.122	2.650
	0.80	2.895	3.743

AUXILIARY INFORMATION

METHOD:

See preceding page.

APPARATUS/PROCEDURE:

See preceding page.

SOURCE AND PURITY OF MATERIALS:

See preceding page.

ESTIMATED ERROR:

See preceding page.

REFERENCES:

See preceding page.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Water; H_2O; 7732-18-5 3. Ethanol (Ethyl Alcohol); C_2H_6O; 64-17-5	Krestov, G.A.; Patsatsiya, K.M. Izv. Vyssh. Uchebn. Zaved., Khim. Khim Tekhnol. 1969, 12, 1333-1337.
VARIABLES:	PREPARED BY:
T/K: 283.15 - 313.15 Total P/kPa: 101.325 (1 atm)	P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction Ethanol x_3	Bunsen Coefficient at 1 atm Total Pressure $\alpha \times 10^2$	T/K	Mol Fraction Ethanol x_3	Bunsen Coefficient at 1 atm Total Pressure $\alpha \times 10^2$
283.15	0.00	1.092	293.15	0.00	1.045
	0.02	1.140		0.02	1.091
	0.04	1.138		0.04	1.092
	0.06	1.113		0.06	1.062
	0.08	1.072		0.08	1.029
	0.10	1.043		0.10	1.008
	0.15	1.021		0.15	1.027
	0.20	1.076		0.20	1.074
	0.25	1.195		0.25	1.216
	0.30	1.334		0.30	1.362
	0.35	1.476		0.35	1.507
	0.40	1.630		0.40	1.662
	0.45	1.791		0.45	1.826
	0.50	1.950		0.50	1.994
	0.60	2.282		0.60	2.335
	0.70	2.624		0.70	2.675
	0.80	2.984		0.80	3.035
	0.90	3.355		0.90	3.402
	1.00	3.726		1.00	3.772

AUXILIARY INFORMATION

METHOD:

The apparatus (1) is a modification of the apparatus of Ben-Naim and Baer (2). The modifications include the use of a larger water thermostat, the addition of a degassing device, and a bubbler to presaturate the gas with solvent vapor.

The authors label their solubility values as Ostwald coefficients, γ^0. However, comparison of their results with the results of other workers for water and ethanol, and the careful reading of other papers from the Ivanovo Laboratory convince the Evaluator that the solubility values are Bunsen coefficients measured at a total pressure of gas + solvent vapor pressure of one atm. A knowledge of the solvent vapor pressure is required to convert the above solubility values to Bunsen coefficents at one atm Ne pressure.

SOURCE AND PURITY OF MATERIALS:

No information given.

ESTIMATED ERROR:

$\delta\alpha/\alpha = 0.01$ (Compiler)

REFERENCES:

1. Patsatsiya, K.M.; Krestov, G.A. "Report on the Second All-Union Conference on Theory of Solution," Alma-Ata, 1968.
2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Ethanol (Ethyl Alcohol); C_2H_6O; 64-17-5

ORIGINAL MEASUREMENTS:

Krestov, G.A.; Patsatsiya, K.M.

Izv. Vyssh. Uchebn. Zaved., Khim. Khim Tekhnol. 1969, *12*, 1333-1337.

VARIABLES:

T/K: 283.15 - 313.15
Total P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction Ethanol x_3	Bunsen Coefficient at 1 atm Total Pressure $\alpha \times 10^2$	T/K	Mol Fraction Ethanol x_3	Bunsen Coefficient at 1 atm Total Pressure $\alpha \times 10^2$
303.15	0.00	1.002	313.15	0.00	0.942
	0.02	1.024		0.02	0.950
	0.04	1.023		0.04	0.946
	0.06	1.005		0.06	0.935
	0.08	0.975		0.08	0.924
	0.10	C.966		0.10	0.923
	0.15	0.983		0.15	0.968
	0.20	1.072		0.20	1.070
	0.25	1.234		0.25	1.252
	0.30	1.387		0.30	1.440
	0.35	1.556		0.35	1.593
	0.40	1.716		0.40	1.762
	0.45	1.860		0.45	1.933
	0.50	2.047		0.50	2.109
	0.60	2.397		0.60	2.466
	0.70	2.746		0.70	2.823
	0.80	3.102		0.80	3.161
	0.90	3.471		0.90	3.544
	1.00	3.826		1.00	3.906

AUXILIARY INFORMATION

METHOD:

See preceding page.

SOURCE AND PURITY OF MATERIALS:

See preceding page.

APPARATUS/PROCEDURE:

See preceding page.

ESTIMATED ERROR:

See preceding page.

REFERENCES:

See preceding page.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Water; H_2O; 7732-18-5
3. Urea; CH_4N_2O ($(NH_2)_2CO$); 57-13-6

ORIGINAL MEASUREMENTS:

Borina, A.F.

Zh. Fiz. Khim. 1977, 51, 138 - 142.
Russ. J. Phys. Chem. 1977, 51, 76-78.

VARIABLES:

T/K: 288.15 - 303.15

Total P/kPa: 98.659 (740 mmHg)

Urea/mol kg^{-1} H_2O: 0 - 11

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Urea mol kg^{-1} H_2O	Mol Fraction $X_1 \times 10^9$ at 1 mmHg	Mol Fraction $X_1 \times 10^4$ at 1 atm
288.15	0	11.39	0.0866
	0.603	10.80	0.0821
	1.125	10.53	0.0800
	1.200	10.38	0.0789
	1.850	10.16	0.0772
	2.120	9.82	0.0746
	2.910	9.29	0.0706
	4.810	8.45	0.0642
	5.040	8.37	0.0636
	7.670	7.78	0.0591
	9.080	7.40	0.0562
	10.960	7.17	0.0545
293.15	0	10.98	0.0835
	0.612	10.51	0.0799
	1.191	10.34	0.0786
	1.695	9.92	0.0754
	2.370	9.36	0.0711
	3.785	8.90	0.0676
	4.950	8.25	0.0627
	5.555	8.18	0.0622
	6.950	7.67	0.0583
	7.580	7.55	0.0574
	9.080	7.35	0.0559

Table continued on next page.

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

The apparatus, described in earlier papers (1,2), was based on the design of Ben-Naim and Baer (3). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete with the gas and solvent in contact at constant pressure.

The calculation of the inverse Henry constant was described by Borina and Samoilov (4).

The concentration of the urea solution was checked on the basis of its density after each experimentThe calibration curves were prepared from density data from the literature and from the authors'own measurements.

The solubility measurement was carried out at a total pressure of neon + water vapor of 740 mmHg. The solubility values in the table above were calculated for either 1 mmHg or 1 atm partial pressure of neon.

SOURCE AND PURITY OF MATERIALS:

1. Neon.Especially pure grade. Contained 0.1 per cent of other gases.
2. Water. Distilled.
3. Urea. Analytical reagent grade.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.0035 - 0.0050$

REFERENCES:

1. Lyashchenko, A.K.; Borina, A.F. Zh. Strukt. Khim. 1971, 12, 964.
2. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316.
3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59,2735.
4. Borina, A.F.; Samoilov, O. Ya. Zh. Strukt. Khim. 1974, 15, 395.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9	Borina, A. F.
2. Water; H_2O; 7732-18-5	Zh. Fiz. Khim. 1977, 51, 138 - 142.
3. Urea; CH_4N_2O ($(NH_2)_2CO$); 57-13-6	Continued from previous page.

EXPERIMENTAL DATA:

T/K	Urea mol kg^{-1} H_2O	Mol Fraction $X_1 \times 10^9$ at 1 mmHg	Mol Fraction $X_1 \times 10^4$ at 1 atm
298.15	0	10.58	0.0804
	0.897	9.92	0.0754
	1.465	9.76	0.0742
	2.172	9.51	0.0723
	3.047	9.09	0.0691
	4.500	8.41	0.0639
	5.805	7.96	0.0605
	6.000	7.88	0.0599
	7.420	7.78	0.0591
	8.350	7.67	0.0583
	10.220	7.15	0.0543
303.15	0	10.54	0.0801
	0.425	10.26	0.0780
	1.080	9.96	0.0757
	1.980	9.48	0.0720
	2.917	9.10	0.0692
	3.310	8.94	0.0679
	4.225	8.58	0.0652
	6.460	7.97	0.0606
	7.740	7.76	0.0590
	8.100	7.72	0.0587
	10.420	7.05	0.0536
	11.070	7.05	0.0536

The inverse of the mole fraction solubility at 1 mmHg is the Henry constant $K/mmHg = P/X_1$

The inverse of the mole fraction solubility at 1 atm pressure is the Henry constant $K/atm = P/X_1$.

The mole fraction solubility at 101.325 kPa (1 atm) was calculated by the compiler.

The original paper presents graphs of the enthalpy change and entropy change as a function of urea molality for the transfer on neon gas at a pressure of 101.325 kPa (1 atm) to the hypothetical solution of unit neon mole fraction.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Pentane; C_5H_{12}; 109-66-0

ORIGINAL MEASUREMENTS:

Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L.

Hung. J. Ind. Chem. 1976, 4, 269-280.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

S. A. Johnson

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.15	4.1	8.0	8.7

The mole fraction and Bunsen coefficient were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Volumetric method. The apparatus of Bodor, Bor, Mohai, and Sipos (1) was used.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Bodor, E.; Bor, Gy.; Mohai, B.; Sipos, G.
Veszpremi Vegyip. Egy. Kozl. 1957, 1, 55;
Chem. Abstr. 1961, 55, 3175h.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Hexane; C_6H_{14}; 110-54-3

ORIGINAL MEASUREMENTS:

Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M.

J. Phys. Chem. 1957, 61, 1078-1083.

VARIABLES:

T/K: 287.15 - 311.85
P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L.Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
287.15	3.36	5.77	6.07
298.15	3.80	6.48	7.07
311.85	4.04	6.75	7.71

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 5{,}443.6 + 47.425\ T$

Std. Dev. ΔG^o = 53.1, Coef. Corr. = 0.9959

$\Delta H^o/J\ mol^{-1} = 5{,}443.6$, $\Delta S^o/J\ K^{-1}\ mol^{-1} = -47.425$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^o/J\ mol^{-1}$
288.15	3.44	19,109
293.15	3.57	19,346
298.15	3.71	19,583
303.15	3.84	19,821
308.15	3.98	20,058
313.15	4.12	20,295

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with the gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed.

ADDED NOTE. Makranczy, J.; Megyery-Balog, K.;Rusz, L.;Patyi, L. Hung. J. Ind. Chem. 1976, 4, 269 report an Ostwald coefficient of 0.076 at 298.15 K for this system. The value was not used in the smoothed data fit above.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.
2. Hexane. Humphrey-Wilkinson, Inc., New Haven, CN. Shaken with H_2SO_4, washed, dried over sodium, distilled.

ESTIMATED ERROR: $\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid.1952, 3819.
2. Baldwin, R.R.; Daniel, S.G. J. Appl. Chem. 1952, 2, 161.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. Heptane; C_7H_{16}; 142-82-5

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, 61, 1078 - 1083.

VARIABLES:

T/K: 287.15 - 311.95
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
287.15	3.30	5.09	5.35
298.15	3.48	5.29	5.77
311.95	3.96	5.92	6.76

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 5{,}571.9 + 47.347\ T$

Std. Dev. ΔG = 45.0, Coef. Corr. = 0.9971

$\Delta H°/J\ mol^{-1} = 5{,}571.9$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -47.347$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
283.15	3.15	18,978
288.15	3.29	19,215
293.15	3.42	19,452
298.15	3.55	19,688
303.15	3.69	19,925
308.15	3.82	20,162
313.15	3.96	20,399

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with the gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed.

ADDED NOTE. Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind. Chem. 1976, 4, 269 report an Ostwald coefficient of 0.069 at 298.15 K for this system. The value was not used in the smoothed data fit above.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Both standard and research grades were used.

2. Heptane. Phillips Petroleum Co. Bartlesville, OK. Used as received.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.

2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Octane; C_8H_{18}; 111-65-9	H. L. Clever Chemistry Department Emory University Atlanta, GA 30322 U.S.A. March 1978

CRITICAL EVALUATION:

The solubility of neon in octane was measured at three laboratories. Clever, Battino, Saylor and Gross (1) report three solubility values between 287.25 and 312.15 K. Makranczy, Megyery-Balog, Rusz, and Patyi (2) and Wilcock, Battino and Danforth (3) each report one solubility value near 298 K.

The solubility value of Makranczy *et al*. (Ostwald coefficient 5.7×10^{-2} and mole fraction3.8×10^{-4} at 298.15 K) is not recommended. It was reported to only two significant figures and it is 5.5 percent higher than the values from the other two laboratories.

The solubility values of Clever *et al*. and Wilcock *et al*. agree within 0.8 percent at 298.15 K. Without solubility values to compare at several temperatures it is not possible to recommend values of neon in octane solubility except for the mole fraction of 3.595×10^{-4} at 298.15 K and 101.325 kPa. However, we have combined the solubility data of Clever, *et al*. and Wilcock *et al*. in a one to one weight least squares fit to a Gibbs energy equation linear in temperature. The result gives a tentative set of solubility data and changes in thermodynamic properties.

The tentative values for the transfer of one mole of neon from the gas at a pressure of 101.325 kPa to the hypothetical unit mole fraction solution are

$$\Delta G°/\text{J mol}^{-1} = - RT \ln X_1 = 6,962.8 + 42.524\ T$$

$$\text{Std. Dev. } \Delta G° = 27.6, \quad \text{Coef. Corr.} = 0.9980$$

$$\Delta H°/\text{J mol}^{-1} = 6,962.8, \quad \Delta S°/\text{J K}^{-1}\ \text{mol}^{-1} = -42.524$$

The tentative solubility values and Gibbs energy as a function of temperature are in Table 1.

TABLE 1. The solubility of neon in octane. Tentative values of the mole fraction solubility at 101.325 kPa and the Gibbs energy change as a function of temperature.

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/\text{J mol}^{-1}$
288.15	3.285	19,216
293.15	3.45	19,429
298.15	3.62	19,641
303.15	3.79	19,854
308.15	3.97	20,067
313.15	4.14	20,279

1. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078.
2. Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. *Hung. J. Ind. Chem.* 1976, *4*, 269.
3. Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. *J. Chem. Thermodyn.* 1978, *10*, 817.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Octane; C_8H_{18}; 111-65-9

ORIGINAL MEASUREMENTS:

Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M.

J. Phys. Chem. 1957, 61, 1078-1083.

VARIABLES:

T/K: 287.25 - 312.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
287.25	3.29	4.56	4.80
298.35	3.58	4.91	5.36
312.15	4.14	5.58	6.38

Smoothed Data: $\Delta G^\circ/J\ mol^{-1} = -RT \ln X_1 = 6947.9 + 42.561\ T$

Std. Dev. $\Delta G^\circ = 32.5$, Coef. Corr. = 0.9981

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

For the recommended Gibbs energy equation and smoothed values of the solubility see the critical evaluation of the solubility of neon in octane.

AUXILIARY INFORMATION

METHOD:

Volumetric. The solvent is saturated with the gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE:

The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.
2. Octane. Humphrey-Wilkinson Inc. Shaken with H_2SO_4, washed, dried, distilled.

ESTIMATED ERROR:

$\delta T/K = 0.05$

$\delta P/torr = 3$

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.
2. Baldwin, R.R.; Daniel, S.G. J. Appl. Chem. 1952, 2, 161.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Octane; C_8H_{18}; 111-65-9

ORIGINAL MEASUREMENTS:

Wilcock, R.J.; Battino, R.; Danforth, W.F; Wilhelm, E.

J. Chem. Thermodyn. 1978, 10, 817-822.

VARIABLES:

T/K: 298.27
P/kPa: 101.325 (1 atm)

PREPARED BY:

A.L. Cramer

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.27	3.609	4.951	5.406

See the evaluation of neon + octane for recommended Gibbs equation and smoothed solubility values.

The solubility value was adjusted to a partial pressure of neon of 101.325 kPa by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

The apparatus is based on the design of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3).

Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.

Solubility Determination. The degassed solvent is passed in a thin film down a glass spiral tube containing the solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co. Inc. Purest commercially available grade.
2. Octane. Phillips Petroleum Co. minimum 99 mol per cent.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. J. Am. Oil Chem. Soc. 1968, 45, 830.
3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. Anal. Chem. 1971, 43, 806.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. 3-Methylheptane; C_8H_{18}, 589-81-1

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, *61*, 1078 - 1083.

VARIABLES:

T/K: 287.15 - 312.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
287.15	3.47	4.85	5.10
298.15	3.66	5.05	5.51
312.15	4.18	5.66	6.47

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 5,652.7 + 46.652\ T$

Std. Dev. $\Delta G°$ = 46.3, Coef. Corr. = 0.9969

$\Delta H°/J\ mol^{-1} = 5,652.7$, $\Delta S°/J\ mol\ K^{-1}\ mol^{-1} = -46.652$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
283.15	3.31	18,862
288.15	3.46	19,095
293.15	3.60	19,329
298.15	3.74	19,562
303.15	3.88	19,795
308.15	4.03	20,028
313.15	4.17	20,262

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with the gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.
2. 3-Methylheptane. Humphrey-Wilkinson, Inc., New Haven, CN. Shaken with H_2SO_4, washed, dried over Na, distilled through a vacuum column.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid.* 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. *J. Appl. Chem.* 1952, *2*, 161.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. 2,3-Dimethylhexane; C_8H_{18}; 584-94-1

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, *61*, 1078 - 1083.

VARIABLES:

T/K: 287.15 - 312.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
287.15	3.28	4.61	4.85
298.15	3.66	5.09	5.56
312.15	4.00	5.47	6.25

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 5,857.7 + 46.243\ T$

Std. Dev. $\Delta G°$ = 26.0, Coef. Corr. = 0.9990

$\Delta H°/J\ mol^{-1}$ = 5,857.7, $\Delta S°/J\ K^{-1}\ mol^{-1}$ = -46.243

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
283.15	3.19	18,952
288.15	3.33	19,183
293.15	3.47	19,414
298.15	3.62	19,645
303.15	3.76	19,876
308.15	3.90	20,108
313.15	4.05	20,339

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with the gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.
2. 2,3-Dimethylhexane. Humphrey-Wilkinson, Inc., New Haven, CT. Shaken with H_2SO_4, washed, dried over Na, distilled through a vacuum column.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid.* 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. *J. Appl. Chem.* 1952, *2*, 161.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. 2,4-Dimethylhexane; C_8H_{18}; 589-43-5

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, 61, 1078 - 1083.

VARIABLES:

T/K: 287.35 - 312.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
287.35	3.68	5.08	5.34
298.15	3.99	5.42	5.92
312.15	4.39	5.89	6.73

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 5{,}303.5 + 47.287\ T$

Std. Dev. $\Delta G°$ = 0.6, Coef. Corr. = 0.9999

$\Delta H°/J\ mol^{-1} = 5{,}303.5$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -47.287$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
283.15	3.56	18,693
288.15	3.70	18,929
293.15	3.85	19,166
298.15	3.99	19,402
303.15	4.13	19,638
308.15	4.28	19,875
313.15	4.42	20,111

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with the gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.

2. 2,4-Dimethylhexane. Humphrey-Wilkinson, Inc., New Haven, CT. Shaken with H_2SO_4, washed, dried over Na, distilled through a vacuum column.

ESTIMATED ERROR:

$\delta T/K = 0.05$

$\delta P/torr = 3$

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.

2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. 2,2,4-Trimethylpentane; C_8H_{18}; 540-84-1

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, *61*, 1078 - 1083.

VARIABLES:

T/K: 289.30 - 312.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
289.30	4.32	5.90	6.25
298.15	4.61	6.25	6.82
312.15	4.96	6.60	7.54

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 4{,}489.0 + 48.864\ T$

Std. Dev. $\Delta G°$ = 12.7, Coef. Corr. = 0.9997

$\Delta H°/J\ mol^{-1} = 4{,}489.0$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -48.864$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
283.15	4.16	18,325
288.15	4.30	18,569
293.15	4.44	18,813
298.15	4.58	19,058
303.15	4.72	19,302
308.15	4.86	19,546
313.15	5.00	19,791

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with the gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.
2. 2,2,4-Trimethylpentane. Enjay Co., New York. Used as received.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid.* 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. *J. Appl. Chem.* 1952, *2*, 161.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Nonane; C_9H_{20}; 111-84-2

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R. Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, 61, 1078 - 1083.

VARIABLES:

T/K: 287.15 - 312.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
287.15	3.07	3.88	4.08
298.15	3.50	4.37	4.77
312.15	3.81	4.68	5.35

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 6,336.7 + 45.083\ T$

Std. Dev. $\Delta G°$ = 45.1, Coef. Corr. = 0.9968

$\Delta H°/J\ mol^{-1} = 6,336.7$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -45.083$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
283.15	2.99	19,102
288.15	3.14	19,327
293.15	3.28	19,553
298.15	3.43	19,778
303.15	3.57	20,004
308.15	3.72	20,229
313.15	3.87	20,454

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with the gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed.

ADDED NOTE. Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind. Chem. 1976, 4, 269 report an Ostwald coefficient of 0.047 at 298.15 K for this system . The value was not used in the smoothed data fit above.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.
2. Nonane. Phillips Petroleum Co., Bartlesville, OK. Used as received.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Decane; $C_{10}H_{22}$; 124-18-5	H. L. Clever Chemistry Department Emory University Atlanta, GA 30322 U.S.A. February 1978

CRITICAL EVALUATION:

The solubility of neon in decane was measured in three laboratories. Clever, Battino, Saylor and Gross (1) report three solubility values between 289.05 and 312.15 K. Makranczy, Megyery-Balog, Rusz and Patyi (2) and Wilcock, Battino and Danforth (3) each report one solubility value near 298 K.

The solubility value of Makranczy *et al*. (Ostwald coefficient 4.5×10^{-2} and mole fraction 3.6×10^{-4} at 298.15 K) agrees well with the value of Clever *et al*., but it is reported to only two significant figures.

The solubility values of Clever *et al*. and Wilcock *et al*. differ by 3.9 percent at 298.15 K which is within the estimated error of the two laboratories. The Wilcock *et al*. solubility determination uses an improved degassing procedure, and improved control of temperature and pressure. Their solubility value should be considered the more reliable. It is a mole fraction of 3.430×10^{-4} at 298.27 K.

Without other solubility values to compare at several temperatures it is not possible to recommend values of solubility and thermodynamic changes. We have used the data of Clever *et al*. and Wilcock *et al*. on a one to one weight basis to obtain a tentative set of solubility data and changes in thermodynamic properties. The discussion above indicates the tentative solubility values may be 2 percent or more high.

The tentative values for the transfer of one mole of neon from the gas at a pressure of 101.325 kPa to the hypothetical unit mole fraction solution are

$$\Delta G°/\text{J mol}^{-1} = -RT \ln X_1 = 6{,}536.6 + 44.288\ T$$

Std. Dev. $\Delta G°$ = 44.2, Coef. Corr. = 0.9946

$\Delta H°/\text{J mol}^{-1}$ = 6,536.6, $\Delta S°/\text{J K}^{-1}\text{ mol}^{-1}$ = -44.288

The tentative solubility values and Gibbs energy change as a function of temperature are in Table 1.

TABLE 1. The solubility of neon in decane. Tentative values of the mole fraction solubility at 101.325 kPa and the Gibbs energy change as a function of temperature.

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/\text{J mol}^{-1}$
288.15	3.17	19,298
293.15	3.33	19,520
298.15	3.48	19,741
303.15	3.63	19,962
308.15	3.79	20,184
313.15	3.95	20,405

1. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078.
2. Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. *Hung. J. Ind. Chem.* 1976, *4*, 269.
3. Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. *J. Chem. Thermodyn.* 1978, *10*, 817.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Decane; $C_{10}H_{22}$; 124-18-5

ORIGINAL MEASUREMENTS:

Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M.

J. Phys Chem. 1957, *61*, 1078-1083.

VARIABLES:

T/K: 289.05 - 312.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
289.05	3.18	3.68	3.89
298.15	3.57	4.07	4.44
312.15	3.90	4.39	5.02

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 6460.8 + 44.500\ T$

Std. Dev. $\Delta G^o = 44.8$, Coef. Corr. = 0.9963

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

See the evaluation of neon + decane for the recommended Gibbs energy equation and smoothed solubility values.

AUXILIARY INFORMATION

METHOD:

Volumetric. The solvent is saturated with the gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE:

The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.
2. Decane. Humphrey-Wilkinson, Inc. Shaken with H_2SO_4, washed, dried, distilled.

ESTIMATED ERROR:

$\delta T/K = 0.05$

$\delta P/torr = 3$

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *Ibid.* 1952, 3819.
2. Baldwin, R.R.; Daniel, S.G. *J. Appl. Chem.* 1952, *2*, 161.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Decane; $C_{10}H_{22}$; 124-18-5

ORIGINAL MEASUREMENTS:

Wilcock, R.J.; Battino, R.; Danforth, W.F; Wilhelm, E.

J. Chem. Thermodyn. 1978, 10, 817-822

VARIABLES:

T/K: 298.24
P/kPa: 101.325 (1 atm)

PREPARED BY:

A.L. Cramer

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.24	3.430	3.928	4.288

See the evaluation of neon + decane for recommended Gibbs energy equation and smoothed solubility values.

The solubility value was adjusted to a partial pressure of neon of 101.325 kPa by Henry's law.

The Bunsen coefficients were calculated by the compiler.

A preliminary report of this work appeared in Conf. Int. Thermodyn. Chim., {C.R.}, 4th 1975, 6, 122 - 128; Chem. Abstr. 1977, 86, 22375d.

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

The apparatus is based on the design of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3).

See neon + octane data sheet for more details.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co. Inc. Purest commercially available grade.
2. Decane. Phillips Petroleum Co. 99 mol per cent minimum.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. J. Am. Oil Chem. Soc. 1968, 45, 830.
3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. Anal. Chem. 1971, 43, 806.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. Undecane; $C_{11}H_{24}$; 1120-21-4

ORIGINAL MEASUREMENTS:

Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L.

Hung. J. Ind. Chem. 1976, 4, 269-280.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

S. A. Johnson

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.15	3.7	3.9	4.3

The mole fraction and Bunsen coefficient were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Volumetric method. The apparatus of Bodor, Bor, Mohai, and Sipos (1) was used.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Bodor, E.; Bor, Gy.; Mohai, B.; Sipos, G.
Veszpremi Vegyip. Egy. Kozl. 1957, 1, 55;
Chem. Abstr. 1961, 55, 3175h.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Dodecane; $C_{12}H_{26}$; 112-40-3

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, 61, 1078 - 1083.

VARIABLES:

T/K: 289.05 - 312.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
289.05	2.81	2.77	2.93
298.15	3.24	3.18	3.47
312.15	3.50	3.39	3.87

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 6,855.7 + 44.092\ T$

Std. Dev. $\Delta G° = 73.6$, Coef. Corr. = 0.9899

$\Delta H°/J\ mol^{-1} = 6,855.7$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -44.092$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	2.84	19,561
293.15	2.99	19,781
298.15	3.13	20,002
303.15	3.28	20,222
308.15	3.43	20,443
313.15	3.58	20,663

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with the gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed.

ADDED NOTE. Makranczy, J.; Megyery-Balog, K.;Rusz, L.;Patyi, L. Hung. J. Ind. Chem. 1976, 4, 269 report an Ostwald coefficient of 0.040 at 298.15 K for this system. The value was not used in the smoothed data fit above.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.
2. Dodecane. Humphrey-Wilkinson, Inc. Shaken with H_2SO_4, washed, dried over Na.

ESTIMATED ERROR:

$\delta T/K = 0.05$

$\delta P/torr = 3$

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid. 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Tridecane; $C_{13}H_{28}$; 629-50-5

ORIGINAL MEASUREMENTS:

Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L.

Hung. J. Ind. Chem. 1976, *4*, 269-280.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

S. A. Johnson

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.15	3.6	3.3	3.6

The mole fraction and Bunsen coefficient were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Volumetric method. The apparatus of Bodor, Bor, Mohai, and Sipos (1) was used.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Bodor, E.; Bor, Gy.; Mohai, B.; Sipos, G. *Veszpremi Vegyip. Egy. Kozl.* 1957, *1*, 55; *Chem. Abstr.* 1961, *55*, 3175h.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Tetradecane; $C_{14}H_{30}$; 629-59-4	Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078 - 1083.
VARIABLES: T/K: 289.05 - 313.25 P/kPa: 101.325 (1 atm)	**PREPARED BY:** P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
289.05	3.00	2.66	2.82
298.15	3.24	2.90	3.16
313.25	3.63	3.16	3.62

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 5{,}920.3 + 46.956\ T$

Std. Dev. $\Delta G°$ = 2.3, Coef. Corr. = 0.9999

$\Delta H°/J\ mol^{-1} = 5{,}920.3$ $\Delta S°/J\ K^{-1}\ mol^{-1} = -46.956$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	2.98	19,451
293.15	3.11	19,685
298.15	3.24	19,920
303.15	3.37	20,155
308.15	3.50	20,390
313.15	3.63	20,624
318.15	3.76	20,859

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with the gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed.

ADDED NOTE. Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. *Hung. J. Ind. Chem.* 1976, *4*, 269 report an Ostwald coefficient of 0.033 at 298.15 K for this system. The value was not used in the smoothed data fit above.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:
1. Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.
2. Tetradecane. Humphrey-Wilkinson, Inc. Shaken with H_2SO_4, washed, dried over Na.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *Ibid.* 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. *J. Appl. Chem.* 1952, *2*, 161.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Pentadecane; $C_{15}H_{32}$; 629-62-9

   or

   Hexadecane; $C_{16}H_{34}$; 544-76-3

ORIGINAL MEASUREMENTS:

Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L.

Hung. J. Ind. Chem. 1976, *4*, 269-280.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

S. A. Johnson

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
	Pentadecane; $C_{15}H_{32}$; 629-62-9		
298.15	3.5	2.8	3.1
	Hexadecane; $C_{16}H_{34}$; 544-76-3		
298.15	3.2	2.5	2.7

The mole fraction and Bunsen coefficient were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Volumetric method. The apparatus of Bodor, Bor, Mohai, and Sipos (1) was used.

APPARATUS/PROCEDURE:

SOURCE AND PURITY OF MATERIALS:

Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Bodor, E.; Bor, Gy.; Mohai, B.; Sipos, G. *Veszpremi Vegyip. Egy. Kozl.* 1957, *1*, 55; *Chem. Abstr.* 1961, *55*, 3175h.

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Cyclohexane; C_6H_{12}; 110-82-7	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 U. S. A. January 1978

CRITICAL EVALUATION:

The solubility of neon in cyclohexane was measured at three laboratories. Lannung (1) reported seven solubility values between 288.15 and 303.15 K; Clever, Battino, Saylor and Gross (2) reported three values between 287.15 and 312.15 K; and Dymond (3) reported four solubility values between 292.97 and 310.50 K.

Each data set was smoothed by the method of least squares fit to a Gibbs energy equation linear in temperature. The Lannung and Dymond smoothed solubility values differed by 5 - 5.5 percent over the temperature range of 288.15 - 303.15 K, while the Clever, Battino, Saylor and Gross smoothed solubility values ranged lower than the Dymond data from 2.4 per cent at 288.15 K to 12 per cent at 313.15 K. The three data sets were combined in one least square fit to a Gibbs energy equation that was linear in temperature. No solubility value was over two standard deviations from the fitted equation, but of the 14 solubility values five were of greater magnitude than the fitted line and nine were of lesser magnitude. An arbitrary decision was made to drop the two lowest values both of which were from the same paper (2). The twelve data points were used to obtain the recommended equation.

The recommended thermodynamic values for the transfer of neon from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

$$\Delta G°/\text{J mol}^{-1} = -RT \ln X_1 = 9661.6 + 39.074\ T$$

$$\text{Std. Dev. } \Delta G° = 63, \quad \text{Coef. Corr.} = 0.9778$$

$$\Delta H°/\text{J mol}^{-1} = 9661.6, \quad \Delta S°/\text{J K}^{-1}\text{ mol}^{-1} = -39.074$$

Table 1 contains the recommended values of the mole fraction solubility and the Gibbs energy at five degree intervals between 283.15 and 313.15 K.

TABLE 1. Solubility of neon in cyclohexane at 101.325 kPa. Recommended mole fraction solubility and Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction[a] $X_1 \times 10^4$	$\Delta G°/\text{J mol}^{-1}$
283.15	1.500	20,725
288.15	1.615	20,921
293.15	1.730	21,116
298.15	1.845	21,312
303.15	1.970	21,507
308.15	2.095	21,702
313.15	2.225	21,898

[a] rounded to the nearest 0.005×10^{-4}.

1. Lannung, A. *J. Am. Chem. Soc.* 1930, *52*, 68.
2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078.
3. Dymond, J. H. *J. Phys. Chem.* 1967, *71*, 1829.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. Cyclohexane; C_6H_{12}; 110-82-7

ORIGINAL MEASUREMENTS:

Lannung, A.

J. Am. Chem. Soc. 1930, *52*, 68 - 80.

VARIABLES:

T/K: 288.15 - 303.15
Ne P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	1.60	3.34	3.52
288.15	1.57	3.27	3.45
293.15	1.71	3.54	3.80
293.15	1.70	3.53	3.79
298.15	1.81	3.73	4.07
303.15	1.92	3.93	4.36
303.15	1.91	3.91	4.34

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 9,092.5 + 41.164\ T$

Std. Dev. $\Delta G°$ = 16.9, Coef. Corr. = 0.9979

For the recommended Gibbs free energy equation see the critical evaluation of the solubility of neon in cyclohexane.

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The mole fraction solubility and the Ostwald coefficient were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:
Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Linde's Liquid Air Factory. Contained one percent by volume of helium.

2. Cyclohexane. Poulenc Frères. Shaken with fuming H_2SO_4, water washed, dried over P_2O_5. Distilled from P_2O_5 with rejection of first quarter. Distilled from sodium. m.p. 6.3° C.

APPARATUS/PROCEDURE: The apparatus is a modification of that of von Antropoff (1). A calibrated, combined all glass manometer and bulb is enclosed in an air thermostat. Mercury is used as the calibration and confining liquid. The solvent is degassed in the apparatus. The solvent and the gas are shaken together until equilibrium is established.

ESTIMATED ERROR:

$\delta T/K = 0.03$

REFERENCES:

1. v. Antropoff, A.
Z. Electrochem. 1919, *25*, 269.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Cyclohexane; C_6H_{12}; 110-82-7

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, *61*, 1078 - 1083.

VARIABLES:

T/K: 287.15 - 312.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
287.15	1.65	3.46	3.64
298.15	1.74	3.59	3.92
312.15	2.02	4.10	4.69

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 6{,}159.0 + 51.094\ T$

Std. Dev. $\Delta G° = 57.2$, Coef. Corr. = 0.9960

For the recommended free energy equation see the critical evaluation of the solubility of neon in cyclohexane.

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co. Both research and standard grades were used with no difference in results.
2. Cyclohexane. Phillips Petroleum Co. Used as received.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid.* 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. *J. Appl. Chem.* 1952, *2*, 161.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. Cyclohexane; C_6H_{12}; 110-82-7

ORIGINAL MEASUREMENTS:

Dymond, J. H.

J. Phys. Chem. 1967, *71*, 1829 - 1831.

VARIABLES:

T/K: 292.97 - 310.50
P/kPa: 101.325 (1 atm)

PREPARED BY:

M. E. Derrick

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
292.97	1.79	3.71	3.98
299.55	1.93	3.97	4.35
304.75	2.04	4.17	4.65
310.50	2.20	4.47	5.08

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 8{,}826.6 + 41.634\ T$

Std. Dev. $\Delta G°$ = 12.5, Coef. Corr. = 0.9992

See the evaluation of neon + cyclohexane for the recommended Gibbs energy equation and smoothed solubility values.

The Bunsen and Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Saturation of liquid with gas at partial pressure of gas equal to 1 atm.

APPARATUS/PROCEDURE:

Dymond-Hildebrand apparatus (1) using an all-glass pumping system to spray slugs of degassed solvent into the gas. Amount of gas dissolved calculated from initial and final gas pressures.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co. Dried.

2. Cyclohexane. Matheson, Coleman and Bell chromatoquality reagent. Dried and fractionally frozen. m.p. 6.45° C.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.01$

REFERENCES:

1. Dymond, J.; Hildebrand, J. H. *Ind. Eng. Chem. Fundam.* 1967, *6*, 130.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Methylcyclohexane; C_7H_{14}; 108-87-2

ORIGINAL MEASUREMENTS:

Clever, H. L.; Saylor, J. H. Gross, P. M.

J. Phys. Chem. 1958, *62*, 89 - 91.

VARIABLES:

T/K: 289.15 - 316.25

P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
289.15	2.11	3.73	3.95
303.15	2.34	4.09	4.54
316.25	2.82	4.85	5.62

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 8{,}148.8 + 42.336\ T$

Std. Dev. $\Delta G° = 76.9$, Coef. Corr. = 0.9911

$\Delta H°/J\ mol^{-1} = 8{,}148.8$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -42.336$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	2.05	20,348
293.15	2.17	20,560
298.15	2.30	20,771
303.15	2.42	20,983
308.15	2.55	21,195
313.15	2.69	21,406
318.15	2.82	21,618

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with the gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure of solute gas plus solvent vapor pressure is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.
2. Methylcyclohexane. Eastman Kodak Co., white label, dried over Na and distilled, corrected b.p. 100.95 to 100.97°, lit. b.p. 100.93°C.

ESTIMATED ERROR:

$\delta T/K = 0.05$

$\delta P/torr = 3$

$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *Ibid.* 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. *J. Appl. Chem.* 1952, *2*, 161.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Cyclooctane; C_8H_{16}; 292-64-8

ORIGINAL MEASUREMENTS:

Wilcock, R. J.; Battino, R. Wilhelm, E.

J. Chem. Thermodyn. 1977, 9, 111-115.

VARIABLES:

T/K: 298.21
P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.21	1.372	2.28	2.491

The solubility value was adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficient was calculated by the compiler.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

APPARATUS/PROCEDURE: Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns. Solubility Determination. The degassed solvent passes in a thin film down a glass spiral containing the solute gas and solvent vapor at a total pressure of one atm. The volume of gas absorbed is measured in the attached gas buret, and the solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Minimum purity 99.99 mol per cent.
2. Cyclooctane. Chemical Samples Co. 99 mol per cent, fractionally distilled, n(Na D, 298.15 K) = 1.4562.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F. D.; Danforth, W. F. J. Am. Oil Chem. Soc. 1968, 45, 830.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. cis-1,2-Dimethylcyclohexane; C_8H_{16}; 2207-01-4

ORIGINAL MEASUREMENTS:

Geller, E.B.; Battino, R.; Wilhelm, E.

J. Chem. Thermodyn. 1976, 8, 197-202.

VARIABLES:

T/K: 297.88 - 298.14
P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
297.88	2.25	3.56	3.88
298.14	2.21	3.49	3.81

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans and Danforth (2).

Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm. deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.

Solubility Determination. The degassed solvent is passed in a thin film down a glass spiral tube containing the solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Either Air Products & Chemicals, Inc.,or Matheson Co., Inc. 99 mol % or better.
2. cis-1,2-Dimethylcyclohexane. Chemical Samples Co., fractionally distilled and stored in dark. n_D(298.15 K) 1.4337.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. J. Am. Oil Chem. Soc. 1968, 45, 830.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. trans-1,2-Dimethylcyclohexane; C_8H_{16}; 6876-23-9

ORIGINAL MEASUREMENTS:

Geller, E.B.; Battino, R.; Wilhelm, E.

J. Chem. Thermodyn. 1976, 8, 197-202.

VARIABLES:

T/K: 298.11
P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.11	2.65	4.26	4.66

The solubility value was adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficient was calculated by the compiler.

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.

Solubility Determination. The degassed solvent passes in a thin film down a glass spiral containing the solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is measured in a buret system, and the solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Either Air Products & Chemicals, Inc.,or Matheson Co., Inc. 99 mol % or better.
2. trans-1,2-Dimethylcyclohexane. Chemical Samples Co., fractionally distilled and stored in dark. n_D(298.15) 1.4248.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. J. Am. Oil Chem. Soc. 1968, 45, 830.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. cis-1,3-Dimethylcyclohexane, 59 mol %; C_8H_{16}; 638-04-0
3. trans-1,3-Dimethylcyclohexane, 41 mol %; C_8H_{16}; 2207-03-6

ORIGINAL MEASUREMENTS:

Geller, E.B.; Battino, R.; Wilhelm, E.

J. Chem. Thermodyn. 1976, 8, 197-202.

VARIABLES:

T/K: 298.15 - 298.40
P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.15	2.72	4.18	4.56
298.40	2.70	4.15	4.53

The solubility value was adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficient was calculated by the compiler.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

See neon + 1,2 dimethylcyclohexane data sheet for more detail.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Either Air Products & Chemicals, Inc., or Matheson Co., Inc. 99 mol % or better.
2. cis-1,3-Dimethylcyclohexane. Chemical Samples Co., binary mixture, analysed by R. I. by authors, used as received.
3. trans-1,3-Dimethylcyclohexane. Chemical Samples Co., binary mixture, analysed by R. I. by authors, used as received.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. J. Am. Oil Chem. Soc. 1968, 45, 830.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. cis-1,4-Dimethylcyclohexane, 70 mol %; C_8H_{16}; 624-29-3 3. trans-1,4-Dimethylcyclohexane, 30 mol %; C_8H_{16}; 2207-04-7	Geller, E.B.; Battino, R.; Wilhelm, E. J. Chem. Thermodyn. 1976, 8, 197-202.
VARIABLES: T/K: 298.14 P/kPa: 101.325 (1 atm)	PREPARED BY: H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.14	2.66	4.10	4.48

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

See neon + 1,2 dimethylcyclohexane data sheet for more detail.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Either Air Products & Chemicals, Inc., or Matheson Co., Inc. 99 mol % or better.
2. cis-1,4-Dimethylcyclohexane. Chemical Samples Co., binary mixture, analysed by R. I. by authors, used as received.
3. trans-1,4-Dimethylcyclohexane. Chemical Samples Co., binary mixture, analysed by R. I. by authors, used as received.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. J. Am. Oil Chem. Soc. 1968, 45, 830.

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Benzene; C_6H_6; 71-43-2	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA January 1978

CRITICAL EVALUATION:

The solubility of neon in benzene was measured by Lannung (1), by Clever, Battino, Saylor and Gross (2), and by de Wet (3). The three sets of solubility data, when smoothed by a Gibbs energy function linear in temperature, agree within 5.5 per cent at 288.15 K, 6.1 per cent at 298.15 K, and 8.3 per cent at 308.15 K. On combining the three data sets on a one to one weight basis by the method of least squares in a Gibbs energy equation linear in temperature,only one solubility value at 298.35 K (2) was more than two standard deviations from the linear equation. That solubility value was excluded and the data fitted again to obtain the recommended equation.

The recommended thermodynamic values for the transfer of one mole of neon from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

$$\Delta G°/J\ mol^{-1} = -\ RT\ ln\ X_1 = 10,467 + 40.301\ T$$

$$\text{Std. Dev. } \Delta G° = 46, \quad \text{Coef. Corr.} = 0.9945$$

$$\Delta H°/J\ mol^{-1} = 10,467, \quad \Delta S°/J\ K^{-1}\ mol^{-1} = -40,301$$

The recommended mole fraction solubilities at 101.325 kPa and the Gibbs energy changes at five degree intervals between 283.15 and 313.15 are in Table 1.

TABLE 1. Solubility of neon in benzene at 101.325 kPa. Recommended mole fraction solubility and Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
283.15	0.920	21,878
288.15	0.944	22,080
293.15	1.071	22,281
298.15	1.151	22,483
303.15	1.23	22,684
308.15	1.32	22,886
313.15	1.41	23,087

1. Lannung, A. _J. Am. Chem. Soc._ 1930, _52_, 68.
2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. _J. Phys. Chem._ 1957, _61_, 1078.
3. de Wet, W. J. _J. S. Afr. Chem. Inst._ 1964, _17_, 9.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Benzene; C_6H_6; 71-43-2

ORIGINAL MEASUREMENTS:

Lannung, A.

J. Am. Chem. Soc. 1930, *52*, 68 - 80.

VARIABLES:

T/K: 283.15 - 310.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
283.15	0.913	2.33	2.42
283.15	0.936	2.39	2.48
293.15	1.07	2.69	2.89
293.15	1.08	2.73	2.93
310.15	1.35	3.33	3.78
310.15	1.33	3.28	3.72

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 10{,}010 + 41.860\ T$

Std. Dev. $\Delta G° = 24.2$, Coef. Corr. = 0.9989

For the recommended Gibbs free energy equation see the critical evaluation of the solubility of neon in benzene.

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced.

APPARATUS/PROCEDURE: The apparatus is a modification of that of von Antropoff (1). A calibrated, combined all glass manometer and bulb is enclosed in an air thermostat. Mercury is used as the calibration and confining liquid. The solvent is degassed in the apparatus. The solvent and the gas are shaken together until equilibrium is established.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Linde's Liquid Air Factory. Contained one percent by volume helium.

2. Benzene. Kahlbaum's "Zur Molekulargewitchtsbestimmung", m.p. 5.48°C.

ESTIMATED ERROR:

T/K = 0.03

REFERENCES:

1. v. Antropoff, A. *Z. Electrochem.* 1919, *25*, 269.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Benzene; C_6H_6; 71-43-2

ORIGINAL MEASUREMENTS:

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M.

J. Phys. Chem. 1957, 61, 1078 - 1083.

VARIABLES:

T/K: 287.15 - 312.15

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
287.15	0.95	2.41	2.53
298.35	1.07	2.68	2.93
312.15	1.43	3.53	4.03

Smoothed Data: $\Delta G°/J\ mol^{-1} = - RT \ln X_1 = 12{,}400 + 34.049\ T$

Std. Dev. $\Delta G°$ = 104, Coef. Corr. = 0.9715

For the recommended free energy equation see the critical evaluation of the solubility of neon in benzene.

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co. Both research and standard grades were used with no difference in results.
2. Benzene. Jones and Laughlin Steel Co. Shaken with conc. H_2SO_4, washed, dried over sodium, distilled

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/torr = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; Ibid. 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Benzene; C_6H_6; 71-43-2

ORIGINAL MEASUREMENTS:

de Wet, W. J.

J. S. Afr. Chem. Inst. 1964, 17, 9 - 13.

VARIABLES:

T/K: 291.45 - 304.35
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
291.45	1.07	2.70	2.88
298.95	1.17	2.92	3.20
304.35	1.23	3.07	3.42

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 8003.8 + 48.537\ T$

Std. Dev. $\Delta G°$ = 9.8, Coef. Corr. = 0.9995

For the recommended free energy equation see the critical evaluation of the solubility of neon in benzene.

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric.

To degas, the solvent is placed in a large continuously evacuated bulb until the solvent boils freely without further release of dissolved gases.

To saturate, the solvent is flowed in a thin film through a glass spiral containing the gas. The volume of gas absorbed is measured on an attached buret system.

APPARATUS/PROCEDURE:

The apparatus is a modification of that used by Morrison and Billett (1) and others (2). The degassed solvent is saturated with gas as it flows through a glass spiral containing the gas. The amount of solvent passed through the spiral is such that 10-25 ml of gas was absorbed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. No source given. The gas purified over activated charcoal at liquid air temperature. Impurities estimated to be less than 0.3 percent.
2. Benzene. No source given. Benzene distilled immediately before use.

ESTIMATED ERROR:

$\delta T/K = 0.05$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; Ibid. 1952, 3819.
2. Clever, H. L.; Battino, R. Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Methylbenzene (Toluene); C_7H_8; 108-88-3	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 U.S.A. March 1978

CRITICAL EVALUATION:

The solubility of neon in methylbenzene was measured by Saylor and Battino (1) and by de Wet (2).

Each data set was smoothed by the method of least squares to a Gibbs energy equation linear in temperature. The de Wet smoothed solubility values ranged from 2 percent higher at 288.15 to 12 percent higher at 308.15 K than the Saylor and Battino smoothed values.

The seven solubility values from the two laboratories were combined to obtain the recommended equation. No point fell as much as two standard deviations from the method of least squares fit toa Gibbs energy equation linear in temperature.

The recommended thermodynamic values for the transfer of neon from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

$$\Delta G°/J\ mol^{-1} = -\ RT\ \ln X_1 = 7{,}767.3 + 47.522\ T$$

Std. Dev. $\Delta G°$ = 69, Coef. Corr. = 0.9943

$$\Delta H°/J\ mol^{-1} = 7{,}767.3,\quad \Delta S°/J\ K^{-1}\ mol^{-1} = -47.522$$

The recommended values of the mole fraction solubility at 101.325 kPa and the Gibbs energy of solution are given as a function of temperature in Table 1.

TABLE 1. Solubility of neon in methylbenzene at 101.325 kPa. Recommended mole fraction solubility and Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction[a] $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	1.285	21,461
293.15	1.360	21,699
298.15	1.435	21,936
303.15	1.510	22,173
308.15	1.590	22,411
313.15	1.670	22,649
318.15	1.750	22,887
323.15	1.830	23,124
328.15	1.910	23,362

[a] Values rounded to nearest 0.005×10^{-4}.

1. Saylor, J. H.; Battino, R. J. Phys. Chem. 1958, 62, 1334.
2. de Wet, W. J. J. S. Afr. Chem. Inst. 1964, 17, 9.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Methylbenzene (Toluene); C_7H_8; 108-88-3

ORIGINAL MEASUREMENTS:

Saylor, J. H.; Battino, R.

J. Phys. Chem. 1958, *62*, 1334 - 1337.

VARIABLES:

T/K: 288.15 - 328.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	1.26	2.66	2.81
298.15	1.40	2.94	3.21
313.15	1.62	3.35	3.84
328.15	1.91	3.89	4.67

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 8,146.5 + 46.441\ T$

Std. Dev. $\Delta G°$ = 25.9, Coef. Corr. = 0.9995

$\Delta H°/J\ mol^{-1} = 8,146.5$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -46.441$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	1.25	21,529
293.15	1.33	21,761
298.15	1.40	21,993
303.15	1.48	22,225
308.15	1.56	22,457
313.15	1.64	22,690
318.15	1.72	22,927
323.15	1.81	23,154
328.15	1.89	23,386

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.
The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric. The solvent is saturated with gas as it flows through an 8 mm x 180 cm glass spiral attached to a gas buret. The total pressure is maintained at 1 atm as the gas is absorbed.

APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modification of the method of Baldwin and Daniel (2).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Research grade.
2. Toluene. Mallinckrodt. Reagent grade. Shaken over conc. H_2SO_4, water washed, dried over Drierite, distilled b.p. 110.40 - 110.60° C.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/torr = 1$
$\delta X_1/X_1 = 0.04$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid.* 1952, 3819.
2. Baldwin, R. R.; Daniel, S. G. *J. Appl. Chem.* 1952, *2*, 161.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Methylbenzene (Toluene); C_7H_8; 108-88-3	de Wet, W. J. *J. S. Afr. Chem. Inst.* 1964, *17*, 9 - 13.
VARIABLES: T/K: 292.15 - 304.15 P/kPa: 101.325 (1 atm)	PREPARED BY: P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
292.15	1.35	2.85	3.05
299.35	1.50	3.14	3.44
304.15	1.59	3.32	3.70

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 10{,}115 + 39.447\ T$

Std. Dev. $\Delta G°$ = 8.0, Coef. Corr. = 0.9994

For the recommended free energy equation see the critical evaluation of the solubility of neon in toluene.

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric.

To degas, the solvent is placed in a large continuously evacuated bulb until the solvent boils freely without further release of dissolved gases.

To saturate, the solvent is flowed in a thin film through a glass spiral containing the gas. The volume of gas absorbed is measured on an attached buret system.

APPARATUS/PROCEDURE:

The apparatus is a modification of that used by Morrison and Billett (1) and others (2). The degassed solvent is saturated with gas as it flows through a glass spiral containing the gas. The amount of solvent passed through the spiral was such that 10-25 ml of gas was absorbed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. No source given. The gas purified over activated charcoal at liquid air temperature. Impurities estimated to be less than 0.3 percent.
2. Toluene. No source given. Toluene distilled immediately before use.

ESTIMATED ERROR:

$\delta T/K = 0.05$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *Ibid.* 1952, 3819.
2. Clever, H. L.; Battino, R. Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. 1,2-Dimethylbenzene (o-Xylene); C_8H_{10}; 95-47-6

ORIGINAL MEASUREMENTS:

Byrne, J.E.; Battino, R.; Wilhelm, E.

J. Chem. Thermodyn. 1975, 7, 515-522.

VARIABLES:

T/K: 298.13 - 298.19
P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.13	1.412	2.61	2.849
298.15	1.352	2.50	2.729
298.19	1.395	2.58	2.816

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.

Solubility Determination. The degassed solvent is passed in a thin film down a glass spiral tube containing the solute gas and the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Either Air Products & Chemicals,Inc., or Matheson Co., Inc. 99 mol % or better.

2. 1,2-Dimethylbenzene. Phillips Petroleum Co. Pure grade.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.

2. Battino, R.; Evans, F.D.; Danforth, W.F. J. Am. Oil Chem. Soc. 1968, 45, 830.

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. 1,3-Dimethylbenzene (m-Xylene); C_8H_{10}; 108-38-3	H. L. Clever Chemistry Department Emory University Atlanta, Georgia 30322 U.S.A. USA March 1978

CRITICAL EVALUATION:

The solubility of neon in 1,3-dimethylbenzene was measured in two laboratories. Three solubility values between 291.65 and 305.25 K were reported by de Wet (1), and two solubility values at 298.17 and 298.18 K were reported by Byrne, Battino, and Wilhelm (2).

The de Wet solubility values at 299.25 K and the average of the Byrne, Battino and Wilhelm values at 298.17 and 298.18 K fall within the expected experimental error of 3 per cent. All data points were combined on a one to one weight basis to obtain the recommended Gibbs energy equation linear in temperature by the method of least squares.

The recommended thermodynamic values for the transfer of one mole of neon from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

$$\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 10{,}187 + 38.421\ T$$

Std. Dev. $\Delta G°$ = 49, Coef. Corr. = 0.9670

$$\Delta H°/J\ mol^{-1} = 10{,}187, \quad \Delta S°/J\ K^{-1}\ mol^{-1} = -38.421$$

The recommended mole fraction solubilities at 101.325 kPa and the Gibbs energy changes at five degree intervals between 288.15 and 308.15 K are given in Table 1.

TABLE 1. Solubility of neon in 1,3-dimethylbenzene. Recommended mole fraction solubility and Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction[a] $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
288.15	1.400	21,259
293.15	1.505	21,451
298.15	1.615	21,643
303.15	1.730	21,835
308.15	1.845	22,027

[a] rounded to the nearest 0.005×10^{-4}.

1. de Wet, W. J. *J. S. Afr. Chem. Inst.* 1964, *17*, 9.
2. Byrne, J. E.; Battino, R.; Wilhelm, E. *J. Chem. Thermodyn.* 1975, *7*, 515.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. 1,3-Dimethylbenzene (m-Xylene); C_8H_{10}; 108-38-3

ORIGINAL MEASUREMENTS:

de Wet, W. J.

J. S. Afr. Chem. Inst. 1964, *17*, 9 - 13.

VARIABLES:

T/K: 291.65 - 305.25
P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
291.65	1.47	2.69	2.87
299.25	1.66	3.01	3.30
305.25	1.77	3.19	3.56

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 10,161 + 38.493\ T$

Std. Dev. $\Delta G°$ = 22.5, Coef. Corr. = 0.9963

For the recommended free energy equation see the critical evaluation of the solubility of neon in m-xylene.

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric.

To degas, the solvent is placed in a large continuously evacuated bulb until the solvent boils freely without further release of dissolved gases.

To saturate, the solvent is flowed in a thin film through a glass spiral containing the gas. The volume of gas absorbed is measured on an attached buret system.

APPARATUS/PROCEDURE:

The apparatus is a modification of that used by Morrison and Billett (1) and others (2). The degassed solvent is saturated with gas as it flows through a glass spiral containing the gas. The amount of solvent passed through the spiral was such that 10-25 ml of gas was absorbed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. No source given. The gas purified over activated charcoal at liquid air temperature. Impurities estimated to be less than 0.3 percent.
2. m-Xylene. No source given. m-Xylene distilled immediately before use.

ESTIMATED ERROR:

$\delta T/K = 0.05$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid.* 1952, 3819.
2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. 1,3-Dimethylbenzene (*m*-Xylene); C_8H_{10}; 108-38-3	Byrne, J. E.; Battino, R.; Wilhelm, E. *J. Chem. Thermodyn.* 1975, 7, 515-522.
VARIABLES:	PREPARED BY:
T/K: 298.17 - 298.18 P/kPa: 101.325 (1 atm)	H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.17	1.654	3.00	3.277
298.18	1.570	2.85	3.109

The Bunsen coefficients were calculated by the compiler.

The solubility values were adjusted to neon partial pressure of 101.325 kPa (1 atm) by Henry's law.

See the evaluation of neon + 1,3-dimethylbenzene for the recommended Gibbs energy equation and smoothed values of solubility.

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

APPARATUS/PROCEDURE: Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns. Solubility Determination. The degassed solvent passes in thin film down a glass spiral at a total pressure of one atm of solute gas plus solvent vapor. Solubility equilibrium is rapidly attained. The volume of gas absorbed is measured, and the solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Either Air Products and Chemicals, Inc., or Matheson Co., Inc. 99 mole % or better.
2. m-Xylene. Phillips Petroleum Co., pure grade.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* 1948, 2033.
2. Battino, R.; Evans, F. D.; Danforth, W. F. *J. Am. Oil Chem. Soc.* 1968, 45, 830.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. 1,4-Dimethylbenzene (p-Xylene); C_8H_{10}; 106-42-3

ORIGINAL MEASUREMENTS:

Byrne, J.E.; Battino, R.; Wilhelm, E.

J. Chem. Thermodyn. 1975, 7, 515-522.

VARIABLES:

T/K: 298.12 - 298.21
P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.12	1.563	2.83	3.085
298.16	1.528	2.76	3.016
298.17	1.524	2.76	3.008
298.21	1.553	2.81	3.066

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.

Solubility Determination. The degassed solvent passes in a thin film down a glass spiral tube containing the solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final gas volume in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Either Air Products & Chemicals, Inc., or Matheson Co., Inc. 99 mol % or better.
2. 1,4 Dimethylbenzene. Phillips Petroleum Co. Pure grade.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. J. Am. Oil Chem. Soc. 1968, 45, 830.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Methanol (Methyl Alcohol); CH_4O; 67-56-1

ORIGINAL MEASUREMENTS:

Lannung, A.

J. Am. Chem. Soc. 1930, *52*, 68-80.

VARIABLES:

T/K: 288.15 - 310.15

Ne P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.742	4.13	4.36
293.15	0.780	4.32	4.64
293.15	0.773	4.28	4.59
303.15	0.841	4.60	5.11
310.15	0.881	4.78	5.43

Smoothed Data: $\Delta G^{\circ}/J\ mol^{-1} = -RT \ln X_1 = 5{,}781.5 + 58.970\ T$

Std. Dev. $\Delta G^{\circ} = 10.1$, Coef. Corr. = 0.9998

$\Delta H^{\circ}/J\ mol^{-1} = 5{,}781.5$, $\Delta S^{\circ}/J\ K^{-1}\ mol^{-1} = -58.970$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^{\circ}/J\ mol^{-1}$
288.15	0.744	22774
293.15	0.775	23068
298.15	0.807	23363
303.15	0.839	23658
308.15	0.870	23953
313.15	0.902	24248

The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Gas absorption. The gas is pre-saturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced.

APPARATUS/PROCEDURE:

The apparatus is a modification of that of von Antropoff (1). A calibrated, combined all glass manometer and bulb is enclosed in an air thermostat. Mercury is used as the calibration and confining liquid. The solvent is degassed in the apparatus. The solvent and the gas are shaken together until equilibrium is established.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Linde's Liquid Air Factory. Contained 1 per cent by volume of helium.
2. Methanol. B.A.S.F. Distilled from freshly cut magnesium strips. First one-third rejected.

ESTIMATED ERROR:

$\delta T/K = 0.03$

REFERENCES:

1. v. Antropoff, A. *Z. Electrochem.* 1919, *25*, 269.

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Ethanol (Ethyl Alcohol); C_2H_6O; 64-17-5	H. L. Clever Chemistry Department Emory University Atlanta, GA 30322 U.S.A. April 1978

CRITICAL EVALUATION:

The solubility of neon in ethanol was measured by Lannung (1) and by Krestov and Patsatsiya (2).

The Krestov and Patsatsiya data were reported as absorption coefficients which were equivalent to Bunsen coefficients at a gas partial pressure of (760-solvent vapor pressure) mmHg. The Krestov and Patsatsiya data were recalculated as mole fraction solubilities at 101.325 kPa (1 atm) assuming that the gas is ideal and that Henry's law is obeyed.

The mole fraction solubilities from each laboratory were smoothed by the method of least squares to a Gibbs energy function linear in temperature. The smoothed solubility values from the two laboratories agree within 2.0 per cent at 288.15 K and 1.6 per cent at 313.15 K. The agreement is well within the expected experimental error. All of the solubility values from both laboratories were used on a one to one weight basis to obtain the recommended Gibbs energy equation linear in temperature by the method of least squares.

The recommended thermodynamic values for the transfer of one mole of neon gas at 101.325 kPa to the hypothetical unit mole fraction solution are

$$\Delta G°/\text{J mol}^{-1} = - RT \ln X_1 = 6{,}123.8 + 55.307\ T$$

$$\text{Std. Dev. } \Delta G° = 46.6, \text{ Coef. Corr.} = 0.9963$$

$$\Delta H°/\text{J mol}^{-1} = 6{,}123.8, \ \Delta S°/\text{J K}^{-1}\text{ mol}^{-1} = -55.307$$

The recommended mole fraction solubilities at 101.325 kPa and the Gibbs energy changes between 283.15 and 313.15 K are given in Table 1.

TABLE 1. Solubility of neon in ethanol. Recommended mole fraction solubility and Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction[a] $X_1 \times 10^4$	$\Delta G°/\text{J mol}^{-1}$
283.15	0.960	21,784
288.15	1.000	22,061
293.15	1.045	22,337
298.15	1.090	22,614
303.15	1.135	22,890
308.15	1.185	23,167
313.15	1.230	23,443

[a] Rounded to the nearest 0.005×10^{-4}

1. Lannung, A. *J. Am. Chem. Soc.* 1930, *52*, 68.
2. Krestov, G. A.; Patsatsiya, K. M. *Izv. Vyssh. Uchebn. Zaved., Khim. Khim. Tekhnol.* 1969, *12*, 1333.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Ethanol (Ethyl Alcohol); C_2H_6O; 64-17-5	Lannung, A. *J. Am. Chem. Soc.* 1930, *52*, 68-80.
VARIABLES:	PREPARED BY:
T/K: 288.15 - 310.15 Ne P/kPa: 101.325 (1 atm)	P.L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.987	3.81	4.02
288.15	0.984	3.80	4.01
293.15	1.04	3.98	4.27
293.15	1.06	4.07	4.37
298.15	1.09	4.17	4.55
310.15	1.18	4.43	5.03

Smoothed Data: $\Delta G^{\circ}/J\ mol^{-1} = -RT \ln X_1 = 5992.0 + 55.820\ T$

Std. Dev. ΔG° = 29.2, Coef. Corr. = 0.9980

$\Delta H^{\circ}/J\ mol^{-1} = 5992.0$, $\Delta S^{\circ}/J\ K^{-1}\ mol^{-1} = -55.820$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^{\circ}/J\ mol^{-1}$
288.15	0.996	22076
293.15	1.04	22356
298.15	1.08	22635
303.15	1.13	22914
308.15	1.17	23193
313.15	1.22	23472

The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced.

APPARATUS/PROCEDURE:

The apparatus is a modification of that of von Antropoff (1). A calibrated, combined all glass manometer and bulb is enclosed in an air thermostat. Mercury is used as the calibration and confining liquid. The solvent is degassed in the apparatus. The solvent and the gas are shaken together until equilibrium is established.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Linde's Liquid Air Factory. Contained 1 per cent by volume of helium.
2. Ethanol. Alcohol absolutus, Ph. dan. Distilled twice from freshly prepared calcium oxide.

ESTIMATED ERROR:

$\delta T/K = 0.03$

REFERENCES:

1. v. Antropoff, A. *Z. Electrochem.* 1919, *25*, 269.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Ethanol (Ethyl Alcohol); C_2H_6O; 64-17-5

ORIGINAL MEASUREMENTS:

Krestov, G.A.; Patsatsiya, K.M.

Izv. Vyssh. Uchebn. Zaved., Khim. Khim. Tekhnol. 1969, 12, 1333 - 1337.

VARIABLES:

T/K: 283.15 -313.15

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Neon P/mmHg	Bunsen Coefficient $\alpha \times 10^2$	Calculated Values for Ne P/kPa = 101.325 (760 mmHg) Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
283.15	736.0	3.726	0.991	3.848	3.989
293.15	715.4	3.772	1.043	4.007	4.300
303.15	680.8	3.826	1.124	4.271	4.740
313.15	625.0	3.906	1.265	4.750	5.446

Smoothed Data: $\Delta G^0/J\ mol^{-1} = -RT \ln X_1 = 5{,}990.2 + 55.658\ T$

Std. Dev. ΔG^0 = 56.0 Coeff. Corr. 0.9969

For the recommended Gibbs energy equation see the page on the critical evaluation of the solubility of neon in ethanol.

The Evaluator calculated the solubility values at a pressure of neon of 101.325 kPa (760 mmHg). Ethanol vapor pressure and density values were taken from Wilhoit and Zwolinski (2). The neon partial pressures in the Table above were obtained by subtracting the ethanol vapor pressure from 760 mmHg.

See the data sheet on the solubility of neon in mixtures of water + ethanol for additional data from this paper.

AUXILIARY INFORMATION

METHOD:

The apparatus is a modification of the apparatus of Ben-Naim and Baer (1).

The authors label their solubility values as Ostwald coefficients at a total pressure on gas + solvent vapor of one atm. However, after reading some of the authors' other papers, the Evaluator is convinced that these are Bunsen coefficients measured at a gas partial pressure of (760 - solvent vapor pressure) mmHg. They are so treated in the Table above.

SOURCE AND PURITY OF MATERIALS:

No information given.

ESTIMATED ERROR:

$\delta\alpha/\alpha = 0.01$ (Compiler)

REFERENCES:

1. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.
2. Wilhoit, R.C; Zwolinski, B.J. "Physical and Thermodynamic Properties of Aliphatic Alcohols" American Chemical Society, 1973.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. 2-Methyl-1-propanol; $C_4H_{10}O$; 78-83-1

ORIGINAL MEASUREMENTS:

Battino, R.; Evans, F.D.; Danforth, W.F.; Wilhelm, E.

J. Chem. Thermodyn. 1971, *3*, 743-751.

VARIABLES:

T/K: 274.07 - 312.77
P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
274.07	1.31	3.23	3.24
283.01	1.41	3.45	3.57
298.40	1.53	3.70	4.04
312.77	1.65	3.92	4.49

Smoothed Data: $\Delta G^o = -RT \ln X_1 = 4151.4 + 59.127\,T$

Std. Dev. ΔG^o = 15.5, Coef. Corr. =0.9999

$\Delta H^o/J\ mol^{-1} = 4151.4$, $\Delta S^o/J\ K^{-1}\ mol^{-1} = -59.127$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^o/J\ mol^{-1}$
273.15	1.31	20302
278.15	1.35	20598
283.15	1.40	20893
288.15	1.44	21189
293.15	1.49	21484
298.15	1.53	21780
303.15	1.57	22076
308.15	1.61	22371
313.15	1.66	22667

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.
The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

A. Degasser (1). B. Absorption of gas in a thin film of liquid (2, 3).

APPARATUS/PROCEDURE:

Degassing. The solvent is sprayed into an evacuated chamber of an all glass apparatus; it is stirred and heated until the pressure drops to the vapor pressure of the liquid.

Solubility Determination. The degassed liquid passes in a thin film down a glass spiral tube at a total pressure of one atm of solute gas plus solvent vapor. The gas absorbed is measured in the attached buret system, and the solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. The Matheson Co., Inc. Greater than 99 mol %.
2. 2-Methyl-1-propanol. Fisher Scientific Co. Certified (99 mol %).

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.015$

REFERENCES:

1. Battino, R.; Evans, D.F. *Anal. Chem.* 1966, *38*, 1627.
2. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1948, 2033.
3. Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. 1-Octanol; $C_8H_{18}O$; 111-87-5	Wilcock, R.J.; Battino, R.; Danforth, W.F; Wilhelm, E. J.Chem.Thermodyn. 1978, 10, 817-822.
VARIABLES: T/K: 298.08 P/kPa: 101.325 (1 atm)	PREPARED BY: A.L. Cramer

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.08	1.693	2.397	2.616

The solubility value was adjusted to a partial pressure of neon of 101.325 kPa by Henry's law.

The Bunsen coefficients were calculated by the compiler.

A preliminary report of the work appeared in Conf. Int. Thermodyn. Chim., {C.R.}, 4th 1975, 6, 122 - 128; Chem. Abstr. 1977, 86, 22375d.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The apparatus is based on the design of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3).

See neon + octane data sheet for more details.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co. Inc. Purest commercially available grade.
2. 1-Octanol. Eastman organic chemicals. Distilled.

ESTIMATED ERROR:

$\delta T/K = 0.03$

$\delta P/mmHg = 0.5$

$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. J.Am.Oil Chem. Soc. 1968, 45, 830.
3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. Anal. Chem. 1971, 43, 806.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. 1-Decanol; $C_{10}H_{22}O$; 112-30-1

ORIGINAL MEASUREMENTS:

Wilcock, R.J.; Battino, R.; Danforth, W.F; Wilhelm, E.

J.Chem.Thermodyn. 1978, 10, 817-822.

VARIABLES:

T/K: 298.09
P/kPa: 101.325 (1 atm)

PREPARED BY:

A.L. Cramer

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.09	1.978	2.316	2.527

The solubility value was adjusted to a partial pressure of neon of 101.325 kPa by Henry's law.

The Bunsen coefficients were calculated by the compiler.

A preliminary report of the work appeared in *Conf. Int. Thermodyn. Chim.*, {C.R.}, 4th 1975, 6, 122 - 128; *Chem. Abstr.* 1977, 86, 22375d.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The apparatus is based on the design of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3).

See neon + octane data sheet for more details.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co. Inc. Purest commercially available grade.
2. 1-Decanol. Eastman Organic Chemicals. Distilled.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. *J.Am.Oil Chem. Soc.* 1968, 45, 830.
3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. *Anal. Chem.* 1971, 43, 806.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Cyclohexanol; $C_6H_{12}O$; 108-93-0

ORIGINAL MEASUREMENTS:

Lannung, A.

J. Am. Chem. Soc. 1930, *52*, 68-80.

VARIABLES:

T/K: 298.15 - 310.15

Ne P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.15	0.714	1.51	1.65
298.15	0.723	1.53	1.67
303.15	0.759	1.60	1.78
310.15	0.807	1.69	1.92
310.15	0.831	1.74	1.98

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 8386.6 + 51.199\ T$

Std. Dev. ΔG^o = 28.9, Coef. Corr. = 0.9956

$\Delta H^o/J\ mol^{-1} = 8386.6$, $\Delta S^o/J\ K^{-1}\ mol^{-1} = -51.199$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^o/J\ mol^{-1}$
298.15	0.718	23652
303.15	0.760	23908
308.15	0.802	24164
313.15	0.845	24420

The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.

The solubility of neon in cyclohexanol reported by G. Cauquil *J. Chim. Phys.* 1927, *68*, 53 is unsatisfactory and should not be used.

AUXILIARY INFORMATION

METHOD:

Gas absorption. The gas is pre-saturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced.

APPARATUS/PROCEDURE:

The apparatus is a modification of that of von Antropoff (1). A calibrated, combined all glass manometer and bulb is enclosed in an air thermostat. Mercury is used as the calibration and confining liquid. The solvent is degassed in the apparatus. The solvent and the gas are shaken together until equilibrium is established.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Linde's Liquid Air Factory, Contained 1 per cent by volume of helium.
2. Cyclohexanol. "pur", Poulenc Freres, fractionated twice *in vacuo*; used portion with m.p. = 23.6 - 23.9 °C.

ESTIMATED ERROR:

$\delta T/K = 0.03$

REFERENCES:

1. v. Antropoff, A. *Z. Electrochem.* 1919, *25*, 269.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. 2-Propanone (Acetone); C_3H_6O; 67-64-1	Lannung, A. *J. Am. Chem. Soc.* 1930, *52*, 68-80.
VARIABLES: T/K: 288.15 - 298.15 Ne P/kPa: 101.325 (1 atm)	PREPARED BY: P.L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	1.39	4.28	4.52
288.15	1.33	4.10	4.33
293.15	1.49	4.56	4.89
293.15	1.54	4.70	5.04
293.15	1.41	4.30	4.61
298.15	1.59	4.82	5.26
298.15	1.64	4.98	5.44
298.15	1.48	4.50	4.91

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 10072 + 39.025\ T$

Std. Dev. $\Delta G^o = 96.1$, Coef. Corr. = 0.8611

$\Delta H^o/J\ mol^{-1} = 10072$, $\Delta S^o/J\ K^{-1}\ mol^{-1} = -39.025$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^o/J\ mol^{-1}$
288.15	1.37	21317
293.15	1.47	21512
298.15	1.57	21707

The mole fraction solubility and the Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Gas absorption. The gas is pre-saturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Linde's Liquid Air Factory. Contained 1 per cent by volume of helium.
2. Acetone. Kahlbaum's "Zur Analyse." Used after tests showed absence of water, acid and aldehyde.

APPARATUS/PROCEDURE:

The apparatus is a modification of that of von Antropoff (1). A calibrated, combined all glass manometer and bulb is enclosed in an air thermostat. Mercury is used as the calibration and confining liquid. The solvent is degassed in the apparatus. The solvent and the gas are shaken together until equilibrium is established.

ESTIMATED ERROR:

$\delta T/K = 0.03$

REFERENCES:

1. v. Antropoff, A. *Z. Electrochem.* 1919, *25*, 269.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Undecafluoro(trifluoromethyl)-cyclohexane (Perfluoromethyl-cyclohexane); C_7F_{14}; 355-02-2	Clever, H.L.; Saylor, J.H.; Gross, P.M. *J. Phys. Chem.* 1958, *62*, 89-91.
VARIABLES: T/K: 289.15 - 316.25 P/kPa: 101.325 (1 atm)	PREPARED BY: P.L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
289.15	10.8	12.5	13.2
303.15	11.5	13.2	14.6
316.25	12.2	13.6	15.7

Smoothed Data: $\Delta G^\circ/\text{J mol}^{-1} = - RT \ln X_1 = 3420.2 + 44.973\ T$

Std. Dev. $\Delta G^\circ = 4.2$, Coef. Corr. = 0.9999

$\Delta H^\circ/\text{J mol}^{-1} = 3420.2$, $\Delta S^\circ/\text{J K}^{-1}\text{ mol}^{-1} = -44.973$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^\circ/\text{J mol}^{-1}$
288.15	10.7	16379
293.15	11.0	16604
298.15	11.3	16829
303.15	11.5	17054
308.15	11.8	17279
313.15	12.0	17503
318.15	12.3	17728

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Volumetric. The apparatus (1) is a modification of that used by Morrison and Billett (2). Modifications include the addition of a spiral solvent storage tubing, a manometer for constant reference pressure, and an extra gas buret for highly soluble gases.

APPARATUS/PROCEDURE:

(a) Degassing. 700 ml of solvent is shaken and evacuated while attached to a cold trap, until no bubbles are seen; solvent is then transferred through a 1 mm. capillary tubing, released as a fine mist into a continuously evacuated flask. (b) Solvent is saturated with gas as it flows through 8 mm x 180 cm of tubing attached to a gas buret. Pressure is maintained at 1 atm as the gas is absorbed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Both standard and research grades were used.
2. Perfluoromethylcyclohexane. du Pont FCS-326, shaken with concentrated H_2SO_4, washed, dried over Drierite and distilled. b.p. 75.95 to 76.05° at 753 mm., lit. b.p. 76.14 at 760 mm.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/\text{mmHg} = 3$
$\delta X_1/X_1 = 0.03$

REFERENCES:

1. Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M. *J. Phys. Chem.* 1957, *61*, 1078.
2. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid.* 1952, 3819.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Hexafluorobenzene; C_6F_6; 392-56-3

ORIGINAL MEASUREMENTS:

Evans, F.D.; Battino, R.

J. Chem. Thermodyn. 1971, *3*, 753-760.

VARIABLES:

T/K: 282.91 - 298.14
P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
282.91	2.66	5.25	5.44
283.35	2.71	5.35	5.55
297.83	3.43	6.64	7.24
298.14	3.47	6.71	7.32

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 11850 + 26.514\ T$

Std. Dev. $\Delta G^o = 12.4$, Coef. Corr. = 0.9987

$\Delta H^o/J\ mol^{-1} = 11850$, $\Delta S^o/J\ K^{-1}\ mol^{-1} = 26.514$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^o/J\ mol^{-1}$
278.15	2.45	19225
283.15	2.69	19357
288.15	2.93	19490
293.15	3.19	19622
298.15	3.46	19755

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2).

APPARATUS/PROCEDURE:

Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.

Solubility Determination. The degassed solvent passes in a thin film down a glass spiral tube containing the solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final gas volume in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Either Air Products & Chemicals, Inc., or Matheson Co., Inc. Better than 99 mol % (usually 99.9+).
2. Hexafluorobenzene. Imperial Smelting Co., Avonmouth, U.K. GC purity 99.7%, density at 25°C 1.60596 g cm^{-3}. Purified by see: *Anal. Chem.* 1968, *40*, 224.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.015$

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. *J. Am. Oil Chem. Soc.* 1968, *45*, 830.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Fluorobenzene; C_6H_5F; 462-06-6

ORIGINAL MEASUREMENTS:

Saylor, J. H.; Battino, R.

J. Phys. Chem. 1958, 62, 1334-1337.

VARIABLES:

T/K: 288.15 - 328.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	1.46	3.50	3.69
298.15	1.52	3.62	3.95
313.15	1.84	4.28	4.91
328.15	2.07	4.72	5.67

Smoothed Data: $\Delta G^\circ/J\ mol^{-1} = -RT \ln X_1 = 7313.1 + 48.254\ T$

Std. Dev. $\Delta G^\circ = 66.2$, Coef. Corr. = 0.9969

$\Delta H^\circ/J\ mol^{-1} = 7313.1$, $\Delta S^\circ/J\ K^{-1}\ mol^{-1} = -48.254$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^\circ/J\ mol^{-1}$
288.15	1.42	21218
293.15	1.50	21459
298.15	1.58	21700
303.15	1.66	21941
308.15	1.74	22183
313.15	1.82	22424
318.15	1.90	22665
323.15	1.98	22906
328.15	2.07	23148

AUXILIARY INFORMATION

METHOD:

The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Clever, Battino, Saylor, and Gross (2).

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

APPARATUS/PROCEDURE:

The degassed solvent is passed through a glass spiral tube containing the gas. The gas dissolves rapidly and the saturated liquid flows into a buret system. The volume of gas dissolved is determined by the increase in the solution level at constant pressure. The volume of liquid is determined in the burets. For low solubilities extra solvent is run through the buret system and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Research grade.
2. Fluorobenzene. Eastman White label. Dried over P_4O_{10}, distilled, b.p. 84.28-84.68 °C.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 1$
$\delta X_1/X_1 = 0.04$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Clever, H.L.: Battino, R.; Saylor, J.H.; Gross, P.M. J. Phys. Chem. 1957, 61, 1078.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113); $C_2Cl_3F_3$; 76-13-1

ORIGINAL MEASUREMENTS:

Linford, R.G.; Hildebrand, J.H.

Trans. Faraday Soc. 1970, *66*, 577-581.

VARIABLES:

T/K: 279.25 - 298.15
Ne P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
279.25	4.22	8.11	8.29
283.81	4.37	8.34	8.67
287.05	4.46	8.48	8.91
290.35	4.57	8.64	9.18
292.37	4.65	8.76	9.38
294.55	4.73	8.89	9.59
298.15	4.86	9.09	9.92

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = 5160.2 + 46.145\ T$

Std. Dev. $\Delta G°$ = 5.5, Coef. Corr. = 0.9998

$\Delta H°/J\ mol^{-1} = 5160.2$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -46.145$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
278.15	4.17	17,995
283.15	4.34	18,226
288.15	4.51	18,457
293.15	4.68	18,688
298.15	4.85	18,918

The Bunsen and Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Saturation of liquid with gas at a partial pressure of gas equal to 1 atm.

APPARATUS/PROCEDURE:

Dymond-Hildebrand apparatus (1) which uses an all-glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is calculated from initial and final pressures.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Source not given. Purest commercially obtainable, dried before use.
2. 1,1,2-Trichloro-1,2,2-trifluoroethane. Matheson, Coleman and Bell. Spectroquality.

ESTIMATED ERROR:

$\delta X_1/X_1 = 0.01$ (Evaluator)

REFERENCES:

1. Dymond, J. H.; Hildebrand, J. H. *Ind. Eng. Chem. Fundam.* 1967, *6*, 130.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. 1,1,2,2-Tetrachloroethane; $C_2H_2Cl_4$; 79-34-5

ORIGINAL MEASUREMENTS:

de Wet, W.J.

J. S. Afr. Chem. Inst. 1964, *17*, 9-13.

VARIABLES:

T/K: 291.45 - 304.95
P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
291.45	1.39	2.96	3.16
298.85	1.50	3.17	3.47
304.95	1.61	3.40	3.80

Smoothed Data: $\Delta G^\circ/\text{J mol}^{-1} = -RT \ln X_1 = 8026.4 + 46.315\,T$

Std. Dev. ΔG° = 8.6, Coef. Corr. = 0.9996

$\Delta H^\circ/\text{J mol}^{-1} = 8026.4$, $\Delta S/\text{J K}^{-1}\text{ mol}^{-1} = -46.315$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^\circ/\text{J mol}^{-1}$
288.15	1.34	21372
293.15	1.41	21604
298.15	1.49	21835
303.15	1.58	22067
308.15	1.66	22299

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The mole fraction solubility and Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD: Volumetric.

To degas, the solvent is placed in a large continuously evacuated bulb until the solvent boils freely without further release of dissolved gases.

To saturate, the solvent flows in a thin film through a glass spiral containing the gas. The volume of gas absorbed is measured on an attached buret system.

APPARATUS/PROCEDURE:

The apparatus is a modification of that used by Morrison and Billett (1) and others (2). The degassed solvent is saturated with gas as it flows through a glass spiral containing the gas. The amount of solvent passing through the spiral is such that 10-25 ml of gas was absorbed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. No source given. The gas purified over activated charcoal at liquid air temperature. Impurities estimated to be less than 0.3 percent.

2. 1,1,2,2,-Tetrachloroethane. No source given. 1,1,2,2,-Tetrachloroethane distilled immediately before use.

ESTIMATED ERROR:

$\delta T/K = 0.05$

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1948, 2033; *ibid.* 1952, 3819.

2. Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Chlorobenzene; C_6H_5Cl; 108-90-7

ORIGINAL MEASUREMENTS:

Saylor, J.H.; Battino, R.

J. Phys. Chem. 1958, *62*, 1334-1337.

VARIABLES:

T/K: 288.15 - 328.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.853	1.89	1.99
298.15	0.986	2.16	2.36
313.15	1.17	2.53	2.90
328.15	1.40	2.97	3.57

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 9630.0 + 44.457\ T$

Std. Dev. $\Delta G^o = 16.6$, Coef. Corr. = 0.9998

$\Delta H^o/J\ mol^{-1} = 9630.0$, $\Delta S^o/J\ K^{-1}\ mol^{-1} = -44.457$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^o/J\ mol^{-1}$
288.15	0.86	22440
293.15	0.92	22663
298.15	0.98	22885
303.15	1.04	23107
308.15	1.11	23329
313.15	1.18	23552
318.15	1.25	23774
323.15	1.32	23996
328.15	1.40	24219

AUXILIARY INFORMATION

METHOD:

The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Clever, Battino, Saylor, and Gross (2).

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

APPARATUS/PROCEDURE:

The degassed solvent is passed through a glass spiral tube containing the gas. The gas dissolves rapidly and the saturated liquid flows into a buret system. The volume of gas dissolved is determined by the increase in the solution level at constant pressure. The volume of liquid is determined in the burets. For low solubilities extra solvent is run through the buret system and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Research grade.
2. Chlorobenzene, Eastman white label. Dried over P_4O_{10}, distilled, b.p. 131.67 - 131.71 °C.

ESTIMATED ERROR:

$\delta T/K = 0.03$

$\delta P/mmHg = 1$

$\delta X_1/X_1 = 0.04$

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1948, 2033.
2. Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Bromobenzene; C_6H_5Br; 108-86-1

ORIGINAL MEASUREMENTS:

Saylor, J.H.; Battino, R.

J. Phys. Chem. 1958, 62, 1334-1337.

VARIABLES:

T/K: 288.15 - 328.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.706	1.52	1.60
298.15	0.771	1.64	1.79
313.15	0.932	1.95	2.24
328.15	1.07	2.21	2.66

Smoothed Data: $\Delta G^\circ/J\ mol^{-1} = -RT\ ln\ X_1 = 8405.2 + 50.394\ T$

Std. Dev. ΔG° = 33.3, Coef. Corr. = 0.9993

$\Delta H^\circ/J\ mol^{-1} = 8405.2$, $\Delta S^\circ/J\ K^{-1}\ mol^{-1} = -50.394$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^\circ/J\ mol^{-1}$
288.15	0.698	22926
293.15	0.741	23178
298.15	0.786	23430
303.15	0.831	23682
308.15	0.877	23934
313.15	0.924	24186
318.15	0.972	24438
323.15	1.02	24690
328.15	1.07	24942

AUXILIARY INFORMATION

METHOD:

The apparatus is based on the design by Morrison and Billett(1) and the version used is described by Clever, Battino, Saylor, and Gross (2).

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

APPARATUS/PROCEDURE:

The degassed solvent is passed through a glass spiral tube containing the gas. The gas dissolves rapidly and the saturated liquid flows into a buret system. The volume of gas dissolved is determined by the increase in the solution level at constant pressure. The volume of liquid is determined in the burets. For low solubilities extra solvent is run through the buret system and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Research grade.
2. Bromobenzene. Eastman, white label. Dried over P_4O_{10}, distilled, b.p. 155.86 - 155.90 °C.

ESTIMATED ERROR:

$\delta T/K = 0.03$

$\delta P/mmHg = 1$

$\delta X_1/X_1 = 0.04$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M. J. Phys. Chem. 1957, 61, 1078.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Iodobenzene; C_6H_5I; 591-50-4

ORIGINAL MEASUREMENTS:

Saylor, J.H.; Battino, R.

J. Phys. Chem. 1958, *62*, 1334-1337.

VARIABLES:

T/K: 288.15 - 328.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.452	0.910	0.960
298.15	0.539	1.08	1.18
313.15	0.621	1.23	1.41
328.15	0.787	1.53	1.84

Smoothed Data: $\Delta G^\circ/\text{J mol}^{-1} = -RT \ln X_1 = 10497 + 46.715\ T$

Std. Dev. $\Delta G^\circ = 70.3$, Coef. Corr. = 0.9963

$\Delta H^\circ/\text{J mol}^{-1} = 10497$, $\Delta S^\circ/\text{J K}^{-1}\text{ mol}^{-1} = -46.715$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^\circ/\text{J mol}^{-1}$
288.15	0.454	23958
293.15	0.489	24191
298.15	0.526	24425
303.15	0.564	24659
308.15	0.603	24892
313.15	0.644	25126
318.15	0.686	25359
323.15	0.730	25593
328.15	0.774	25826

AUXILIARY INFORMATION

METHOD:

The apparatus is based on the design by Morrison and Billett (1) and the version used is described by Clever, Battino, Saylor, and Gross (2).

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

APPARATUS/PROCEDURE:

The degassed solvent is passed through a glass spiral tube containing the gas. The gas dissolves rapidly and the saturated liquid flows into a buret system. The volume of gas dissolved is determined by the increase in the solution level at constant pressure. The volume of liquid is determined in the burets. For low solubilities extra solvent is run through the buret system and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Research grade.
2. Iodobenzene. Eastman, white label. Shaken with dil. aq. thiosulfate, washed with water, dried over P_4O_{10}, distilled 77.40 - 77.60 °C (20 mmHg).

ESTIMATED ERROR:

$\delta T/K = 0.03$

$\delta P/\text{mmHg} = 1$

$\delta X_1/X_1 = 0.04$

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1948, 2033.
2. Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Carbon Disulfide; CS_2; 75-15-0

ORIGINAL MEASUREMENTS:

Powell, R.J.

J. Chem. Eng. Data 1972, 17, 302-304.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$	$R \frac{\Delta \log X_1}{\Delta \log T} = N$
298.15	0.59	2.18	2.38	∿8.0

The author states that solubility measurements were made between 288.15 and 313.15 K, but only the solubility at 298.15 K was given in the paper. The slope $R(\Delta \log X_1/\Delta \log T)$ was given. The smoothed data below were calculated by the compiler from the slope in the form:

$$\log X_1 = \log(0.59 \times 10^{-4}) + (8.0/R) \log (T/298.15)$$

with R = 1.9872 cal K^{-1} mol^{-1}.

Smoothed Data:

T/K	Mol Fraction $X_1 \times 10^4$
273.15	0.41
278.15	0.45
283.15	0.48
288.15	0.51
293.15	0.55
298.15	0.59
303.15	0.63

The Bunsen and Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

APPARATUS/PROCEDURE:

Dymond and Hildebrand (1) apparatus which uses an all glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is calculated from the initial and final gas pressures. The solvent is degassed by freezing and pumping followed by boiling under reduced pressure.

SOURCE AND PURITY OF MATERIALS:

1. Neon. No source given. Research grade, dried over $CaCl_2$ before use.
2. Carbon disulfide. No source given. Spectrochemical grade.

ESTIMATED ERROR:

δN/cal K^{-1} mol^{-1} = 0.1
$\delta X_1/X_1$ = 0.002

REFERENCES:

1. Dymond, J.H.; Hildebrand, J.H. Ind. Eng. Chem. Fundam. 1967, 6, 130.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Sulfinylbismethane (Dimethyl Sulfoxide); C_2H_6OS (CH_3SOCH_3); 67-68-5

ORIGINAL MEASUREMENTS:

Dymond, J.H.

J. Phys. Chem. 1967, 71, 1829-1831.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

M.E. Derrick

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.15	0.368	1.16	1.27

The Bunsen and Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

The liquid is saturated with the gas at a gas partial pressure of 1 atm.

The apparatus is that described by Dymond and Hildebrand (1). The apparatus uses an all-glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is calculated from the initial and final gas pressure.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co. Dried.
2. Dimethyl Sulfoxide. Matheson, Coleman, and Bell Co. Spectro-quality reagent, dried, and a fraction frozen out. Melting pt.: 18.37°C.

ESTIMATED ERROR:

REFERENCES:

1. Dymond., J.; Hildebrand. J.H. Ind. Eng. Chem. Fundam. 1967, 6, 130.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Nitromethane; CH_3NO_2; 75-52-5

ORIGINAL MEASUREMENTS:

Friedman, H.L.

J. Am. Chem. Soc. 1954, 76, 3294-3297.

VARIABLES:

T/K: 298.00
P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.00			2.41
			2.49
	0.540	0.225	2.45 av.

The author reports Ostwald coefficients measured at about 700 mmHg. The Bunsen coefficient and the mole fraction solubility at 101.325 kPa (1 atm) were calculated by the compiler with the assumptions that the gas is ideal, and that Henry's law is obeyed.

AUXILIARY INFORMATION

METHOD:

Gas absorption. The method was essentially that employed by Eucken and Herzberg (1). Modifications included a magnetic stirring device instead of shaking the saturation vessel, and balancing the gas pressure against a column of mercury with electrical contacts instead of balancing the gas pressure against the atmosphere.

APPARATUS/PROCEDURE: The solvent was degassed by vacuum. The procedure, repeated 5-10 times, was to alternate 5-15 s evacuation and rapid stirring to produce cavitation. In the solubility measurement, gas, pre-saturated with solvent vapor, was brought into contact with about 80 ml of solvent in the saturation vessel. Initial conditions were established by a time extrapolation. Solubility equilibrium was approached from both under- and supersaturation by varying the rate.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Air Reduction Co. Reagent grade, 99.8 per cent pure by mass spectroscopy.
2. Nitromethane. Source not given. Distilled, dried by filtering at 253 K.

ESTIMATED ERROR:

$\delta T/K = 0.05$
$\delta P/mmHg = 0.3$
$\delta L/L = 0.03$

REFERENCES:

1. Euken, A.; Herzberg, G. Z. Phys. Chem. 1950, 195, 1.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Nitrobenzene; $C_6H_5NO_2$; 98-95-3

ORIGINAL MEASUREMENTS:

Saylor, J.H.; Battino, R.

J. Phys. Chem. 1958, *62*, 1334-1337.

VARIABLES:

T/K: 288.15 - 328.15

P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
288.15	0.317	0.698	0.736
298.15	0.509	1.12	1.22
313.15	0.575	1.24	1.42
328.15	0.676	1.44	1.73

Smoothed Data: $\Delta G^o/J\ mol^{-1} = -RT \ln X_1 = 13274 + 38.974\ T$

Std. Dev. ΔG^o = 300.4, Coef. Corr. = 0.9152

$\Delta H^o/J\ mol^{-1} = 13274$, $\Delta S^o/J\ K^{-1}\ mol^{-1} = -38.974$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G^o/J\ mol^{-1}$
288.15	0.361	24505
293.15	0.397	24700
298.15	0.435	24895
303.15	0.475	25089
308.15	0.518	25284
313.15	0.562	25479
318.15	0.609	25674
323.15	0.658	25869
328.15	0.710	26064

AUXILIARY INFORMATION

METHOD:

The apparatus is based on the design by Morrison and Billett(1) and the version used is described by Clever, Battino, Saylor, and Gross (2).

The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law.

The Bunsen coefficients were calculated by the compiler.

APPARATUS/PROCEDURE:

The degassed solvent is passed through a glass spiral tube containing the gas. The gas dissolves rapidly and the saturated liquid flows into a buret system. The volume of gas dissolved is determined by the increase in the solution level at constant pressure. The volume of liquid is determined in the burets. For low solubilities extra solvent is run through the buret system and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Research grade.
2. Nitrobenzene. Eastman, white label. Distilled from P_4O_{10}, reduced pressure of 10 mm of Hg, b.p. 81.0 - 81.2°C.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 1$
$\delta X_1/X_1 = 0.04$

REFERENCES:

1. Morrison, T.J.; Billett, F. *J. Chem. Soc.* 1948, 2033.
2. Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. 1,1,2,2,3,3,4,4,4-nonafluoro-N,N-bis(nonafluorobutyl)-1-butanamine (Perfluorotributylamine); $C_{12}F_{27}N$; 311-89-7.

ORIGINAL MEASUREMENTS:

Powell, R.J.

J. Chem. Eng. Data 1972, *17*, 302-304.

VARIABLES:

T/K: 298.15
P/kPa: 101.325 (1 atm)

PREPARED BY:

P.L. Long

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$	$R \frac{\Delta \log X_1}{\Delta \log T} = N$
298.15	16.79	10.5	11.5	2.76

The author states that solubility measurements were made between 288.15 and 313.15 K, but only the solubility at 298.15 K was given in the paper. The slope $R(\Delta \log X_1/\Delta \log T)$ was given. The smoothed data below were calculated by the compiler from the slope in the form:

$$\log X_1 = \log(16.79 \times 10^{-4}) + (2.76/R) \log(T/298.15)$$

with $R = 1.9872$ cal K^{-1} mol^{-1}.

Smoothed Data:

T/K	Mol Fraction $X_1 \times 10^4$
288.15	16.0
293.15	16.4
298.15	16.8
303.15	17.2
308.15	17.6
313.15	18.0
318.15	18.4

The Bunsen and Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

APPARATUS/PROCEDURE:

Dymond and Hildebrand (1) apparatus which uses an all glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is calculated from the initial and final gas pressures. The solvent is degassed by freezing and pumping followed by boiling under reduced pressure.

SOURCE AND PURITY OF MATERIALS:

1. Neon. No source given. Research grade, dried over $CaCl_2$ before use.
2. Perfluorotributylamine. Minnesota Mining & Manufacturing Co. Distilled, used portion boiling between 447.85-448.64 K which gave a single GLC peak.

   $d_{298.15} = 1.880$ g cm^{-3}.

ESTIMATED ERROR:

δ N/cal K^{-1} mol^{-1} = 0.1
$\delta X_1/X_1$ = 0.002

REFERENCES:

1. Dymond, J.H.; Hildebrand, J.H. *Ind. Eng. Chem. Fundam.* 1967, *6*, 130.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Octamethylcyclotetrasiloxane; $C_8H_{24}O_4Si_4$; 556-67-2

ORIGINAL MEASUREMENTS:

Wilcock, R.J.; McHale, J.L.; Battino, B.; Wilhelm, E.

Fluid Phase Equilib. 1978, *2*, 225-230.

VARIABLES:

T/K: 298.13

P/kPa: 101.325 (1 atm)

PREPARED BY:

H.L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
298.13	9.19	6.609	7.213

The solubility values were adjusted to a gas partial pressure of 101.325 kPa by Henry's law.

The Bunsen coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

The apparatus is based on the design of Morrison and Billett (1), and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus and procedure are described by Battino, Banzhof, Bogan, and Wilhelm (3).

Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.

Solubility Determination. The degassed solvent is passed in a thin film down a glass spiral tube containing the solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. Minimum mole per cent purity 99.99.
2. Octamethylcyclotetrasiloxane. General Electric Co. Distilled density of 298.15 K was 0.9500 g cm^{-3}.

ESTIMATED ERROR:

$\delta T/K = 0.03$

$\delta P/mmHg = 0.5$

$\delta X_1/X_1 = 0.02$

REFERENCES:

1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Battino, R.; Evans, F.D.; Danforth, W.F. *J. Am. Oil Chem. Soc.* 1968, *45*, 830.
3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. *Anal. Chem.* 1971, *43*, 806.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Neon; Ne; 7440-01-9 2. Argon; Ar; 7440-37-1	Karasz, F.E.; Halsey, G.D.Jr. *J. Chem. Phys.* 1958, *29*, 173 - 179.
VARIABLES: T/K: 83.91 - 87.45 P/kPa: 5.333 - 18.665 (4 - 14 cmHg)	PREPARED BY: P. L. Long

EXPERIMENTAL VALUES:

T/K	Henry's Constant $10^{-4}K$/cmHg	Mol Fraction At Ne Pressure 1 cmHg $X_1 \times 10^4$	Mol Fraction At Ne Pressure 76 cmHg $X_1 \times 10^4$
83.91	8.38	0.119	9.04
84.54	8.39	0.119	9.04
86.11	8.00	0.125	9.50
86.89	7.83	0.128	9.73
87.45	7.66	0.131	9.96

The authors did not present numerical values of their solubility data. The data were shown in two graphs: one was a Henry's law plot of Ne pressure against Ne mole fraction dissolved in argon; the other was a log K against 1/T plot. The compiler took log K values from the points on the second graph to obtain the values of Henry's constant given in the Table above. The compiler calculated the mole fraction solubility of neon in liquid argon at pressures of one and 76 cmHg from Henry's law.

The Henry's constant is $K/\text{cmHg} = (P_1/\text{cmHg})/X_1$.

Smoothed Data: For the mole fraction solubility values at 76 cmHg.

$$\Delta G^0/\text{J mol}^{-1} = -RT \ln X_1 = 1{,}731.5 + 37.716\ T$$

$$\text{Std. Dev. } \Delta G^0 = 5\ , \text{ Coef. Corr.} = 0.9956$$

$$\Delta H^0/\text{J mol}^{-1} = 1{,}731.5,\ \Delta S^0/\text{J K}^{-1}\text{ mol}^{-1} = -37.716$$

AUXILIARY INFORMATION

METHOD:

A measured amount of neon gas was placed in the cell with a measured amount of liquid argon. The pressure was recorded as a function of the amount of gas (isotherm) or as a function of temperature (isostere). Only the results from the isotherm runs are given above.

APPARATUS/PROCEDURE:

A stainless steel cell with one compartment for the solution and one compartment for pure liquid argon as a reference. The cell was suspended so that movement in one direction by an electromagnet agitated the solution. The argon vapor pressure checked with literature values (1).

SOURCE AND PURITY OF MATERIALS:

1. Neon. Air Reduction Co. Used as received in glass sealed bulbs.
2. Argon. Air Reduction Co. Used as received in glass sealed bulbs for the reference. The actual solvent was tank argon purified with titanium metal.

ESTIMATED ERROR:

$\delta T/K = 0.01$
$\delta P/\text{cmHg} = 0.002$
$\delta X_1/X_1 = 0.001$

REFERENCES:

1. Mallett, M. W. *Ind. Eng. Chem.* 1950, *42*, 2045.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Olive Oil

ORIGINAL MEASUREMENTS:

Ikels, K. G.

Technical Report
SAM-TDR-64-28, May 1964

VARIABLES:

T/K: 310.75
Total P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
310.75	1.930 ± .0077	2.20

The Bunsen coefficient uncertainty is the standard deviation.

The Ostwald coefficient was calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Van Slyke-gas chromatograph apparatus (1). Equilibration apparatus was a standard Van Slyke instrument to which a small water manometer was attached. The sample material was degassed *in vacuo* in the Van Slyke apparatus, gas was added, and the system agitated until equilibrium was reached. The saturated gas-liquid sample was passed from the Van Slyke apparatus to the gas chromatograph where the solubility was measured by the peak size. Known volumes of a reference gas were used before and after each run. The chromatograph was calibrated with water.

SOURCE AND PURITY OF MATERIALS:

1. Neon. No source given. Research grade.
2. Olive oil.

ESTIMATED ERROR:

REFERENCES:

1. Ikels, K. G.
SAM-TDR-64-1. February 1964.

COMPONENTS:

1. Neon; Ne; 7440-01-9
2. Olive Oil

ORIGINAL MEASUREMENTS:

Battino, R.; Evans, F. D.; Danforth, W. F.

J. Am. Oil Chem. Soc. 1968, 45, 830 - 833.

VARIABLES:

T/K: 297.67 - 328.00
P/kPa: 101.325 (1 atm)

PREPARED BY:

H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $X_1 \times 10^4$	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
297.67	8.54	1.95_7	2.13_3
297.97	8.64	1.98_0	2.16_0
307.90	8.53	1.94_4	2.19_1
308.15	8.43	1.92_2	2.16_9
318.65	8.30	1.88_2	2.19_6
328.00	8.17	1.84_4	2.20_7

Smoothed Data: $\Delta G°/J\ mol^{-1} = -RT \ln X_1 = -1359.7 + 63.245\ T$

Std. Dev. $\Delta G°$ = 14.8, Coef. Corr. = 0.9998

$\Delta H°/J\ mol^{-1} = -1359.7$, $\Delta S°/J\ K^{-1}\ mol^{-1} = -63.245$

T/K	Mol Fraction $X_1 \times 10^4$	$\Delta G°/J\ mol^{-1}$
293.15	8.68	17,181
298.15	8.60	17,497
303.15	8.53	17,813
308.15	8.45	18,129
313.15	8.38	18,445
318.15	8.31	18,762
323.15	8.25	19,078
328.15	8.18	19,394

AUXILIARY INFORMATION

METHOD: The apparatus is based on the design by Morrison and Billett (1) and the version used is a modification of the apparatus of Clever, Battino, Saylor and Gross (2).

APPARATUS/PROCEDURE: Degassing. The solvent is sprayed into an evacuated chamber of an all glass apparatus; it is stirred and heated until the pressure drops to the vapor pressure of the liquid. Solubility Determination. The degassed liquid passes in a thin film down a glass spiral tube at a total pressure of one atm of solute gas plus solvent vapor. The gas absorbed is measured in the attached buret system, and the solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

1. Neon. Matheson Co., Inc. 99.995 Min. Vol % Purity.
2. Olive oil. A. U.S.P., Fisher Scientific Company., 0.58% free fatty acid.
   B. Nutritional Biochemicals Corp., 0.30% free fatty acid.
   The density was measured and fitted to the equation $\rho/g\ cm^{-3} = 0.9152 - 0.000468 t/C$. The average mol wt is 884 ± 45.

ESTIMATED ERROR:

$\delta T/K = 0.03$
$\delta P/mmHg = 0.5$
$\delta X_1/X_1 = 0.01$

REFERENCES:

1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033.
2. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.

COMPONENTS:

1. Neon; Ne; 7440-01-9

2. Human Fat (pooled)

ORIGINAL MEASUREMENTS:

Ikels, K. G.

Technical Report
SAM-TDR-64-28, May 1964.

VARIABLES:

T/K: 310.75

Total P/kPa: 101.325 (1 atm)

PREPARED BY:

P. L. Long

EXPERIMENTAL VALUES:

T/K	Bunsen Coefficient $\alpha \times 10^2$	Ostwald Coefficient $L \times 10^2$
310.75	1.972 ± 0.0109	2.24

The Bunsen coefficient uncertainty is the standard deviation.

The Ostwald coefficient was calculated by the compiler.

AUXILIARY INFORMATION

METHOD:

Van Slyke-gas chromatograph apparatus (1). Equilibration apparatus was a standard Van Slyke instrument to which a small water manometer was attached. The sample material was degassed in vacuo in the Van Slyke apparatus, gas was added, and the system agitated until equilibrium was reached. The saturated gas-liquid sample was passed from the Van Slyke apparatus to the gas chromatograph where the solubility was measured by the peak size. Known volumes of a reference gas were used before and after each run. The chromatograph was calibrated with water.

SOURCE AND PURITY OF MATERIALS:

1. Neon. No source given. Research grade.

ESTIMATED ERROR:

REFERENCES:

1. Ikels, K. G.
SAM-TDR-64-1, February 1964.

HELIUM AND NEON SOLUBILITIES ABOVE 2 BAR

General Remarks for High Pressure Solubility Studies on Mixtures Containing Helium or Neon

Mixtures containing helium often exhibit the phenomenon referred to as gas-gas immiscibility (1). This has led to a number of studies in which the solubility data of helium in a less volatile component are presented in a graphical form or are, in general of very low precision.

The following remarks on mixtures (a) studied primarily for investigating gas-gas immiscibility or (b) studied by only one or two groups of workers but at several temperatures and pressure, are included to increase the usefulness and comprehensibleness of the compiled tables.

Helium and Dichlorodifluoromethane

This system was investigated by Tsiklis, Maslennikova and Goryunova (2) primarily to establish that it exhibited gas-gas immiscibility of the first kind. The data are of fairly low accuracy and are classified as tentative.

Helium + Carbon Monoxide

This system has been investigated by Parrish and Stewart (3) and by Sinor and Kurata (4). Although slightly different temperature ranges were used the data interpolated to the same temperatures are in good agreement. The two sets are therefore classified as tentative.

Helium + Ethane

This system has been investigated by Nikitina and coworkers (5). There is little on which to base a meaningful evaluation and hence these data are classified as tentative.

Helium + Propane

This system has only been investigated by Schindler and coworkers (6). There is little evidence on which to base a meaningful evaluation and hence these data are classified as tentative.

Helium + Fluorine

The only data published on these systems are those of Cannon and Crane (7) which are not of high precision. They are classified as tentative.

Helium + Krypton

The only data published on this system are those of Kidnay *et al.* (8) which are classified as tentative. Other measurement on similar systems by this group are thought to be of good accuracy.

Helium-4 + Deuterium
Helium-3 + Deuterium

Hiza's data (9) are the only measurements on the solubility for these two systems and hence both sets of data are classified as tentative. Hiza's data on the corresponding helium + hydrogen system appear to be reliable.

Helium + Nitrous Oxide

The only data published on this system are those of Parrish and Stewart (3) which are classified as tentative.

Helium + Xenon

The data of De Swaan Arons and Diepen (10) are bubble point-dew point data at fixed composition and are not in usual form of solubility data. They were determined to establish the existence of gas-gas immiscibility in this system and are classified as tentative.

Helium + Methanol
Helium + n-Hexane
Helium + Benzene
Helium + Sulfur dioxide

These systems were studied by Tsiklis and Khodeeva (11) but no tabulated data were given. The primary purpose of the investigation was to establish whether these systems exhibited gas-gas immiscibility. All four systems were found to exhibit gas-gas immiscibility of the first type. For the present purpose the data are rejected because of their limited nature and low precision.

Helium + Ammonia

The data of Hiese (12) for this system are limited in scope but classified as tentative. The data of Tsiklis (13) are rejected as they are only reported in graphical form and were determined to establish if this system exhibited gas-gas immiscibility. The data of Ipatieff and Teodorovich (14) are also rejected as they were determined by an inadequate technique. The data of Zakharova and coworkers (15) are also rejected because they are presented in a graphical form.

Neon + Methane

This system has only been studied by Streett and Hill (16). Their data are classified as tentative in view of the fact that other data from this group, where comparison with other workers' data is possible, appears to be reliable. This system exhibits gas-gas immiscibility and the barotropic or phase inversion phenomenon (17).

References

1. Schneider, G. M., in *Chemical Thermodynamics Vol. 2 Specialist Periodical Report*, Chapter 4, ed. McGlashan, M. L., Chemical Society, London, 1978.
2. Tsiklis, D. S., Maslennikova, V. Ya. and Goryunova, N. P., *Zhur. Fiz. Chem.*, 1967, *41*, 1804.

3. Parrish, W. R. and Stewart, W. G., *J. Chem. Engng. Data*, 1975, *20*, 412.
4. Sinor, J. E. and Kurata, F., *J. Chem. Engng. Data*, 1966, *11*, 537.
5. Nikitina, I. E., Skripka, V. G., Gubkina, G. F., Sirotin, A. G. and Ben'yaminovic, O. A., *Gazov. Prom.*, 1970, *15*, no. 6, 35.
6. Schindler, D. L., Swift, G. W. and Kurata, F., *Hydrocarbon Process.*, 1966, *45*, no. 11, 205.
7. Cannon, W. A. and Crane, W. E., *Cryogenic Tech.*, 1968, *4*, 178.
8. Kidnay, A. J., Miller, R. C. and Hiza, M. J., *Ind. Eng. Chem. Fundam.*, 1971, *10*, 459.
9. Hiza, M. J., *Nat. Bur. Standards, Tech. Note 621*, 1972.
10. De Swaan Arons, J. and Diepen, G. A. M., *J. Chem. Phys.*, 1966, *44*, 2322.
11. Tsiklis, D. S. and Khodeeva, S. M., *Inzh.-Fiz. Zhur. Acad. Nauk. Belorus. S.S.R.*, 1958, no. 11, 62.
12. Heise, F., *Ber. Bunsenges. Phys. Chem.*, 1972, *76*, 938.
13. Tsiklis, D. S., *Doklady Acad. Nauk. S.S.S.R.*, 1952, *86*, 1159.
14. Ipatieff, V. V. and Teodorovich, V. P., *Zhur. Obshchei Khim.*, 1932, *2*, 305.
15. Zakharova, A. V., Nikiforova, M. B. and Khazanova, N. E., *Zhur. Fiz. Khim.*, 1969, *43*, 750.
16. Streett, W. B. and Hill, J. L. E., *Progr. Refrig. Sci. Technol. XIII Proc. Internat. Congr. Refrig.*, 1971, *1*, 309.
17. Rowlinson, J. R., *Liquids and Liquid Mixtures 2nd Edition*, p.218, 1969.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Water; H_2O; 7732-18-5	Colin Young, School of Chemistry, University of Melbourne, Parkville, Victoria 3052, AUSTRALIA.

CRITICAL EVALUATION:

The experimental data of Wiebe and Gaddy (1) and Pray *et al.* (2) are classified as tentative whereas those of Gardiner and Smith (3) are recommended. Since there is no overlap in the temperature range a detailed comparison of the data of Pray *et al.* (2) with those of the other two groups is not possible. However, the data of Pray *et al.* (2) are thought to be of considerably lower accuracy than those of Wiebe and Gaddy and Gardiner and Smith (3). The data of Wiebe and Gaddy (1) are probably less accurate than the more recent data of Gardiner and Smith (3). In the latter work a correction for the effect of the meniscus curvature was taken into account which, the authors claim, could account for a slight discrepancy between their values and the earlier values of Wiebe and Gaddy (1). There is little doubt that Gardiner and Smith (2) are correct in applying this meniscus correction. Unfortunately only some of the experimental data are presented in the work of Gardiner and Smith (3), however, smoothing equations were given and these are those recommended below.

The data of Enns *et al.* (4) are not in agreement with either the work of Wiebe and Gaddy (1) or that of Gardiner and Smith (3) and are rejected.

Smoothing Equations

323.15K $x_{He} = 7.152 \times 10^{-6} P - 3.214 \times 10^{-9} P^2 + 3.3926 \times 10^{-12} P^3$

373.15K $x_{He} = 6.7624 \times 10^{-6} P - 2.5091 \times 10^{-9} P^2 + 2.4032 \times 10^{-12} P^3$

where P is pressure in units of bar (10^5 Pa)

References

1. Wiebe, R. and Gaddy, V. L., *J. Am. Chem. Soc.*, 1935, *57*, 847.

2. Pray, H. A., Schweickert, C. E. and Minnick, B. H., *Ind. Eng. Chem.*, 1952, *44*, 1146.

3. Gardiner, G. E. and Smith, N. O., *J. Phys. Chem.*, 1972, *76*, 1195.

4. Enns, T., Scholander, P. F. and Bradstreet, E. D., *J. Phys. Chem.*, 1965, *69*, 389.

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Wiebe, R. and Gaddy, V. L.,
J. Am. Chem. Soc., 1935, *57*, 847.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	10^3 Mole fraction of helium in water, $10^3\ x_{He}$	T/K	P/bar	10^3 Mole fraction of helium in water, $10^3\ x_{He}$
273.15	25.33	0.1657	298.15	1013.25	5.163
	50.66	0.3339	323.15	50.66	0.3175
	101.32	0.6598		101.32	0.6303
	202.65	1.290		202.65	1.238
	405.30	2.449		405.30	2.394
	607.95	3.501		607.95	3.449
	810.60	4.431		810.60	4.445
	1013.25	5.275		1013.25	5.356
298.15	25.33	0.154	348.15	25.33	0.1745
	50.66	0.310		50.66	0.3494
	101.32	0.606		101.32	0.6926
	202.65	1.205		202.65	1.3608
	405.30	2.311		405.30	2.6128
	607.95	3.334	348.15	810.60	4.826
	810.60	4.280		1013.25	5.861

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

One pass flow method with two vessel adsorption train. Second vessel used as source of sample for analysis. Pressure maintained with dead weight gauges. Measurements taken both for a high pressure and low pressure approach to equilibrium. Details in source and refs. 1 and 2.

SOURCE AND PURITY OF MATERIALS:

1. Purity 99.95 mole per cent; Bureau of Mines sample.

2. No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.1$; $\delta P/\text{bar} = \pm 0.5\%$;

$\delta x_{He} < 0.2\%$ (estimated by compiler).

REFERENCES:

1. Wiebe, R., Gaddy, V. L. and Heins, C., *J. Am. Chem. Soc.*, 1933, *55*, 947.

2. Wiebe, R., Gaddy, V. L. and Heins, C., *Ind. Eng. Chem.*, 1931, *23*, 401.

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Gardiner, G. E. and Smith, N. O., *J. Phys. Chem.*, 1972, *76*, 1195.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	10^3 Mole fraction of helium in liquid, $10^3\, x_{He}$
293.15	202.6	1.336
298.15	202.6	1.323
303.15	202.6	1.324
308.15	202.6	1.329
313.15	202.6	1.331
318.15	202.6	1.343
323.15	101.3	0.692
323.15	202.6	1.363
323.15	304.0	1.979
323.15	405.3	2.599
323.15	506.6	3.236
323.15	607.9	3.745

At 373.15 K

$$x_{He} = 6.7624\times10^{-6}\ P/\text{bar} - 2.5091\times10^{-9}\ (P/\text{bar})^2 + 2.4032\times10^{-12}\ (P/\text{bar})^3.$$

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Large steel autoclave (~4.5l). Pressure measured with Bourdon gauge. Temperature measured with iron-constantan thermocouple. Cell charged with liquid, compressed gas added. After equilibrium attained samples removed and analysed using volumetric techniques. Details in ref. 1.

SOURCE AND PURITY OF MATERIALS:

1. Matheson Co. sample, purity 99.995 mole per cent.
2. Distilled and deionized.

ESTIMATED ERROR:

$\delta T/K = \pm 0.5$; $\delta P/\text{bar} = \pm 0.05\%$; $\delta x_{He} = \pm 0.4\%$.

REFERENCES:

1. O'Sullivan, T. D. and Smith, N. O., *Geochem. Cosmochim. Acta*, 1966, *30*, 617.

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Pray, H. A. H., Schweichert, C. E. and Minnich, B. H., *Ind. Eng. Chem.*, 1952, *44*, 1147.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	10^3 Mole fraction of helium in water, 10^3 x_{He}
435.9	6.89	0.14
	13.79	0.22
	20.68	0.27
533.1	6.89	0.29
	13.79	0.43
	20.68	0.71
	27.58	0.99
	34.47	1.26
588.7	13.79	0.66
	20.68	1.18
	27.58	1.78
	34.47	2.13

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Rocking equilibrium cell of 3 ℓ capacity. Pressure measured with dead weight gauge and temperature measured using chromel-alumel thermocouple. Cell contents equilibrated and liquid sample removed. The amount of dissolved gas estimated volumetrically.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 1$; $\delta P/\text{bar} = \pm 1$; $\delta x_{He} = \pm 1\text{-}5\%$ (estimated by compiler).

REFERENCES:

COMPONENTS:

(1) Helium; He; 7740-59-7

(2) Sodium chloride; NaCl; 7647-14-5

(3) Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Gardiner, G. E. and Smith, N. O.,
J. Phys. Chem., 1972, *76*, 1195.

VARIABLES:

Temperature, pressure, composition

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

		Coefficients in Smoothing Equation		
T/K	Solvent	$a \times 10^6$	$-b \times 10^{-9}$	$c \times 10^{12}$
298.15	1.003m NaCl	5.694	1.273	0.239
	4.067m NaCl	3.283	1.187	0.805
323.15	1.003m NaCl	5.627	1.875	1.967
	4.067m NaCl	3.327	1.346	0.757
373.15	1.003m NaCl	5.262	1.351	1.299
	4.067m NaCl	4.056	2.905	2.218

$$x_{He} = a(P/\text{bar}) + b(P/\text{bar})^2 + c(P/\text{bar})^3$$

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Large steel cell (4.5 ℓ). Pressure measured with Bourdon gauge. Temperature measured with iron-constantan thermocouple. Cell charged with salt solution, compressed gas added. After equilibrium attained, samples of liquid removed and analysed using volumetric techniques. Details in ref. 1.

SOURCE AND PURITY OF MATERIALS:

1. Matheson Co. sample, purity 99.995 mole per cent.
2. Baker analysed reagent.
3. Distilled and de-ionised.

ESTIMATED ERROR:

$\delta T/K = \pm 0.5$; $\delta P/\text{bar} = \pm 0.5\%$;

$\delta x_{He} = \pm 0.3\%$.

REFERENCES:

1. O'Sullivan, T. D. and Smith, N. O., *Geochem. Cosmochim. Acta*, 1966, *30*, 617.

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Uranyl Sulfate; UO_2SO_4; 1314-64-3

(3) Water; H_2O; 7732-18-5

ORIGINAL MEASUREMENTS:

Stephan, E. L., Hatfield, N. S., Peoples, R. S. and Pray, H. A. H., *Battelle Memorial Institute Report BMI-1067*, 1956.

VARIABLES:

Temperature, pressure, composition

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	g Uranium per liter	P^+/bar	Solubility*	T/K	g Uranium per liter	P^+/bar	Solubility*
435.92	40	35.4	0.618	533.15	100	29.6	0.91
		35.2	0.645			26.2	0.85
		34.5	0.610			23.4	0.78
	100	32.1	0.44		243	35.2	0.865
		30.0	0.415			31.7	0.77
		27.2	0.375			29.0	0.725
	243	33.4	0.325	574.82	40	19.0	1.12
		31.0	0.33			18.3	1.11
		29.3	0.31			13.8	0.835
		26.5	0.26			10.3	0.62
533.15	40	27.6	1.13		100	19.0	0.975
		24.8	0.98			18.3	0.99
		24.5	1.06			17.2	0.90
						15.5	0.81

P^+ partial pressure of helium

* ml of helium at S.T.P. per g of solution

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Static equilibrium cell. Gas and liquid equilibrated for 18 hours. Pressure measured with Bourdon gauge and temperature measured with thermocouple. Composition of liquid estimated by volumetric method. Details in source. Partial pressure estimated by subtracting vapor pressure from total pressure.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.6$; $\delta P/\text{bar} = \pm 0.3$;

δ(solubility) = ±3% (estimated by compiler).

REFERENCES:

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Methane; CH_4; 74-82-8	Colin Young, School of Chemistry, University of Melbourne, Parkville, Victoria 3052, AUSTRALIA.

CRITICAL EVALUATION:

Measurements on this system have been reported in six publications. The measurements by Sinor *et al.* (1), Rhodes and coworkers (2), (3), Heck and Hiza (4) and Streett *et al.* (5) are in good agreement in the ranges of temperature and pressures where there is extensive overlap. The data of Streett *et al.* (5) are of lower accuracy than those of the other workers mentioned above but the range of pressure is more than an order of magnitude greater. All the above data are classified as tentative.

The data of Gonikberg and Fastowski appear to be somewhat high when compared with extrapolated and interpolated data obtained from the results of the five above studies and are therefore classified as doubtful.

References

1. Sinor, J. E., Schindler, D. L. and Kurata, F., *Am. Inst. Chem. Engnrs. J.*, 1966, *12*, 353.
2. Rhodes, H. L., De Vaney, W. E. and Tully, P. C., *J. Chem. Engng. Data*, 1971, *16*, 19.
3. De Vaney, W. E., Rhodes, H. L. and Tully, P. C., *J. Chem. Engng. Data*, 1971, *16*, 158.
4. Heck, C. K. and Hiza, M. J., *Am. Inst. Chem. Engnrs. J.*, 1967, *13*, 593.
5. Streett, W. B., Erickson, A. L. and Hill, J. L. E., *Physics Earth Planetary Interiors*, 1972, *6*, 69.
6. Gonikberg, M. G. and Fastowski, V. G., *Acta Physicochimica U.R.S.S.*, 1940, *13*, 399.

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Methane; CH_4; 74-82-8

ORIGINAL MEASUREMENTS:

Sinor, J. E., Schindler, D. L. and Kurata, F., *Am. Inst. Chem. Engnrs.J.*, 1966, *12*, 353.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
93.15	17.2	0.0006	0.984
	34.5	0.0011	0.992
	51.7	0.0016	0.994
	68.95	0.0022	0.995
	86.18	0.0026	-
	103.4	0.0032	0.997
	120.7	0.0034	-
	137.9	0.0039	0.998
113.15	17.2	0.0013	0.914
	34.5	0.0028	0.957
	51.7	0.0042	0.969
	68.95	0.0055	0.976
	86.18	0.0067	0.980
	103.4	0.0078	0.982
	120.7	0.0090	0.984
	137.9	0.0099	0.985
133.15	17.2	0.0024	0.696
	34.5	0.0056	0.837
	51.7	0.0086	-
	68.95	0.0116	0.912
	86.18	0.0144	-
	103.4	0.0169	0.938
	120.7	0.0193	-
	137.9	0.0214	0.952
153.15	27.6	0.0058	0.519
	41.4	0.0109	0.667
153.15	55.2	0.0163	0.744
	68.95	0.0205	-
	86.18	0.0266	0.825
	103.4	0.0320	0.850
	120.7	0.0366	0.867
	137.9	0.0404	0.884
173.15	34.5	0.0060	0.150
	51.7	0.0189	0.361
	68.95	0.0322	0.491
	86.18	0.0417	0.554
	103.4	0.0524	0.632
	120.7	0.0618	0.674
	137.9	0.0712	0.713
188.15	51.7	0.0142	0.058
	68.95	0.0428	0.169
	86.18	0.0678	0.253
	103.4	0.0906	0.322
	120.7	0.1105	0.372
	137.9	0.1300	0.415
189.15	137.9	0.138	0.372
189.65	137.9	0.152	0.348
190.15	137.9	0.166	0.320
190.45	137.9	0.178	0.300
190.65	037.9	0.183	0.287
190.95	137.9	0.265	0.275

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Static equilibrium cell (0.1 ℓ capacity) fitted with magnetic stirrer. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Contents charged into cell, equilibrated; vapor and liquid samples withdrawn and analysed by G.C. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. Bureau of Mines sample maximum impurity 12 parts per million.
2. Phillips Petroleum pure grade purity < 99 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$; $\delta P/bar = \pm 0.1$; $\delta x_{He} = \pm 1\%$ or 0.0003 (whichever is greater) $\delta y_{He} = \pm 1\%$.

REFERENCES:

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Methane; CH_4; 74-82-8

ORIGINAL MEASUREMENTS:

Rhodes, H. L., DeVaney, W. E. and Tully, P. C., *J. Chem. Engng. Data*, 1971, *16*, 19.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}
94.00	69.57	-	0.9962
	69.84	0.0022	-
	103.4	-	0.9968
	103.5	0.0028	-
	139.5	-	0.9978
	139.1	0.0036	-
124.00	69.29	-	0.9544
	69.02	0.0079	-
	103.3	-	0.9675
	103.3	0.0112	-
	137.7	-	0.9744
	137.6	0.0135	-
	206.4	-	0.9816
	207.0	0.0196	-
	261.7	-	0.9849
	261.5	0.0232	-
154.00	69.09	-	0.7618
	68.88	0.0192	-
	103.4	0.0290	0.8314
	138.3	-	0.8685
	137.9	0.0376	-
	206.8	-	0.9048
	206.6	0.0520	-
	261.7	-	0.9222
	261.9	0.0618	-
164.00	68.88	0.0238	0.6300
	86.39	-	0.6924
	86.25	0.0310	-
	103.4	-	0.7341
	103.5	0.0378	-
	137.6	-	0.7900
	137.9	0.0498	-
	172.8	-	0.8253
	172.7	0.0609	-
	207.1	-	0.8499
	207.0	0.0702	-
	261.7	-	0.8761
	262.1	0.0836	-
174.00	68.88	-	0.4580
	68.74	0.0291	-
	86.05	-	0.5386
	85.98	0.0396	-
	103.5	-	0.5986
	103.1	0.0493	-
	137.7	-	0.6768
	137.6	0.0669	-
	172.3	-	0.7280
	172.1	0.0820	-
	206.8	0.0957	0.7642
	260.2	-	0.8035

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus. Beryllium-copper windowed cell. Vapor recirculated through external loop. Temperature measured with platinum resistance thermometer and measured by pressure transducer and Bourdón gauge calibrated against a dead weight tester. Details in source and ref. 1.

SOURCE AND PURITY OF MATERIALS:

1. Ultrapure sample purity better than 99.99 mole per cent.
2. Sample contained oxygen and nitrogen impurities purity 99.99 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.15$;

$\delta x_{He} \simeq \delta y_{He} = \pm 0.0005$.

REFERENCES:

1. Tully, P. C., DeVaney, W. E. and Rhodes, H. L., *Adv. Cryogenic Engng.*, 1971, *16*, 88.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Methane; CH_4; 74-82-8	Rhodes, H. L., DeVaney, W. E. and Tully, P. C., *J. Chem. Engng. Data*, 1971, *16*, 19.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}
174.00	259.8	0.1126	-	190.60	172.1	0.1899	-
184.00	68.88	-	0.2518		206.8	-	0.4503
	68.85	0.0353	-		207.1	0.2129	-
	86.18	-	0.3400		262.0	-	0.5351
	86.25	0.0525	-		261.9	0.2395	-
	103.4	-	0.4081	190.90	114.2	0.1562	0.2043
	103.1	0.0681	-		118.8	-	0.2210
	120.3	-	0.4617		118.3	0.1585	-
	120.2	0.0820	-		123.8	-	0.2358
	138.4	-	0.5082		123.6	0.1620	-
	138.3	0.0957	-		138.0	-	0.2787
	172.9	-	0.5769		137.9	0.1743	-
	172.6	0.1187	-		172.3	-	0.3645
	206.6	-	0.6271		172.2	0.2012	-
	206.2	0.1376	-		207.0	-	0.4361
	262.1	-	0.6877		206.6	0.2224	-
	262.0	0.1621	-		261.9	0.2472	0.5228
189.00	68.88	-	0.1399	191.06	137.8	-	0.2530
	68.95	0.0429	-		137.4	0.1936	-
	85.98	-	0.2138	191.10	207.1	-	0.4230
	85.84	0.0680	-		206.8	0.2306	-
	103.4	-	0.2769	191.37	172.5	-	0.3054
	103.6	0.0909	-		172.4	0.2478	-
	120.8	-	0.3306	191.40	176.1	-	0.3113
	120.4	0.1112	-		176.0	0.2526	-
	137.9	0.1284	0.4514		179.2	-	0.3263
	172.4	-	0.4834		179.0	0.2445	-
	172.5	0.1585	-		192.7	-	0.3650
190.30	68.95	-	0.1019		193.0	0.2439	-
	68.81	0.0511	-		206.9	-	0.3991
	86.18	-	0.1673		206.2	0.2456	-
	85.84	0.0819	-		230.4	0.2532	0.4471
	103.4	-	0.2236		262.1	0.2632	0.4987
	103.5	0.1086	-	191.68	207.0	-	0.3589
	120.6	-	0.2753		206.7	0.2804	-
	120.5	0.1316	-	192.00	236.4	-	0.3849
	138.0	-	0.3211		236.1	0.3058	-
	137.7	0.1508	-		238.0	-	0.3911
	172.6	-	0.4000		237.9	0.3080	-
	172.3	0.1806	-		248.3	-	0.4227
	206.8	-	0.4651		248.1	0.2998	-
	206.6	0.2054	-		262.0	0.2946	0.4557
	262.1	0.2327	0.5464		262.1	0.2944	-
190.60	68.88	0.0587	0.0873		261.8	-	0.4548
	103.4	0.1182	0.2043	192.20	262.1	-	0.4288
	137.9	-	0.3029		262.0	0.3153	-
	137.8	0.1594	-	192.29	262.0	0.3417	0.4071
	172.6	-	0.3850				

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Methane; CH_4; 74-82-8

ORIGINAL MEASUREMENTS:

Streett, W. B., Erickson, A. L., and Hill, J. L. E., *Physics Earth Planetary Interiors*, 1972, *6*, 69.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
94.92	62	0.0023	0.9931	130.16	482	0.0398	0.9858
	152	0.0038	0.9966		643	0.0451	0.9882
	172	0.0050	0.9973		850	0.0488	0.9903
	204[a]	0.006	0.998		973	0.0506	0.9924
100.05	164	0.0056	0.9946		1102	0.0510	0.9935
	207	0.0069	0.9954		1232	0.0508	0.9935
	241	0.0077	0.9954		1378	0.0519	0.9940
	276	0.0085	0.9954		1516	0.0521	0.9940
	352	0.0098	0.9957		1791	0.0517	0.9956
	413	0.0111	0.9963		2188[a]	0.052	0.996
	458[a]	0.012	0.997	139.85	482	0.0559	0.9763
105.09	283	0.0111	0.9946		628	0.0618	0.9800
	345	0.0125	0.9970		819	0.0670	0.9844
	413	0.0140	0.9973		965	0.0691	0.9865
	482	0.0144	0.9977		1102	0.0707	0.9876
	551	0.0155	0.9979		1378	0.0709	0.9906
	620	0.0163	0.9983		1929	0.0693	0.9938
	669[a]	0.017	0.998		2205	0.0689	0.9987
110.07	276	0.0136	0.9948		2480	0.0660	0.9980
	413	0.0170	0.9955		2619	0.0642	0.9959
	489	0.0186	0.9970		2810[a]	0.062	0.998
	620	0.0209	0.9977	149.78	227	0.0500	0.9286
	765	0.0219	0.9981		413	0.0693	0.9525
	827	0.0228	0.9981		689	0.0867	0.9674
	954[a]	0.024	0.998		965	0.0939	0.9783
130.16	353	0.0334	0.9820		1378	0.0955	0.9844

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic pump. Temperature measured with platinum resistance thermometer. Pressure measured with Manganin resistance gauge. Samples of liquid and gas analysed by thermal conductivity. Details in ref. 1.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$; $\delta P/bar = \pm 5$;

δx_{He}, δy_{He} = ±1 mole per cent.

REFERENCES:

1. Streett, W. B. and Erickson, A. L., *Physics Earth Planetary Interiors*, 1972, *5*, 357.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Methane; CH_4; 74-82-8	Streett, W. B., Erickson, A. L., and Hill, J. L. E., *Physics Earth Planetary Interiors*, 1972, *6*, 69.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
149.78	1723	0.0935	0.9855	187.81	353	0.2276	0.6906
	2067	0.0897	0.9903		482	0.2519	0.7736
	3102	0.0831	0.9931		689	0.2675	0.8413
	3488[a]	0.080	0.994		965	0.2677	0.8861
159.84	276	0.0763	0.8610		1240	0.2612	0.9161
	413	0.0953	0.9279		1654	0.2481	0.9412
	551	0.1076	-	187.87	165	0.1407	0.4932
	697	0.1149	0.9518		198	0.1640	0.5360
	827	0.1200	0.9589		267	0.2077	0.5989
	1034	0.1245	0.9670	189.97	689	0.2851	0.8216
	1240	0.1258	0.9698		1034	0.2803	0.8877
	1516	0.1247	0.9756		1385	0.2687	0.9207
	1791	0.1225	0.9796		1654	0.2588	0.9348
	2067	0.1192	0.9855		1929	0.2491	0.9478
	2371	0.1143	-		2094	0.2464	0.9548
	2480	0.1145	0.9899		2411	0.2365	0.9677
	2757	0.1111	0.9903		3102	0.2123	0.9810
	3102	0.1066	0.9924		3791	0.1967	0.9903
	3446	0.1026	-		4135	0.1887	0.9941
	3791	0.0979	0.9928	190.98	138	0.2177	0.2862
	3881	0.1018	0.9817		145	0.1705	0.3195
	4066	0.0961	0.9931		159	0.1915	0.3579
	4080	0.0998	0.9899		168	0.1950	0.3560
	4163	0.0985	0.9913		241	0.2365	0.4927
	4212	0.098	0.9927		276	0.2505	0.5411
	4281	0.0972	0.9936		324	0.2653	0.5965
	4308[a]	0.098	0.994		719	0.2966	0.8176
180.08	35	0.0051	0.1123		965	0.2932	0.8698
	46	0.0071	0.1589		1240	0.2836	0.9038
	60	0.0176	-	192.58	248[b]	0.375	0.375
	69	0.0350	0.3715		276	0.3267	0.4563
	103	0.0691	0.4961		310	-	0.5463
	138	0.0819	0.5863		340	0.3175	0.5645
	179	0.1038	0.6588		413	0.3147	0.6366
	234	0.1329	0.7293		482	0.3198	0.6855
	293	0.1499	0.7691		555	0.3204	0.7300
	482	0.1849	0.8476		616	0.3198	0.7549
	628	0.2011	0.8797		689	0.3186	0.7720
	827	0.2119	0.9067		827	0.3167	0.8121
	1034	0.2132	0.9263		1026	0.3062	0.8670
	1344	0.2107	0.9442	194.52	400[b]	0.450	0.450
	1723	0.2028	0.9586		434	0.3910	0.5490
	2067	0.1942	0.9674		455	0.3807	0.5850
	2412	0.1862	0.9705		486	0.3765	0.6229
	2757	0.1778	0.9790		565	0.3592	0.6954
	3102	0.1701	0.9817		709	0.3451	0.7707
	3460	0.1633	0.980		896	0.3280	0.8296
	3633	0.1605	0.9859		1034	0.3222	0.8591
	4135	0.1516	0.9889	198.33	648[b]	0.535	0.535
	4156	0.1516	0.9859		689	0.4610	0.6380
	4488	0.1459	0.9876		728	0.4439	0.6792
	4839	0.140	0.9884		758	0.4270	0.7089
	5335	0.1335	0.9894		792	0.4165	0.7282
	5777	0.1286	0.9905		847	0.4034	0.7587
	5845	0.1285	0.9917		1034	0.3662	0.8231
	5893	0.1279	0.9923		1461	0.3345	0.8921
	5976	0.1265	0.9930		1723	0.3157	0.9158
	6059	0.1260	0.9933		2067	0.2956	0.9358
	6134	0.1257	0.9933		2412	0.2792	0.9491
	6167[a]	0.125	0.993		2757	0.2632	0.9596

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Methane; CH_4; 74-82-8	Streett, W. B., Erickson, A. L., and Hill, J. L. E., *Physics Earth Planetary Interiors*, 1972, *6*, 69.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
198.33	3102	0.2501	0.9647	215.07	1689[b]	0.662	0.662
	3446	0.2413	0.9708		1723	0.5743	0.7460
	3791	0.2314	0.9767		1757	0.5457	0.7723
	3805	0.2224	0.9757		1791	0.5334	0.7879
	3846	0.2243	0.9671		1929	0.4857	0.8317
	4135	0.2280	0.9796		2067	0.4571	0.8557
	4281	0.2110	0.9776		2412	0.4079	0.8937
	4694	0.2012	0.980		2757	0.3737	0.9161
	5115	0.1886	0.9826		3102	0.3534	0.9316
	5659	0.1775	0.9843		3446	0.3320	0.9422
	6134	0.1682	0.9867		3791	0.3127	0.9501
	6624	0.1622	0.9884		4135	0.2942	0.9565
	7162	0.1568	0.990	221.10	2081[b]	0.677	0.677
	7596	0.1518	0.9903		2116	0.6136	0.7431
	7948	0.1446	0.9903		2136	0.5980	0.7618
	7996[a]	0.144	0.990		2170	0.5717	0.7825
203.75	1006[b]	0.589	0.589		2205	0.5493	0.8015
	1019	0.5316	-		2274	0.5259	0.8207
	1048	0.4950	0.6770		2412	0.4806	0.8532
	1102	0.4687	0.7256		2757	0.4308	0.8911
	1171	0.4479	0.7508		3102	0.3977	0.9158
	1240	0.4296	0.7896		3446	0.3681	0.9315
	1447	0.3942	0.8352		3791	0.3454	0.9412
	1723	0.3639	0.8813		4135	0.3258	0.9493
	2067	0.3343	0.9165	225.84	2427[b]	0.687	0.687
	2412	0.3116	0.9339		2439	0.6366	0.7373
	2757	0.2991	0.9471		2480	0.5844	0.7879
	3102	0.2778	0.9555		2571	0.5465	0.8175
	3446	0.2625	0.9623		2647	0.5210	0.8358
	3791	0.2510	-		2757	0.4983	0.8551
	4135	0.2415	-		3102	0.4435	0.8934
210.62	1420[b]	0.638	0.638		3446	0.4069	0.9124
	1447	0.5426	0.7198		3791	0.3779	0.9289
	1516	0.5151	0.7643		4135	0.3541	0.9335
	1654	0.4691	0.8193	231.83	2840[b]	0.698	0.698
	1791	0.4400	0.8494		2843	-	0.7161
	1929	0.4182	0.8698		2860	0.6325	0.7667
	2205	0.3856	0.8996		2895	0.5998	0.7957
	2412	0.3635	-		2964	0.5730	0.8201
	2757	0.3385	-		3102	0.5336	0.8457
	3102	0.3234	0.9412		3446	0.4666	0.8873
	3446	0.3020	0.9515		3708	0.4463	0.9013
	3743	0.2846	0.9592		3791	0.4322	0.9119
	3791	0.2847	0.9589		4004	0.4171	0.9163
	3998	0.2740	0.9604		4135	0.4013	0.9249
	4135	0.2719	0.9647		4488	0.3802	0.9375
	4287	0.2640	0.9647		4956	0.3564	0.9498
	4700	0.2502	0.9707		5514	0.3319	0.9593
	5115	0.2373	0.9740		5521	0.3332	0.9579
	5576	0.2255	0.9758		6011	0.3135	0.9655
	6072	0.2134	0.9804		6224	0.3091	0.9665
	6562	0.2022	0.9838		6693	0.2950	0.9702
	7031	0.1930	0.9858		7182	0.2816	0.9737
	7582	0.1831	0.9871		7754	0.2674	0.9766
	8140	0.1741	0.9885		8010	0.2538	0.9784
	8375	0.1728	0.9887		8554	0.2430	0.9809
	8547	0.1677	0.9892		9078	0.2330	0.9835
	8967	0.1687	0.9897		9636	0.2247	0.9849
	9208	0.1591	0.9899		9761	0.2214	0.9853
	9422[a]	0.158	0.990		10133	0.2159	0.9858

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Methane; CH_4; 74-82-8	Streett, W. B., Erickson, A. L., and Hill, J. L. E., *Physics Earth Planetary Interiors*, 1972, *6*, 69.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
239.95	3474[b]	0.706	0.706	256.49	5039	0.5936	0.8501
	3515	0.6294	0.8021		5170	0.5686	0.8643
	3557	0.5971	0.8201		5445	0.5281	0.8896
	3653	0.5621	0.8431		5859	0.4851	0.9111
	3791	0.5298	0.8635		6335	0.4482	0.9279
	4135	0.4768	0.8963		6802	0.4156	0.9339
243.20	3708[b]	0.710	0.710		6893	0.4135	0.9417
	3722	-	0.7490		7444	0.3833	0.9494
	3756	0.6226	0.7951		7988	0.3605	0.9566
	3791	0.6052	0.8130		8554	0.3404	0.9625
	3832	0.5893	0.8258		9105	0.3229	0.9678
	3859	0.5770	0.8352		9657	0.3074	0.9708
	3914	0.5646	0.8446		10049	0.2958	0.9737
	3997	0.5451	0.8576	273.0	6342[b]	0.746	0.746
	4135	0.5179	0.8762		6417	0.6525	0.8342
244.24	3791[b]	0.712	0.712		6486	0.6272	0.8461
	3805	0.6588	0.7735		6549	0.6131	0.8552
	3859	0.6079	0.8136		6700	0.5899	0.8718
	3997	0.5651	0.8426		6906	0.5593	0.8862
	4135	0.5340	0.8639		7245	0.5220	0.9056
	4488	0.4955	0.8921		7727	0.4836	0.9221
244.24	4963	0.4475	0.9157		8265	0.4508	0.9346
	5514	0.4083	0.9324		8706	0.4299	0.9428
	5996	0.3801	0.9420		8829	0.4210	0.9454
	6555	0.3534	0.9546		9306	0.4041	0.9484
	7169	0.3295	0.9622	290.0	8175[b]	0.753	0.753
	7720	0.3111	0.9678		8292	0.6337	0.8633
	8292	0.2943	0.9713		8354	0.6245	0.8679
	8829	0.2806	0.9749		8423	0.7072	0.8740
	9519	0.2666	0.9771		8478	0.600	0.8769
	9912	0.2572	0.9794		8575	0.5874	0.8852
	10064	0.2479	-		8753	0.5670	0.8933
256.49	4811[b]	0.732	0.732		9126	0.5344	0.9083
	4913	0.6353	0.8208		9554	0.5028	0.9221
	4970	0.6094	0.8365		10133	0.4703	0.9332

[a] Three phase pressure ± 10 bar.

[b] Critical pressure ± 20 bar.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-01-9 (2) Methane; CH_4; 74-82-8	DeVaney, W. E., Rhodes, H. L. and Tully, P. C., *J. Chem. Engng. Data*, 1971, *16*, 158.
VARIABLES:	**PREPARED BY:**
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
124.00	13.92	0.0015	-	164.00	24.34	-	0.1643
	13.99	-	0.7996		27.65	-	0.2380
	20.81	0.0024	0.8643		27.72	0.0046	-
	27.57	0.0031	-		34.47	0.0078	-
	27.64	-	0.8963		34.54	-	0.3578
	34.40	0.0035	0.9155		41.09	0.0108	-
	41.08	0.0044	-		41.37	-	0.4404
	41.36	-	0.9282		48.19	-	0.5050
	54.87	0.0060	-		48.26	0.0139	-
	55.01	-	0.9452		55.71	0.0181	0.5594
	69.02	0.0079	-		68.88	0.0238	-
154.00	13.79	0.0001	0.0644	174.00	31.16	0.0027	-
	17.30	0.0014	0.2197		31.23	-	0.0796
	20.89	0.0028	0.3321		34.54	0.0057	0.1332
	27.36	0.0050	-		41.16	0.0105	-
	27.78	-	0.4742		41.30	-	0.2274
	34.20	0.0072	-		48.26	-	0.3028
	34.54	-	0.5640		48.33	0.0150	-
	41.23	0.0098	-		55.57	0.0200	0.3692
	41.58	-	0.6285		62.12	-	0.4149
	55.50	0.0148	-		62.19	0.0246	-
	55.71	-	0.7121		68.74	0.0291	-
	68.88	0.0192	-	184.00	41.23	0.0038	-
164.00	20.89	0.0006	0.0683		41.37	-	0.0393
	24.27	0.0026	-		48.26	0.0122	-

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus. Beryllium copper widowed cell. Vapor recirculated through external loop. Temperature measured with platinum resistance thermometer and pressure measured by pressure transducer and Bourdon gauge. Details ref. 1.

SOURCE AND PURITY OF MATERIALS:

1. Bureau of Mines high purity sample purity better than 99.999 mole per cent.
2. Ultrapure grade at least 99.99 mole per cent (traces of oxygen and nitrogen).

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/\text{bar} = \pm 0.07$;

$\delta x_{He} \simeq \delta y_{He} = \pm 0.005\%$.

REFERENCES:

1. Tully, P. C., DeVaney, W. E. and Rhodes, H. L., *Adv. Cryogenic Eng.*, 1971, *16*, 88.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Methane; CH_4; 74-82-8	DeVaney, W. E., Rhodes, H. L. and Tully, P. C., *J. Chem. Engng. Data*, 1971, *16*, 158.

EXPERIMENTAL VALUES:

T/K	*P*/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
184.00	48.33	-	0.1039
	55.02	0.0196	-
	55.57	-	0.1626
	62.19	0.0280	-
	62.26	-	-
	68.95	0.0353	0.2092
186.00	48.26	0.0110	0.0699
	48.13	0.0088	-
	48.26	-	0.0398
189.00	49.71	0.0100	-
	49.78	-	0.0363
	55.16	0.0196	-
	55.23	-	0.0679
	62.19	0.0316	-
	62.33	-	0.1064
	68.95	0.0429	-
190.30	55.09	0.0215	-
	55.16	-	0.0435
	62.12	0.0368	-
	62.26	-	0.0736
	68.81	0.0511	-
190.60	55.23	-	0.0331
	55.30	0.0256	-
	62.05	0.0429	-
	62.12	-	0.0596
	68.88	0.0587	-

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Methane; CH_4; 74-82-8

ORIGINAL MEASUREMENTS:

Heck, C. K. and Hiza, M. J.,
Am. Inst. Chem. Engnrs. J., 1967, *13*, 593.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
94.97	4.81	0.00012	0.9580	139.83	82.88	0.0163	0.9055
±0.02	10.18	0.00034	0.9810	±0.03	113.5	0.0214	0.9258
	20.27	0.00069	0.9900		144.3	0.0262	-
	40.28	0.00136	0.99405		174.3	0.0304	0.9477
	60.80	-	0.99566		201.6	0.0341	0.9527
	69.91	0.00226	-	169.81	32.93	0.0640	0.217
	85.72	0.00274	0.99637	±0.05	56.03	0.0206	0.469
	91.50	0.00285	-		58.77	0.0217	-
	119.0	0.00363	0.99747		67.79	0.0261	-
	144.5	0.00419	0.99769		83.09	0.0352	0.601
	164.0	0.00472	0.99804		108.6	0.0469	0.669
	182.8	-	0.99790		116.1	0.0499	-
	194.5	0.00524	-		143.8	0.0612	0.738
124.85	11.35	0.00125	0.741		170.8	0.0716	0.770
±0.03	20.47	0.00216	0.857		198.5	0.0806	-
	40.73	0.00499	0.9210	109.90	20.42	0.00151	0.9537
	64.44	0.00799	0.9483	±0.02	35.67	0.00262	0.9721
	86.63	0.0104	0.9605		41.54	0.00304	0.9756
	113.7	0.0131	0.9693		71.23	0.00488	0.9851
	144.4	0.0160	0.9742		90.99	0.00604	0.9878
	174.0	0.0184	0.9778		102.8	-	0.9892
	204.0	0.0209	0.9799		103.4	0.00679	-
139.83	23.10	0.00447	0.702		133.1	0.00833	0.99052
±0.03	39.72	0.00789	0.812		164.8	0.00978	0.99178
	63.23	-	0.876		193.0	0.0111	-

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Vapor recirculated through cell. Liquid and vapor samples analysed by gas chromatography. Pressure measured by Bourdon gauge and temperature measured with platinum resistance thermometer. Details in source and ref. 1.

SOURCE AND PURITY OF MATERIALS:

1. Bureau of Mines grade A sample 0.015 mole per cent neon.
2. Two samples used, purities better than 99.8 mole per cent and 99.95 mole per cent (no difference detected in results using different samples).

ESTIMATED ERROR:

$\delta T/K = \pm 0.05$; $\delta P/\text{bar} = \pm 0.1$ (up to 100 bar) = ±0.03 (above 100 bar); $\delta x_{He} \simeq \delta(1-y)_{He} = \pm 3\%$ of value or ±0.00002 (whichever is greatest).

REFERENCES:

1. Herring, R. N. and Barrick, P. L., *Adv. Cryogenic Engng.*, 1965, *10*, 151.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Methane; CH_4; 74-82-8	Heck, C. K. and Hiza, M. J., *Am. Inst. Chem. Engnrs. J.*, 1967, *13*, 593.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}
109.90 ±0.02	201.7	-	0.99279
154.80	17.63	-	0.212
±0.04	37.69	0.0103	-
	43.67	0.0130	0.632
	63.13	0.0189	-
	79.64	-	0.785
	80.55	0.0235	-
	109.9	0.0319	-
	110.3	-	0.838
	144.9	0.0413	0.871
	173.9	0.0480	0.892
	203.9	0.0537	0.900
184.83	45.09	-	0.0693
±0.05	67.48	0.0352	0.212
	88.66	-	0.331
	89.17	0.0558	-
	113.4	0.0773	0.436
	154.4	0.111	0.519
	180.4	0.126	0.562
	205.3	0.137	0.592

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Methane; CH_4; 74-82-8

ORIGINAL MEASUREMENTS:

Gonikberg, M. G. and Fastowski, V. G. *Acta Physicochimica URSS*, 1940, *13*, 399.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	*P*/bar	Mole fraction of helium in liquid, x_{He}
90.3	29.4	0.0013
	76.5	0.0027
	96.1	0.0032
	113.8	0.0037
	136.3	0.0046
	158.9	0.0052
106.0	25.5	0.0019
	59.8	0.0039
	98.1	0.0063
	146.1	0.0090
	156.9	0.0097

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus. Method described in ref. 1. Sample analysed by adsorption on charcoal then removal of helium.

SOURCE AND PURITY OF MATERIALS:

1. Purity 99.8 mole per cent.
2. Purity 99.6 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.1$; $\delta P/\text{bar} = \pm 1$; $\delta x_{He} = \pm 0.0003$ (compiler).

REFERENCES:

1. Sokolov, V. A. "Methods for investigation of natural gases." 1932 (Russian).

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Ethane; C_2H_6; 74-84-0

ORIGINAL MEASUREMENTS:

Nikitina, I. E., Skripka, V. G., Gubkina, G. F., Sirotin, A. G. and Ben'yaminovic, O. A., *Gazov. Prom.*, 1970, *15*, No. 6, 35.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
273.15	29.4	0.00297	0.145	233.15	19.6	0.00315	0.569
	39.2	0.00704	0.328		39.2	0.00681	0.784
	58.8	0.01284	0.477		58.8	0.00947	0.857
	78.5	0.01670	0.566		78.5	0.01158	0.896
	98.1	0.01940	0.635		98.1	0.01340	0.915
	117.7	0.02177	0.696		117.7	0.01510	0.926
263.15	19.6	0.00060	0.037	223.15	9.8	0.00108	0.389
	39.2	0.00800	0.475		19.6	0.00315	0.681
	58.8	0.01240	0.618		39.2	0.00626	0.849
	78.5	0.01550	0.696		58.8	0.00852	0.906
	98.1	0.01781	0.750		78.5	0.01027	0.928
	117.7	0.01990	0.794		98.1	0.01180	0.941
253.15	19.6	0.00215	0.188		117.7	0.01329	0.948
	39.2	0.00771	0.581	213.15	4.9	0.00028	0.200
	58.8	0.01140	0.714		9.8	0.00133	0.570
	78.5	0.01407	0.779		19.6	0.00300	0.790
	98.1	0.01625	0.821		39.2	0.00548	0.894
	117.7	0.01822	0.850		58.8	0.00740	0.932
243.15	19.6	0.00305	0.360		78.5	0.00897	0.949
	39.2	0.00745	0.674		98.1	0.01035	0.960
	58.8	0.01050	0.781		117.7	0.01170	0.966
	78.5	0.01290	0.842	193.15	4.9	0.00043	0.570
	98.1	0.01493	0.875		9.8	0.00105	0.835
	117.7	0.01679	0.894		19.6	0.00219	0.916
233.15	9.8	0.00060	0.182		39.2	0.00408	0.957

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus fitted with stirrer. Temperature measured with platinum resistance thermometer. Liquid and gas phases analysed by gas chromatography using a thermal conductivity detector. Details in source and ref. 1.

SOURCE AND PURITY OF MATERIALS:

1. Purity 99.9 mole per cent.
2. Purity 99.5 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.2$; $\delta P/bar = \pm 1\%$; $\delta x_{He} = \pm 0.5\%$; $\delta(1-y_{He}) = \pm 2.0\%$.

REFERENCES:

1. Skripka, V. G., Barsuk, S. D., Nikitina, I. E. and Ben'yaminovic, O. A., *Gazov. Prom.*, 1964, *14*, No. 4, 41.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Ethane; C_2H_6; 74-84-0	Nikitina, I. E., Skripka, V. G., Gubkina, G. F., Sirotin, A. G. and Ben'yaminovic, O. A., *Gazov. Prom.*, 1970, *15*, No. 6, 35.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
193.15	58.8	0.00560	0.972
	78.5	0.00683	0.978
	98.1	0.00797	0.983
	117.7	0.00911	0.987
173.15	4.9	0.00037	0.903
	9.8	0.00072	0.950
	19.6	0.00146	0.971
	39.2	0.00273	0.986
	58.8	0.00382	0.992
	78.5	0.00479	0.994
	98.1	0.00562	0.995
	117.7	0.00642	0.996
153.15	4.9	0.00022	0.975
	9.8	0.00045	0.986
	19.6	0.00090	0.993
	39.2	0.00182	0.997
	58.8	0.00258	0.998
	78.5	0.00323	0.998
	98.1	0.00385	0.998
	117.7	0.00440	0.999
133.15	4.9	0.00010	0.996
	9.8	0.00021	0.998
	19.6	0.00042	0.998
	39.2	0.00084	-
	58.8	0.00128	-
	78.5	0.00170	-
	98.1	0.00213	-
	117.7	0.00257	-
113.15	4.9	0.00004	-
	9.8	0.00008	-
	19.6	0.00017	-
	39.2	0.00034	-
	58.8	0.00050	-
	78.5	0.00068	-
	98.1	0.00085	-
	117.7	0.00102	-

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Propane; C_3H_8; 74-98-6

ORIGINAL MEASUREMENTS:

Schindler, D. L., Swift, G. W. and Kurata, F., *Hydrocarbon Process.*, 1966, *45*, no.11, 205.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in gas, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in gas, y_{He}
348.15	41.37	0.0132	0.221	273.15	96.53	0.0266	0.9444
	68.95	0.0396	0.432		124.1	0.0331	0.9540
	96.53	0.0625	0.550		151.7	0.0392	0.9600
	124.1	0.0826	0.633		179.3	0.0449	0.9646
	151.7	0.101	0.694		206.8	0.0506	0.9688
	179.3	0.118	0.737	248.15	13.79	0.0025	0.831
	206.8	0.134	0.763		41.37	0.0080	0.9414
323.15	41.37	0.0150	0.495		68.95	0.0133	0.9642
	68.95	0.0311	0.671		96.53	0.0183	0.9739
	96.53	0.0462	0.756		124.1	0.0230	0.9791
	124.1	0.0601	0.806		151.7	0.0274	0.9822
	151.7	0.0730	0.839		179.3	0.0315	0.9839
	179.3	0.0847	0.860		206.8	0.0354	0.9847
	206.8	0.0953	0.874	223.15	13.79	0.0018	0.9387
298.15	13.79	0.0020	0.253		41.37	0.0055	0.9815
	41.37	0.0139	0.721		68.95	0.0089	0.9884
	68.95	0.0246	0.831		96.53	0.0122	0.9905
	96.53	0.0343	0.879		124.1	0.0153	0.9913
	124.1	0.0435	0.9047		151.7	0.0182	0.9920
	151.7	0.0523	0.9204		179.3	0.0210	0.9929
	179.3	0.0611	0.9304		206.8	0.0238	0.9942
	206.8	0.0702	0.9365	198.15	13.79	0.0011	0.9820
273.15	13.79	0.0030	0.624		41.37	0.0033	0.9920
	41.37	0.0117	0.877		68.95	0.0054	0.9961
	68.95	0.0195	0.9255		96.53	0.0074	0.9971

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Static equilibrium cell with magnetic stirrer. Temperature measured with platinum resistance thermometer; pressure measured with Bourdon gauge. Propane charged into cell helium added. Samples of both phases analysed by gas chromatography. Details of apparatus in ref. 1.

SOURCE AND PURITY OF MATERIALS:

1. Minimum purity 99.9988 mole per cent.
2. Instrument grade sample.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.15$;

$\delta x_{He} = \pm 1.5$ to 4%; $\delta y_{He} = \pm 2\%$.

REFERENCES:

1. Sinor, J. E., Schindler, D. L. and Kurata, F., *Am. Inst. Chem. Engng. J.*, 1966, *12*, 357.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Propane; C_3H_8; 74-98-6	Schindler, D. L., Swift, G. W. and Kurata, F., *Hydrocarbon Process.*, 1966, *45*, no. 11, 205.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}
198.15	124.1	0.0092	0.9978
	151.7	0.0110	0.9982
	179.3	0.0127	0.9984
	206.8	0.0143	0.9984
173.15	13.79	0.00064	0.9972
	41.37	0.0019	0.9986
	68.95	0.0031	0.99932
	96.53	0.0042	0.99937
	124.1	0.0052	0.99940
	151.7	0.0062	0.99947
	179.3	0.0072	0.99960
	206.8	0.0081	0.99980
123.15	13.79	0.00012	-
	41.37	0.00033	-
	68.95	0.00052	-
	96.95	0.00070	-
	124.1	0.00087	-
	151.7	0.0010	-
	179.3	0.0012	-
	206.8	0.0014	-

COMPONENTS:

1. Helium; He; 7440-59-7
2. Methane, dichlorodifluoro-; CCl_2F_2; 75-71-8

ORIGINAL MEASUREMENTS:

Tsiklis, D. S., Maslennikova, V. Ya. and Goryunova, N. P., *Zhur. Fiz. Chem.*, 1967, *41*, 1804.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in lower phase, x_{He}	Mole fraction of helium in upper phase, y_{He}	T/K	P/bar	Mole fraction of helium in lower phase, x_{He}	Mole fraction of helium in upper phase, y_{He}
298	57	-	0.85	388	79	0.075	0.24
	126	0.05	-		81	-	0.243
	134	-	0.934		93	-	0.275
	137	-	0.934		96	0.106	-
	228	0.09	-		101	-	0.30
323	60	-	0.73		122	0.150	-
	126	0.06	-		126	-	0.408
	138	-	0.865		135	-	0.435
	233	0.11	-		140	0.166	-
	238	-	0.92		144	0.135	-
348	64	-	0.619		155	0.192	-
	132	0.12	-		158	-	0.49
	134	-	0.776		167	0.283	-
	241	0.16	-		173	-	0.517
	244	-	0.857		181	0.22	-
	247	-	0.860		188	-	0.55
373	74	-	0.413		213	0.258	-
	143	0.13	-		221	-	0.59
	148	-	0.64		241	0.258	-
	199	-	0.70		251	-	0.667
	245	0.212	-	391	110	0.308	-
	251	-			111	-	0.312
388	61	-	0.155		118	-	0.17
	71	-	0.191		120	0.16	-

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Rocking autoclave apparatus. Ref. 1 given as reference in which apparatus is described. It is not clear which of the several apparatus described were used.

SOURCE AND PURITY OF MATERIALS:

1. Purity better than 99.7 mole per cent.
2. Technical grade.

ESTIMATED ERROR:

$\delta T/K = \pm 0.5$; $\delta P/\text{bar} = \pm 1.0$; δx_{He}, $\delta y_{He} = \pm 0.01$ (estimated by compiler).

REFERENCES:

1. Tsiklis, D. S., *Techniques of Physicochemical Experiment at High and Ultrahigh Pressures*, Isd. Khimiya, Moscow, 1965.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Methane; dichlorodifluoro-; CCl_2F_2; 75-71-8	Tsiklis, D. S., Maslennikova, V. Ya. and Goryunova, N. P., *Zhur. Fiz. Chem.*, 1967, *41*, 1804.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in lower phase, x_{He}	Mole fraction of helium in upper phase, y_{He}	T/K	P/bar	Mole fraction of helium in lower phase, x_{He}	Mole fraction of helium in upper phase, y_{He}
391	122	-	0.36	391	235	0.323	-
	135	-	0.37		240	-	0.57
	150	0.23	-		279	0.645	-
	160	0.26	-		286	-	0.615
	197	0.29	-	395	316	0.562	-
	203	-	0.515		321	-	0.566
	220	0.307	-		333	0.464	0.684
	223	-	0.563				

COMPONENTS:

1. Helium; He; 7440-59-7
2. Ammonia; NH_3; 7664-41-7

ORIGINAL MEASUREMENTS:

Heise, F., *Ber. Bunsenges. Phys. Chem.*, 1972, *76*, 936.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
298.15	102.5	0.00304	-
	104.25	-	0.8900
	194.35	0.00528	0.9358
313.15	210.05	0.00701	0.9031

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Static rocking equilibrium cell; liquid and gas samples removed after equilibrium established. Samples analysed by freezing out ammonia in liquid nitrogen trap. Details in source and ref. 1.

SOURCE AND PURITY OF MATERIALS:

1. Messer-Griessheim sample, purity better than 99.95 mole per cent.
2. Gerling and Holtz sample, purity better than 99.8 mole per cent as determined by gas chromatography and mass spectrometry.

ESTIMATED ERROR:

$\delta T/K = \pm 0.1$; $\delta P/\text{bar} = \pm 0.3$ below 100 bar; ± 0.6 above 100 bar; $\delta x_{He} = \pm 2\%$ (estimated by compiler).

REFERENCES:

1. Heise, F., *Dissertation*, Göttingen, 1971.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Argon; Ar; 7440-37-1	Colin Young, School of Chemistry, University of Melbourne, Parkville, Victoria 3052, AUSTRALIA.

CRITICAL EVALUATION:

There are seven sets of high pressure measurements on this system. The three sets of data by Streett and coworkers (1,2,3) are mutually consistent but cover different pressure ranges. The two sets of data by Skripka and coworkers (4,5) are in fair agreement but the later data by Skripka and Lobonova (5) are thought to be more reliable. There is good agreement between the data of Mullins and Ziegler (6), Sinor and Kurata (7) and Streett (1). Hence the data of Mullins and Ziegler (6), Sinor and Kurata (7), Streett (1), Streett and Erickson (2), Streett and Hill (3) are all classified as tentative. The solubility data of Skripka and Lobonova (5) are marginally higher than that of Streett (1) and are classified as doubtful as are the earlier data of Skripka and Dykhno (4).

References

1. Streett, W. B., *Trans. Faraday Soc.*, 1969, *65*, 696.

2. Streett, W. B. and Erickson, A., *Physics Earth Planetary Interiors*, 1972, *5*, 357.

3. Streett, W. B. and Hill, J. L. E., *Trans. Faraday Soc.*, 1971, *67*, 622.

4. Skripka, V. G. and Dykhno, N. M., *Trudy Vses. Nauch.-Issled. Inst. Kislorodn. Mashinostr.*, 1964, *no. 8*, 63.

5. Skripka, V. G. and Lobonova, N. N., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1971, *no. 13*, 90.

6. Mullins, J. C. and Ziegler, W. T., *Int. Adv. Cryog. Engng.*, 1964, *10*, 171.

7. Sinor, J. E. and Kurata, F., *J. Chem. Engng. Data*, 1966, *11*, 537

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Argon; Ar; 7440-37-1	Streett, W. B. and Erickson, A. L., *Physics Earth Planetary Interiors*, 1972, *5*, 357.

VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
150.02	3860	0.2941	0.9353	180.00	5796	0.6217	0.7835
	4274	0.2825	0.9435		5935	0.6002	0.7991
	4518	0.2744	0.9472		5996	0.5877	0.8104
	4683[a]	0.270	0.949		6072	0.5731	0.8207
159.90	3515	0.4240	0.8721		6293	0.5419	0.8419
	4001	0.3904	0.8972		6555	0.5143	0.8603
	4481	0.3640	0.9135		7031	0.4772	0.8818
	4963	0.3429	0.9256		7516	0.4483	0.8983
	5386	0.3272	0.9342		7968	0.4265	0.9079
	5645	0.3191	0.9384		8010[a]	0.424	0.910
	5666[a]	0.317	0.939	190.00	7830[b]	0.715	0.715
170.00	4067[b]	0.682	0.682		7937	0.6346	0.7989
	4102	0.6114	-		8003	0.6193	0.8086
	4142	0.5893	0.7737		8079	0.6042	0.8210
	4205	0.5672	0.7958		8143	0.5949	0.8280
	4280	0.5541	0.8086		8357	0.5697	0.8433
	4419	0.5301	0.8262		8678	0.4265	0.8605
	4625	0.5020	0.8470		9002	0.5167	0.8762
	4963	0.4695	0.8689		9264	0.5033	0.8821
	5452	0.4324	0.8927		9312[a]	0.500	0.883
	5935	0.4051	0.9079	193.00	8514[b]	0.719	0.719
	6197	0.3947	0.9171		8657	0.6259	0.8073
	6638	0.3760	0.9261		8685	0.6124	0.8182
	6817[a]	0.368	0.930		8726	-	0.8264
180.00	5804[b]	0.702	0.702		8768	0.5927	0.8310

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Recirculating vapor flow apparatus with magnetic pump. Temperature measured with platinum resistance thermometer. Pressure measured with manganin resistance gauge. Samples of liquid and gas analysed by thermal conductivity. Details in source.	No details given.
	ESTIMATED ERROR:
	$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 5$; δx_{He}, δy_{He} = ±1 mole percent (estimated by compiler).
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Argon; Ar; 7440-37-1	Streett, W. B. and Erickson, A. L., *Physics Earth Planetary Interiors*, 1972, *5*, 357.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
193.00	8967	0.5712	0.8461
	9250	0.5432	0.8627
	9567	0.5208	0.8750
	9670[a]	0.520	0.878
195.00	8974[b]	0.722	0.722
	9151	0.6026	0.8250
	9181	0.6010	0.8252
	9216	0.5975	0.8317
	9260	0.5951	0.8344
	9346	0.5800	0.8442
	9505	0.5622	0.8548
	9884	0.5347	0.8706
	9940[a]	0.550	0.872
197.00	9360[b]	0.723	0.723
	9519	0.6204	0.8160
	9554	0.6160	0.8210
	9591	0.6098	0.8255
	9636	0.6034	0.8289
	9784	0.5860	0.8416
	9981	0.5667	0.8522
	10153	0.5533	0.8605
	10204[a]	0.560	0.862
199.00	9761[b]	0.724	0.724
	9843	0.6497	0.7989
	9870	0.6432	0.8020
	9894	0.6368	0.8077
	9933	0.6289	0.8120
	10022	0.6119	0.8203
	10043	0.6056	0.8244
	10160	0.5941	0.8335
	10408	0.5681	0.8512
	10481[a]	0.560	0.860

[a] Three phase pressure ± 10 bar

[b] Critical pressure ± 20 bar

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Mullins, J. C. and Ziegler, W. T., *Internat. Adv. Cryogenic Engng.*, 1964, *10*, 171.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
91.99	81.26	-	0.97053	108.04	60.80	-	0.8710
91.99	61.10	-	0.96384	91.99	81.26	0.00756	-
92.00	40.67	-	0.9496	92.00	61.21	0.00580	-
91.95	20.18	-	0.9084	92.00	40.67	0.00387	-
91.96	121.39	-	0.97748	91.96	20.18	0.00192	-
91.98	101.60	-	0.97465	91.97	121.39	0.01071	-
97.50	121.66	-	0.96417	91.96	101.60	0.00917	-
97.50	101.40	-	0.95970	97.51	121.66	0.01406	-
97.51	81.06	-	0.9530	97.50	101.40	0.01212	-
97.51	61.05	-	0.9412	97.50	81.06	0.00985	-
97.51	40.57	-	0.9179	97.52	61.00	0.00756	-
97.52	20.29	-	0.8522	97.51	40.67	0.00499	-
97.50	61.00	-	0.9416	97.52	20.29	0.00240	-
86.02	81.20	-	0.98351	97.51	61.00	0.00748	-
86.02	61.10	-	0.97989	86.02	81.20	0.00550	-
86.03	40.04	-	0.97195	86.02	61.07	0.00418	-
86.02	20.21	-	0.95020	86.03	40.04	0.00283	-
86.02	121.66	-	0.98726	86.00	20.23	0.00143	-
86.01	121.82	-	0.98724	86.01	20.23	0.00143	-
86.00	101.71	-	0.98573	86.01	101.74	0.00675	-
86.00	121.59	-	0.98705	108.02	121.66	0.02216	-
86.02	121.59	-	0.98727	108.03	101.40	0.01879	-
108.01	121.59	-	0.9229	108.03	81.06	0.01523	-
108.01	101.40	-	0.9123	108.04	60.80	0.01145	-
108.04	81.06	-	0.8966				

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Single pass flow apparatus. Two compartment equilibrium cell. Temperature measured with platinum resistance thermometer; pressure measured with Bourdon gauge. Pure helium bubbled through liquid argon. Samples analysed by gas chromatography. Details in source.

SOURCE AND PURITY OF MATERIALS:

1 and 2: Purities better than 99.995 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.03$; $\delta P/bar = \pm 0.5\%$; $\delta x_{He} \leq \pm 2\%$; $\delta(1-y_{He}) \leq \pm 3\%$.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Argon; Ar; 7440-37-1	Sinor, J. E. and Kurata, F., *J. Chem. Eng. Data*, 1966, *11*, 537.
VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}
93.15	17.2	0.0015
	34.5	0.0035
	51.7	0.0052
	68.95	0.0071
	86.18	0.0087
	103.4	0.0102
	120.7	0.0114
	137.9	0.0129
113.15	17.2	0.0025
	34.5	0.0075
	51.7	0.0119
	68.95	0.0164
	86.18	0.0210
	103.4	0.0249
	120.7	0.0287
	137.9	0.0325
133.15	34.5	0.0068
	51.7	0.0171
	68.95	0.0276
	86.18	0.0370
	103.4	0.0461
	120.7	0.0549
	137.9	0.0632
148.15	51.7	0.0121
	68.95	0.0393
	86.18	0.0650
	103.4	0.0895
	120.7	0.1138
	137.9	0.1380

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Static equilibrium cell (0.1 ℓ capacity) fitted with magnetic stirrer. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Contents charged into cell, equilibrated liquid samples withdrawn and analysed by G.C. Details in source and ref. 1.

SOURCE AND PURITY OF MATERIALS:

1. U.S. Bureau of Mines sample maximum impurity 12 parts per million.
2. Linde Co. sample purity 99.996 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$; $\delta P/\text{bar} = \pm 0.1$; $\delta x_{He} = \pm 1\%$ or ± 0.0003 (whichever is greater)

REFERENCES:

1. Sinor, J. E., Schindler, D. L. and Kurata, F., *Am. Inst. Chem. Engnrs J.*, 1966, *12*, 353.

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Streett, W. B., *Trans. Faraday Soc.*, 1969, *65*, 696.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
91.34	14.2	0.0015	0.8812	144.4	554.6	0.2984	0.7192
	41.3	0.0042	0.9461		620.3	-	0.6861
	68.6	0.0065	0.9666		628.9	0.3127	-
	133.0	0.0118	0.9765		687.2	0.3188	-
	204.7	0.0158	0.9844	145.97	243.0	0.2170	0.5323
	273.6	0.0196	0.9861		308.1	0.2596	0.5667
	316.3	0.0216	0.9905		386.0	0.2994	0.6023
	366.0	0.0237	0.9924		450.8	0.3207	0.6261
130.08	32.5	0.0067	0.2716		548.0	0.3584	0.6600
	57.1	0.0198	0.5200		685.9	0.3801	0.7032
	97.2	0.0380	-	146.90	257.5	0.2556	0.4897
	141.3	0.0548	0.7480		288.8	0.2783	0.5086
	199.5	0.0794	0.7967		317.0	0.3007	0.5187
	279.2	0.1032	0.8329		323.2	0.3049	0.5240
	346.0	0.1200	0.8521		374.9	0.3504	0.5363
	418.4	0.1348	0.8670		412.9	0.3652	0.5543
	484.9	0.1454	0.8779		448.1	0.3754	0.5551
	554.1	0.1526	0.8864		486.7	0.3822	0.5862
	619.3	0.1603	0.9013		536.9	0.3987	0.6039
	685.5	0.1664	0.9061		616.9	0.4047	0.6380
144.4	68.7	0.0328	0.3058		689.3	0.4111	0.6655
	134.1	0.0967	0.4631	147.73	98.9	0.0838	0.2581
	204.4	0.1570	0.5551		143.4	0.1528	0.3466
	273.5	0.1999	0.6178		172.4	0.1818	0.3853
	346.0	0.2381	0.6559		239.2	0.2931	0.4158
	422.5	0.2669	0.6820		262.9	0.3678	0.3873
	486.7	0.2862	0.7020				

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus. Details of apparatus given in ref. 1. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Samples of coexisting phases analysed by thermal conductivity.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.03$; $\delta P/bar = \pm 0.1$; $\delta x_{He} = \pm 0.0002$; $\delta y_{He} = \pm 0.001$ (estimated by compiler).

REFERENCES:

1. Streett, W. B., *Cryogenics*, 1965, *5*, 27.

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Skripka, V. G. and Dykhno, N. M., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinstr.*, 1964, *8*, 163.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	P^+/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
90.5	6.03	4.66	0.0452	0.7392
	11.08	9.72	0.092	0.8637
	16.14	14.77	0.138	0.9043
	21.21	19.84	0.190	0.9242
	26.26	24.90	0.230	0.9382

P^+ partial pressure of helium

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Vapor flow apparatus with magnetic recirculating pump. Temperature measured with platinum resistance thermometer, pressure measured with Bourdon gauge. Samples of gas and liquid analysed by gas phase interferometry. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. High purity containing no more than 0.008% hydrogen, 0.02% nitrogen, 0.005% oxygen and 0.07% hydrocarbons.
2. No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$ to 0.03; δP less than 0.2 bar; $\delta x_{He} \simeq \delta y_{He} = \pm 0.00001$ to 0.00002.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Argon; Ar; 7440-37-1	Skripka, V. G. and Lobonova, N. N., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1971, *13*, 90.
VARIABLES: Temperature, pressure	PREPARED BY: C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
90.67	9.8	0.0010	-	102.95	39.2	0.0080	0.8300
	19.6	0.0021	-		49.0	0.0099	0.8590
	29.4	0.0032	0.9230		58.8	0.0118	0.8790
	39.2	0.0043	0.9380		68.6	0.0137	0.8930
	49.0	0.0055	0.9485		78.5	0.0155	0.9030
	58.8	0.0066	0.9565		88.3	0.0174	0.9110
	68.6	0.0075	0.9620		98.1	0.0192	0.9180
	78.5	0.0088	0.9650		107.9	0.0209	0.9245
	88.3	0.0098	0.9675		117.7	0.0226	0.9300
	98.1	0.0109	0.9695		127.5	0.0242	0.9350
	107.9	0.0119	0.9715		137.3	0.0258	0.9385
	117.7	0.0129	0.9740		147.1	0.0273	0.9420
	127.5	0.0138	0.9755		156.9	0.0287	0.9450
	137.3	0.0146	0.9770		166.7	0.0302	0.9480
	147.1	0.0154	0.9775		176.5	0.0315	0.9500
	156.9	0.0161	0.9780		186.3	0.0328	0.9525
	166.7	0.0168	0.9790		196.1	0.0342	0.9550
	176.5	0.0175	0.9805		205.9	0.0354	0.9570
	186.3	0.0183	0.9815		215.7	0.0366	0.9585
	196.1	0.0190	0.9830	115.09	9.8	0.0005	-
	205.9	0.0197	0.9840		19.6	0.0046	-
	215.7	0.0204	0.9845		29.4	0.0085	0.4650
102.95	9.8	0.0018	-		39.2	0.0120	0.5850
	19.6	0.0040	-		49.0	0.0153	0.6640
	29.4	0.0061	0.7815		58.8	0.0183	0.7140

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Rocking autoclave partially filled with liquid and then pressurized with gas. Samples of phases analysed by interferometry. Temperature measured with platinum resistance thermometer and pressure with Bourdon gauge. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. High purity sample purity 98.9 mole per cent.
2. High purity sample purity 99.99 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/\text{bar} = \pm 0.4$; δx_{He}, $\delta y_{He} = \pm 0.0002$.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Argon; Ar; 7440-37-1	Skripka, V. G. and Lobonova, N. N., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1971, *13*, 90.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
115.09	68.6	0.0216	0.7480
	78.5	0.0247	0.7730
	88.3	0.0278	0.7930
	98.1	0.0310	0.8080
	107.9	0.0341	0.8215
	117.7	0.0370	0.8320
	127.5	0.0400	0.8420
	137.3	0.0428	0.8505
	147.1	0.0456	0.8580
	156.9	0.0483	0.8650
	166.7	0.0503	0.8700
	176.5	0.0533	0.8760
	186.3	0.0557	0.8800
	196.1	0.0579	0.8840
	205.9	0.0600	0.8880
	215.7	0.0621	0.8920

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Streett, W. B. and Hill, J. L. E., *Trans. Faraday Soc.*, 1971, *67*, 622.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
98.02	220.9	0.0229	0.9740	120.01	1172.3	0.1284	0.9557
	275.6	0.0261	0.9747		1310.1	0.1286	0.9588
	420.5	0.0347	0.9802		1447.9	0.1286	0.9629
	482.3	0.0376	0.9816		1585.7	0.1315	0.9650
	627.2	0.0430	0.9817		1723.5	0.1316	0.9678
	696.1	0.0448	0.9823		1861.3	0.1316	0.9698
	717.4	0.0452	0.9834		1930.2	0.1316	0.9705
108.17	489.4	0.0602	0.9622		1999.1	0.1316	0.9705
	620.1	0.0669	0.9670		2075.1	0.1313	0.9705
	757.9	0.0721	0.9713		2111.6	0.1310	0.9707
	896.7	0.0762	0.9747	129.74	358.7	0.1185	0.8555
	965.6	0.0776	0.9754		482.3	0.1395	0.8761
	1034.5	0.0784	0.9767		620.1	0.1557	0.8912
	1103.4	0.0802	0.9774		757.9	0.1671	0.9078
	1179.4	0.0813	0.9774		896.7	0.1754	-
	1206.8	0.0819	0.9774		1034.5	0.1795	-
	1224.0	0.0823	0.9774		1241.2	0.1836	0.9360
	1241.2	0.0834	0.9774		1361.8	0.1848	0.9413
	1261.5	0.0841	0.9774		1585.7	0.1856	0.9492
	1277.7	0.0841	0.9775		1861.3	0.1836	0.9560
120.01	344.5	0.0796	0.9117		2068.0	0.1812	-
	613.0	0.1078	0.9372		2413.6	0.1769	0.9595
	744.7	0.1152	0.9426		2620.3	0.1746	0.9616
	896.7	0.1221	0.9486		2765.2	0.1732	0.9650
	1034.5	0.1253	0.9528		2827.0	0.1722	0.9692

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic pump at ambient temperature. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Details in source and ref. 1.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.5$;

$\delta x_{He} = \delta y_{He} = 0.001$.

REFERENCES:

1. Streett, W. B., *Cryogenics*, 1965, *5*, 27.

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Streett, W. B. and Hill, J. L. E., *Trans. Faraday Soc.*, 1971, *67*, 622.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
129.74	2880.7	0.1720	0.9662	147.80	314.1	0.3050	0.4721
139.39	344.5	0.1765	0.7502		351.6	0.3641	-
	482.3	0.2127	0.7894		545.1	-	0.5452
	620.1	0.2347	0.8157		585.7	0.4317	-
	757.9	0.2479	0.8353		610.0	-	0.5753
	896.7	0.2563	0.8520		627.2	0.4272	0.5985
	1034.5	0.2605	0.8659		641.3	0.4278	0.6052
	1172.3	0.2629	0.8775		689.0	0.4232	0.6315
	1312.1	0.2629	0.8875		827.8	0.4090	0.6928
	1447.9	0.2611	0.8961		965.6	0.4054	0.7338
	1723.5	0.2581	0.9091	148.03	96.3	0.0854	0.2787
	1999.1	0.2529	0.9195		140.8	0.144	0.3556
	2275.8	0.2456	0.9280		179.3	0.1896	0.3901
	2551.4	0.2405	0.9333		228.0	0.2400	0.4183
	2827.0	0.2329	0.9392		262.4	0.3110	0.3892
	2895.9	0.2329	0.9406		658.6	0.4559	0.5981
	2964.8	0.2307	0.9419		723.5	0.4320	-
	3033.7	0.2306	0.9486		836.9	0.4241	0.6806
	3102.6	0.2285	0.9499		895.7	0.4122	0.7093
	3171.5	0.2277	0.9509		1043.6	0.4087	0.7492
	3240.4	0.2261	0.9513		1172.3	0.3984	0.7822
	3326.5	0.2251	0.9534		1379.0	0.3829	0.8145
	3454.2	0.2238	0.9545		1654.6	0.3662	0.8466
	3581.8	0.2226	0.9556		1930.2	0.3506	0.8713
	3619.3	0.2224	0.9556		2068.0	0.3401	0.8818
145.00	2750.8	0.2805	-		2413.6	0.3261	0.8989
	3109.7	0.2685	-		2736.8	0.3118	0.9099
	3447.1	0.2598	-		3102.6	0.2983	0.9253
	3792.6	0.2494	0.9379		3461.3	0.2869	0.9326
	4219.2	0.2480	0.9383	148.30	757.9	0.4982	-
146.90	220.9	0.2188	0.4957		793.4	0.4795	0.5796
	275.6	0.2584	0.5182		827.8	0.4527	0.6535
	344.5	0.3008	-		965.6	0.4308	0.7137
	434.7	0.3425	0.5876		1103.4	0.4157	0.7476
	496.5	0.3576	0.6127		1241.2	0.4054	0.7751
	551.2	0.3717	0.6328		1654.6	0.3755	0.8347
	689.0	0.3817	0.6810	149.00	892.7	0.4855	0.6362
	827.8	0.3842	0.7282		958.5	-	0.6821
	965.6	0.3822	0.7571		1061.9	0.4385	0.7222
	1103.4	0.3750	0.7778		1172.3	0.4256	0.7502
	1241.2	0.3696	0.7976		1379.0	0.4045	0.7932
	1379.0	0.3614	0.8203		1654.6	0.3826	0.8325
	1654.6	0.3479	0.8520		1930.2	0.3626	0.8604
	2068.0	0.3310	0.8818		2482.5	0.3319	0.8907
	2413.6	0.3174	-		2827.0	0.3189	0.9098
	2808.7	0.3040	0.9117		3426.8	0.2937	0.9273
	3102.6	0.2942	0.9208		3792.6	0.2851	0.9372
147.30	344.5	0.3105	0.5349	150.02	1034.5	0.5239	0.6097
	413.4	0.3546	0.5536		1103.4	0.4861	0.6708
	482.3	0.3839	0.5808		1254.4	0.4448	0.7389
	689.0	0.4089	0.6607		1379.0	0.4287	0.7698
	827.8	0.4045	0.7064		1516.8	0.4104	0.7921
147.80	213.8	0.2269	0.4476		1723.5	0.3955	0.8284
	265.6	0.2653	0.4604		2075.1	0.3691	0.8561

(cont.)

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Streett; W. B. and Hill, J. L. E., *Trans. Faraday Soc.*, 1971, *67*, 622.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
150.02	2424	0.3491	0.8862	155.94	3786	0.3485	0.9065
	2765	0.3322	0.9039		4137	0.3399	0.9214
	3006	0.3204	0.9117	158.09	2220	0.5749	0.6943
	3447	0.3062	0.9247		2251	-	0.7187
	3793	-	0.9346		2276	0.5293	0.7471
	4137	0.2895	0.9425		2441	0.4964	0.7789
150.99	1179	0.5612	-		2482	0.4855	-
	1241	0.5057	0.6718		2800	0.4432	0.8260
	1310	0.4788	-		2992	0.4199	0.8454
	1379	0.4656	0.7122	159.90	2503	0.5978	0.6967
	1586	-	0.7800		2520	0.5776	0.7117
	1724	0.4169	0.8125		2551	0.5578	0.7297
155.94	1940	0.5616	0.7078		2599	0.5389	0.7539
	1952	0.5554	0.7187		2662	0.5210	-
	1982	0.5427	0.7323		2751	0.5036	-
	2006	0.5345	0.7430		2827	0.4886	-
	2031	-	0.7539		2920	0.4755	0.8272
	2206	0.4821	0.7943		3013	-	0.8354
	2414	0.4476	0.8239		3103	0.4578	0.8431
	2758	0.4122	0.8573		3447	0.4211	0.8713
	3103	0.3853	0.8794		3793	0.4004	0.8862
	3447	0.3638	0.8938		4137	0.3761	0.9014

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Carbon monoxide; CO; 630-08-0	Parrish, W. R. and Stewart, W. G., *J. Chem. Engng. Data*, 1975, *20*, 412.
VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
79.50	41.2	0.0047	-	120.00	105.1	0.0767	-
	41.5	0.0048	-		138.0	0.1003	-
	69.1	0.0077	-	80.00	11.9	-	0.9204
	69.4	0.0079	-		13.7	-	0.9303
	102.7	0.0115	-		28.8	-	0.9636
	103.4	0.0116	-		42.3	-	0.9732
	134.9	0.0143	-		56.3	-	0.9787
	136.1	0.0146	-		69.8	-	0.9821
84.71	69.0	0.0105	-		136.4	-	0.9885
	69.4	0.0107	-	84.71	6.9	-	0.8709
	102.9	0.0152	-		7.0	-	0.8713
	103.9	0.0152	-		15.2	-	0.8946
	135.3	0.0185	-		28.8	-	0.9395
	136.2	0.0186	-		42.8	-	0.9563
90.00	35.6	0.0072	-		56.4	-	0.9649
	69.4	0.0141	-		70.9	-	0.9703
	103.6	0.0203	-		104.0	-	0.9777
	135.6	0.0253	-	90.00	14.6	-	0.8127
	136.9	0.0254	-		26.7	-	0.8918
100.00	37.1	0.0116	-		40.1	-	0.9239
	70.1	0.0227	-		55.6	-	0.9413
	104.3	0.0333	-		71.2	-	0.9515
	136.9	0.0419	-		104.0	-	0.9638
120.00	36.5	0.0174	-		137.6	-	0.9689
	69.9	0.0478	-	100.00	13.4	-	0.5471

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Vapor recirculation system similar to that in ref. 1. Pressure measured with Bourdon gauge. Temperature measured with platinum resistance thermometer. Samples of liquid and vapor analysed by gas chromatography. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. No details given.
2. Ultrapure purity better than 99.8 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.013$; $\delta P/bar = \pm 0.07$; $\delta x_{He} \approx \delta y_{He} = \pm 0.002$ or $\pm 2\%$ whichever is greater.

REFERENCES:

1. Duncan, A. G. and Hiza, M. J., *Adv. Cryog. Engng.*, 1970, *15*, 42.

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Carbon monoxide; CO; 630-08-0

ORIGINAL MEASUREMENTS:

Parrish, W. R. and Stewart, W. G., *J. Chem. Engng. Data*, 1975, *20*, 412.

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
100.0	27.4	-	0.7594
	27.9	-	0.7596
	29.3	-	0.7712
	39.0	-	0.8195
	41.4	-	0.8279
	57.0	-	0.8668
	69.8	-	0.8863
	70.2	-	0.8865
	103.9	-	0.9154
	131.0	-	0.9274
	131.8	-	0.9275
	132.7	-	0.9281
	132.9	-	0.9282
120.0	29.3	-	0.2401
	42.5	-	0.4053
	56.7	-	0.5082
	70.5	-	0.5806
	103.8	-	0.6735
	137.1	-	0.7256

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Carbon monoxide; CO; 630-08-0	Sinor, J. E. and Kurata, F., *J. Chem. Eng. Data*, 1966, *11*, 537.

VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}
77.35	17.2	0.0030
	34.5	0.0045
	51.7	0.0062
	68.95	0.0073
	86.18	0.0094
	103.4	0.0106
	120.7	0.0122
	137.9	0.0134
93.15	17.2	0.0042
	34.5	0.0090
	51.7	0.0135
	68.95	0.0189
	86.18	0.0221
	103.4	0.0249
	120.7	0.0300
	137.9	0.0328
11.15	34.5	0.0164
	51.7	0.0290
	68.95	0.0396
	86.18	0.0510
	103.4	0.0605
	120.7	0.0700
	137.9	0.0781
128.15	51.7	0.0424
	68.95	0.0693
	86.18	0.0965
	103.4	0.1214
	120.7	0.1455
	137.9	0.1673

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Static equilibrium cell (0.1 ℓ capacity) fitted with magnetic stirrer. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Contents charged into cell, equilibrated liquid samples withdrawn and analysed by G.C. Details in source and ref. 1.

SOURCE AND PURITY OF MATERIALS:

1. U.S. Bureau of Mines sample maximum impurity 12 parts per million.
2. Olin-Matheson sample purity 99.5 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$; $\delta P/\text{bar} = \pm 0.1$;
$\delta x_{He} = \pm 1\%$ or ± 0.0003 (whichever is greater)

REFERENCES:

1. Sinor, J. E., Schindler, D. L. and Kurata, F., *Am. Inst. Chem. Engnrs. J.*, 1966, *12*, 353.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Carbon dioxide; CO_2; 124-38-9	Colin Young, School of Chemistry, University of Melbourne, Parkville, Victoria, 3052 AUSTRALIA.

CRITICAL EVALUATION:

The solubility of helium in carbon dioxide has been studied at high pressures by Tsiklis (1), MacKendrick *et al.* (2) and Burfield *et al.* The study of Tsiklis covered the temperature range 298 K to 353 K and its main aim was to discover the phase behaviour in order to establish that this mixture exhibits gas-gas immiscibility. It was found to exhibit gas-gas immiscibility of the first kind (3). Since only graphical data were presented, these are rejected for the present purposes.

The data of MacKenrick *et al.* (2), while not of the highest precision, appear to be self-consistent and are classified as tentative. The data of Burfield *et al.* (4) are slightly (∿ 5%) lower than those of MacKendrick *et al.* and are classified as tentative.

References

1. Tsiklis, D. S., *Doklady Acad. Nauk S.S.S.R.*, 1952. *86*, 1159.

2. MacKendrick, R. F., Heck, C. K. and Barrick, P. L., *J. Chem. Engng. Data* 1968, *13*, 352.

3. Schneider, G. M., in *Chemical Thermodynamics Vol. 2 Specialist Periodical Report*, Chapter 4, ed. McGlashan, M. L., Chemical Society, London, 1978.

4. Burfield, D. W., Richardson, H. P. and Guereca, R. A., *Am. Inst. Chem. Engnrs. J.*, 1970, *16*, 97.

COMPONENTS:

1. Helium; He; 7440-59-7
2. Carbon dioxide; CO_2; 124-38-9

ORIGINAL MEASUREMENTS:

Burfield, D. W., Richardson, H. P. and Guereca, R. A., *Am. Inst. Chem. Engnrs. J.*, 1970, *16*, 97.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
293.13	57.31	0.0000	0.0000	273.26	81.98	0.0181	0.4594
	66.06	0.0069	0.0705		89.00	0.0210	0.4983
	77.42	0.0137	0.1380		108.15	0.0268	0.5775
	88.04	0.0190	0.1960		129.12	0.0293	0.6394
	97.03	0.0237	0.2466		136.38	0.0310	0.6569
	106.77	0.0303	0.2843	253.11	19.84	0.0000	0.0000
	121.10	0.0370	0.3429		29.84	0.0020	0.2860
	129.09	0.0427	0.3889		35.37	0.0041	0.3494
	141.11	0.0493	0.4160		47.36	0.0055	0.5070
273.26	34.99	0.0000	0.0000		55.36	0.0070	0.5723
	37.81	0.0010	0.0448		64.07	0.0080	0.6300
	40.84	0.0022	0.0941		77.43	0.0102	0.6836
	49.48	0.0029	0.1434		90.70	0.0134	0.7323
	51.70	0.0048	0.2225		110.20	0.0161	0.7876
	61.67	0.0089	0.3197		117.19	0.0190	0.7991
	67.30	0.0142	0.3630		138.88	0.0173	0.8183
	75.50	0.0173	0.4232				

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic pump. Pressure measured with transducer calibrated against dead weight piston balance; temperature measured with thermocouple. Samples of coexisting phases analysed by mass spectrometer. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. Bureau of Mines, Ultrapure sample, total impurities 35 parts per million.
2. Purity better than 99.98 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.05$; $\delta P/\text{bar} = \pm 0.1$; $\delta x_{He} = \pm 0.0001$ to 0.0005; $\delta y_{He} = \pm 0.001$.

REFERENCES:

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Carbon dioxide; CO_2; 124-38-9

ORIGINAL MEASUREMENTS:

MacKendrick, R. F., Heck, C. K. and Barrick, P. L., *J. Chem. Engng. Data*, 1968, *13*, 352.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	*P*/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
219.9	9.93	-	0.372
	11.75	-	0.460
	16.52	-	0.621
	36.17	-	0.817
	90.38	0.00581	0.9225
	123.0	0.00868	0.9419
	145.4	0.0103	0.9498
	162.2	0.0114	0.9543
	193.3	0.0141	0.9612
229.9	14.6	-	0.354
	14.8	0.00064	-
	29.8	0.00241	0.674
	45.4	0.00409	0.779
	63.9	0.00529	0.836
	91.0	0.00944	0.880
	122.9	0.0129	0.9118
	160.1	0.0167	-
	161.5	-	0.9325
	194.3	0.0195	-
	196.1	-	0.9407
244.9	19.76	-	0.198
	29.79	-	0.441
	40.12	0.00440	0.570
	49.95	-	0.653
	52.79	0.00643	-
244.9	85.32	0.0121	0.784
	99.20	0.0141	-
	99.60	-	0.810
	108.8	0.0156	0.823
	140.2	0.0204	0.864
	157.1	0.0226	-
	159.5	-	0.874
	176.7	0.0249	-
	177.3	-	0.883
	190.5	-	0.893
	200.3	0.0286	-
	202.2	-	0.898
259.9	40.2	0.00428	0.322
	45.3	-	0.383
	59.1	-	0.515
	61.6	0.00960	0.529
	88.3	0.0160	0.653
	104.0	0.0182	-
	104.8	-	0.708
	141.7	0.0259	0.771
	168.4	0.0312	0.801
	197.1	0.0360	0.824
274.9	43.16	0.00267	0.109
	46.31	0.00384	0.149
	56.03	0.00738	0.247

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Vapor recirculated through cell. Liquid and vapor samples analysed by gas chromatography. Pressure measured by Bourdon gauge and temperature with platinum resistance thermometer. Details in source and ref. 1 and 2.

SOURCE AND PURITY OF MATERIALS:

1. Purity 99.995 or better.
2. Purity 99.98 or better.

ESTIMATED ERROR:

$\delta T/K = \pm 0.1$; $\delta P/\text{bar} = \pm 0.1$ (up to 100 bar) $= \pm 0.3$ (above 100 bar); $\delta x_{He} \simeq \delta(1-y)_{He} = \pm 5\%$.

REFERENCES:

1. Herring, R. N. and Barrick, R. L., *Adv. Cryogenic Eng.*, 1965, *10*, 151.
2. Spano, J. O., Heck, C. K. and Barrick, R. L., *J. Chem. Engng. Data*, 1968, *13*, 168.

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Carbon dioxide; CO_2; 124-38-9

ORIGINAL MEASUREMENTS:

MacKendrick, R. F., Heck, C. K. and Barrick, P. L., *J. Chem. Engng. Data*, 1968, *13*, 352.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
274.9	58.77	0.00857	0.262
	80.05	0.0162	-
	87.24	-	0.461
	102.5	0.0241	0.527
	130.1	-	0.618
	141.2	0.0371	-
	172.8	-	0.695
	175.1	0.0492	0.696
	201.2	0.0604	0.736
289.9	62.01	0.00537	0.0760
	84.10	0.0184	-
	85.72	0.0192	0.227

COMPONENTS:

(1) Helium; He^3; 14762-55-1

(2) n-Deuterium; n-D_2; 7782-39-0

ORIGINAL MEASUREMENTS:

Hiza, M. J., *Nat. Bur. Standards, Tech. Note 621*, 1972.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He^3}	T/K	P/bar	Mole fraction of helium in liquid, x_{He^3}
20.00	0.2945	0.0000	24.00	11.301	0.0114
	3.496	0.0065(2)		13.769	0.0118
	6.244	0.0062(6)		13.927	0.0124
	9.418	0.0065(2)	26.00	1.8892	0.0000
	11.859	0.0083(2)		5.816	0.0090(8)
	14.637	0.0086(3)		7.040	0.0106
22.00	0.6082	0.0000		8.718	0.0122
	5.078	0.0072(5)		11.348	0.0142
	7.553	0.0083(5)		15.651	0.0170
	9.722	0.0086(8)	28.00	2.9820	0.0000
	12.432	0.0090(5)		9.457	0.0122
	16.338	0.0104		11.876	0.0158
24.00	1.1204	0.00000		15.010	0.0187
	4.071	0.0060(5)	30.00	4.4678	0.0000
	5.730	0.0074(1)		9.105	0.0130
	6.578	0.0091(5)		10.656	0.0155
	8.840	0.0098(1)		13.534	0.0192
	9.219	0.0107		17.816	0.0257
	9.342	0.0109			

(cont.)

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with copper equilibrium cell. Recirculating pump described in ref. 1. Temperature measured with platinum resistance thermometer and pressure measured with a double-revolution Bourdon gauge. Samples of gas and liquid analysed by gas chromatography using thermistor thermal conductivity detectors. Details in source and ref. 2.

SOURCE AND PURITY OF MATERIALS:

1. USAEC samples containing 1.4 mole per cent He^4.
2. USAEC sample 1.12% HD and 0.02% H_2.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.004$;

δx_{He^3}, δy_{He^3} = ±3% or 0.001 whichever is greater.

REFERENCES:

1. Hiza, M. J. and Duncan, A. G., *Rev. Sci. Instr.*, 1969, *40*, 513.
2. Duncan, A. G. and Hiza, M. J., *Adv. Cryog. Engng.*, 1970, *15*, 42.

COMPONENTS:

(1) Helium; He^3; 14762-55-1

(2) n-Deuterium; n-D_2; 7782-39-0

ORIGINAL MEASUREMENTS:

Hiza, H. J., *Nat. Bur. Standards, Tech. Note 621*, 1972.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in vapor, y_{He^3}
20.00	0.2945	0.0000
	5.286	0.9284(7)
	5.664	0.9305(8)
	8.553	0.9488(8)
	12.604	0.9597(5)
	15.844	0.9641(3)
24.00	1.1205	0.0000
	3.682	0.6501
	8.343	0.8202
	12.504	0.8635
	16.044	0.8846
28.00	2.9820	0.0000
	8.808	0.5813
	12.404	0.6725
	14.603	0.7078
30.00	4.4678	0.0000
	7.501	0.3259
	10.035	0.4531
	13.321	0.5542
	17.161	0.6192

COMPONENTS:

(1) Helium; He^4; 7440-59-7

(2) n-Deuterium; n-D_2; 7782-39-0

ORIGINAL MEASUREMENTS:

Hiza, M. J., *Nat. Bur. Standards, Tech. Note, 621*, 1972.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He^4}	T/K	P/bar	Mole fraction of helium in liquid, x_{He^4}
20.00	0.2945	0.00000	26.00	12.069	0.0182
	9.846	0.0085(5)		13.983	0.0200
	13.420	0.0092(6)		17.375	0.0212
	16.941	0.0099(7)		19.664	0.0252
	19.450	0.0101		20.154	0.0247
22.00	0.6082	0.00000	28.00	2.9820	0.0000
	8.515	0.0099(2)		6.805	0.0103
	10.363	0.0106		7.112	0.0109
	14.093	0.0133		10.294	0.0148
	17.285	0.0136		15.461	0.0236
	20.063	0.0154		18.795	0.0278
24.00	1.1204	0.00000		19.153	0.0277
	8.712	0.0126		20.016	0.0292
	10.639	0.0143	30.00	4.4678	0.0000
	13.841	0.0157		8.943	0.0136
	17.127	0.0195		11.604	0.0192
	20.257	0.0200		14.210	0.0249
26.00	1.8892	0.00000		16.493	0.0290
	8.643	0.0146		20.670	0.0367
	9.329	0.0142		20.684	0.0341

(cont.)

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with copper equilibrium cell. Recirculating pump described in ref. 1. Temperature measured with platinum resistance thermometer and pressure measured with a double revolution Bourdon gauge. Samples of gas and liquid analysed by gas chromatography using thermistor thermal conductivity detectors. Details in source and ref. 2.

SOURCE AND PURITY OF MATERIALS:

1. Nat. Bureau of Mines A grade sample.
2. USAEC sample 1.12% HD and 0.02% H_2.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.004$; δx_{He^4}, δy_{He^4} = ±3% or 0.001 whichever is greater.

REFERENCES:

1. Hiza, M. J. and Duncan, A. G., *Rev. Sci. Instr.*, 1969, *40*, 513.
2. Duncan, A. G. and Hiza, M. J., *Adv. Cryog. Engng.*, 1970, *15*, 42.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He^4; 7440-59-7 (2) n-Deuterium; n-D_2; 7782-39-0	Hiza, M. J., *Nat. Bur. Standards, Tech Note 621*, 1972.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in vapor, y_{He^4}
20.00	6.832	0.9397(1)
	10.042	0.9542(5)
	13.696	0.9607(8)
	18.254	0.9651(1)
24.00	4.037	0.6857
	8.453	0.8240
	14.221	0.8783
	20.439	0.8995
28.00	8.098	0.5564
	10.642	0.6312
	15.744	0.7116
	19.281	0.7477
30.00	7.243	0.2095
	10.556	0.4665
	15.431	0.5873
	20.274	0.6444

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Fluorine; F_2; 7782-41-4

ORIGINAL MEASUREMENTS:

Cannon, W. A. and Crane, W. E., *Cryogenic Tech.*, 1968, *4*, 178.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid phase, x_{He}
77	4.5	0.0002
77	18.3	0.0007
77	35.5	0.0013
120	20.8	0.0016
120	31.2	0.0059

AUXILIARY INFORMATION

METHOD /APPARATUS/ PROCEDURE:

System equilibrated in stainless steel equilibrium cell (which was occasionally agitated). Samples of liquid phase analysed by mass spectrometry. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. Dry sample, purity 99.8 mole per cent.
2. Sample purity 98.5 mole per cent passed through sodium fluoride pellets to remove hydrogen fluoride.

ESTIMATED ERROR:

$\delta T/K = \pm 0.2$; $\delta P/\text{bar} = \pm 0.3$;
$\delta x_{He} = \pm 0.0001$ (estimated by compiler)

REFERENCES:

COMPONENTS:	EVALUATOR:
1. Helium-3; He^3; 14762-55-1 2. Hydrogen; H_2; 1333-74-0	Colin Young, School of Chemistry, University of Melbourne, Parkville, Victoria 3052, AUSTRALIA.

CRITICAL EVALUATION:

There are two sets of data reported for this system. Matyash, Mank and Starkov (2) report one isotherm at 20.4 K up to 9.3 bar and a few points at higher and lower temperatures to indicate the temperature dependence. Hiza (1) has reported a more detailed study at 22.00 K to 28.00 K up to pressures of 15.4 bar. There is some discrepancy between the values of Matyash *et al.* (2) and those extrapolated to the same temperature using Hiza's data. Matyash *et al.*'s mole fraction of helium in the liquid phase is consistently lower than Hiza's extrapolated data particularly at lower pressures.

It is difficult to classify these data as both appear to be of high precision but in view of the accuracy of other studies by Hiza in the same publication (1) we classify Hiza's data as tentative and Matyash *et al.*'s (2) data as doubtful.

1. Hiza, M. J., *Nat. Bur. Standards Techn. Note 621*, 1972.

2. Matyash, I. V., Mank, V. V. and Starkov, M. G., *Ukr. Fiz. Zh.*, 1966, *11*, 497.

COMPONENTS:

1. Helium-3; He^3; 14762-55-1

2. Hydrogen; H_2; 1333-74-0

ORIGINAL MEASUREMENTS:

Matyash, I. V., Mank, V. V. and Starkov, M. G., *Ukran. Fiz. Zhur.*, 1966, *11*, 497.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium-3 in liquid, x_{He^3}
17.2	5.7	0.0039
	7.4	0.0041
19.0	4.3	0.0036
	6.1	0.0059
	8.1	0.0072
20.4	2.0	0.0019
	3.6	0.0041
	4.3	0.0051
	4.9	0.0053
	8.1	0.0092
	9.3	0.0103
23.0	4.9	0.0065
24.0	4.9	0.0082

AUXILIARY INFORMATION

METHOD:

Helium in liquid estimated by measuring nuclear magnetic resonance absorption.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.1$; $\delta P/bar = \pm 0.1$;

$\delta x_{He} = \pm 0.0003$ (estimated by compiler)

REFERENCES:

COMPONENTS:

(1) Helium; He^3; 14762-55-1

(2) n-Hydrogen; n-H_2; 1333-74-0

ORIGINAL MEASUREMENTS:

Hiza, M. J., *Nat. Bur. Standards Tech. Note 621*, 1972.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He^3}
22.00	1.5824	0.0000
	8.298	0.0123
	10.601	0.0151
	13.724	0.0201
	15.134	0.0215
24.00	2.565	0.0000
	7.967	0.0137
	10.374	0.0176
	12.790	0.0221
	14.979	0.0285
26.00	3.9334	0.0000
	7.825	0.0113
	10.435	0.0178
	13.621	0.0285
	15.375	0.0331
28.00	5.7295	0.0000
	9.301	0.0148
	11.700	0.0227
	13.172	0.0280
	15.406	0.0368

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus. Copper equilibrium cell. Recirculating pump described in ref. 1. Temperature measured with platinum resistance thermometer and pressure measured with a double-revolution Bourdon gauge. Samples of gas and liquid analysed by gas chromatography using thermistor thermal conductivity detectors. Details in source and ref. 2.

SOURCE AND PURITY OF MATERIALS:

1. USEAC sample containing 1.4 mole-% He^4.
2. Purified sample equilibrated for several months.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.004$; $\delta x_{He^3} = \pm 0.001$.

REFERENCES:

1. Hiza, M. J. and Duncan, A. G., *Rev. Sci. Inst.*, 1969, *40*, 513.
2. Duncan, A. G. and Hiza, M. J., *Adv. Cryog. Engng.*, 1970, *15*, 42.

COMPONENTS:	EVALUATOR:
1. Helium-4; He^4; 7440-59-7 2. Hydrogen; H_2; 1333-74-0	Colin Young, School of Chemistry, University of Melbourne, Parkville, Victoria 3052, AUSTRALIA.

CRITICAL EVALUATION:

There are five sets of data on this system but no two sets are in complete accord. The unpublished data by Smith (1) at 17.4 K, 20.4 K and 21.7 K are consistent within a few percent of those of Streett *et al.* (2) only at 20.4 K. Smith's (1) data at 21.7 K appear quite erratic and there is a discrepancy of 30-50 percent between the data of Streett *et al.* (2) and those of Smith (1) at 17.4 K. Smith's data are therefore rejected.

The helium-4 + normal hydrogen data of Streett *et al.* (2), Sneed *et al.* (3) and the helium-4 + para hydrogen data of Sonntag *et al.* (4) are broadly consistent with the data of Hiza (5). However there appears to be some discrepancies of up to 20 percent in the mole fraction of helium in the liquid phase in the lower pressure range (below 10 bar). The consistency of the data of Streett *et al.* (2), Sneed *et al.* (3) and Sonntag *et al.* (4) should not be over-emphasised since the apparatus was essentially the same and all compositions were estimated by mass spectrometry in all three studies. The data of Streett *et al.* (2), Sneed *et al.* (3) Sonntag *et al.* (4) and Hiza (5) are all classified as tentative.

The only other data are those of Roellig and Giese (6) which are of lower precision than and not completely consistent with those measurements discussed in the previous paragraph and are therefore classified as doubtful.

References

1. Smith, S. R., *Ph.D. Thesis, Ohio State University*, Columbus, 1952.

2. Streett, W. B., Sonntag, R. E. and Van Wylen, G. J., *J. Chem. Phys.*, 1964, *40*, 1390.

3. Sneed, C. M., Sonntag, R. E. and Van Wylen, G. J., *J. Chem. Phys.*, 1968, *49*, 2410.

4. Sonntag, R. E., Van Wylen, G. J. and Crain, R. W., *J. Chem. Phys.*, 1964, *41*, 2399.

5. Hiza, M. J., *Nat. Bur. Standards Techn. Note 621*, 1972.

6. Roellig, L. O. and Giese, C., *J. Chem. Phys.*, 1962, *37*, 114.

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Hydrogen; H_2; 1333-74-0

ORIGINAL MEASUREMENTS:

Roellig, L. O. and Giese, L.,
J. Chem. Phys., 1962, *37*, 114.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	$p^{\dagger}$/bar	10^2 Mole fraction of helium in liquid, x_{He}
16.3±0.2	1.88±0.07	1.26±0.32
17.7±0.3	3.82±0.19	3.80±0.52
19.8±0.5	7.10±0.20	11.05±0.50
20.7±0.5	1.79±0.19	0.69±0.40
21.6±0.5	3.72±0.18	3.01±0.61
22.3±0.4	7.74±0.18	8.35±0.74
26.8±0.2	2.01±0.15	0.59±0.06
27.3±0.3	4.38±0.26	1.03±0.10
28.6±0.3	6.59±0.40	2.89±0.27

$p^{\dagger}$ partial pressure of helium

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Static glass equilibrium cell fitted with stirrer and vapor and liquid sampling values. Partial pressure of helium determined from analysis of vapor phase and pressure measured with Bourdon gauge. Liquid sample composition determined from knowledge of total amounts of helium and hydrogen in cell and composition of vapor or mass spectral analysis of liquid.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

As denoted in experimental values.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Hydrogen; H_2; 1333-74-0	Sneed, C. M., Sonntag, R. E. and Van Wylen, G. J., *J. Chem. Phys.*, 1968, *49*, 2410.
VARIABLES: Temperature, pressure	PREPARED BY: C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
15.50	26.6	0.0095	0.971	26.00	103.4	0.144	0.736
	34.5	0.0112	0.970	27.80	23.6	0.066	0.530
	41.4	0.0113	0.973		34.5	0.102	0.558
	51.8	0.0118	0.975		51.6	0.166	0.567
	52.5	0.0120	0.974		65.5	0.205	0.556
17.00	29.0	0.0157	0.951		82.7	0.242	0.543
	41.3	0.0166	0.957		88.1	0.253	0.549
	51.7	0.0182	0.960		91.1	0.260	0.556
	65.4	0.0189	0.962		92.9	0.257	0.561
	82.8	0.0196	0.966		103.6	0.264	0.576
20.40	34.5	0.0335	0.897	28.05	70.3	0.255	0.504
	41.4	0.0356	0.902		90.1	0.297	0.497
	51.8	0.0405	0.903		97.3	0.314	0.509
	65.5	0.0432	0.912		103.4	0.328	0.517
	82.8	0.0431	0.920	28.20	58.6	0.212	0.521
	103.4	0.0450	0.927		68.7	0.264	0.486
23.00	41.4	0.058	0.824		70.8	0.269	0.475
	51.6	0.065	0.828		72.7	0.279	0.477
	65.5	0.071	0.837		78.5	0.321	0.441
	82.7	0.076	0.851	28.45	42.9	0.150	0.515
	103.4	0.078	0.867		51.7	0.191	0.496
26.00	41.3	0.092	0.688		59.6	0.252	0.474
	52.1	0.111	0.695		63.2	0.276	0.441
	65.5	0.138	0.705		64.9	0.297	0.416
	82.9	0.157	0.716		66.7	0.363	0.376

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic pump at ambient temperature. Samples analysed by mass spectrometry. Temperature measured with platinum resistance thermometer. Pressure measured using Bourdon gauge. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. Bureau of Mines high purity sample.

2. Matheson ultrapure sample.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.1$; $\delta x_{He} = \pm 0.003$ or less; $\delta y_{He} = \pm 0.001$.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Hydrogen; H_2; 1333-74-0	Sneed, C. M., Sonntag, R. E. and Van Wylen, G. J., *J. Chem. Phys.*, 1968, *49*, 2410.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
29.00	29.8	0.098	0.457	29.80	28.4	0.107	0.387
	36.3	0.133	0.469		34.5	0.156	0.390
	41.4	0.165	0.465		38.6	0.195	0.358
	51.7	0.268	0.380		40.1	0.232	0.327
	52.0	0.277	0.365		40.3	0.248	0.317

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Hydrogen; H_2; 1333-74-0	Sonntag, R. E., Van Wylen, G. J. and Crain, R. W., *J. Chem. Phys.*, 1964, *41*, 2399.

VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
20.40	2.39	0.0023	0.4940	23.00	34.47	0.0562	0.8250
	3.48	0.0058	0.6279	26.00	6.96	0.0079	0.2966
	5.17	0.0060	0.7280		10.34	0.0200	0.4557
	6.89	0.0087	0.7821		13.79	0.0303	0.5355
	8.62	0.0102	0.8083		17.24	0.0367	0.5877
	10.34	0.0117	0.8300		17.24	0.0390	0.5952
	12.07	0.0155	0.8471		20.68	0.0508	0.6300
	13.79	0.0177	0.8579		27.58	0.0595	0.6651
	17.24	0.0192	-		27.58	0.0637	0.6505
	17.24	0.0204	0.8664		34.47	0.0782	0.6715
	20.68	0.0225	0.8680		34.47	0.0810	0.6804
	27.58	0.0266	0.8872	29.00	9.79	0.0..9	0.1760
	27.58	0.0294	0.8856		12.03	0.0222	0.2615
	34.47	0.0308	-		13.79	0.0305	0.3115
	34.47	0.0316	0.8599		17.34	0.0478	0.3790
23.00	4.45	0.0054	0.4560		20.72	0.0633	0.4190
	5.17	0.0065	0.5220		27.61	0.1006	0.4600
	6.96	0.0105	0.6170		34.54	-	0.4700
	8.62	0.0138	0.6700	31.00	13.79	0.0217	0.1317
	10.38	0.0175	0.7090		17.13	0.0440	0.2010
	12.07	0.0227	0.7350		17.24	0.0455	-
	13.79	0.0240	0.7535		20.68	0.0752	0.2314
	17.24	0.0300	0.7790		22.34	0.0908	-
	20.68	0.0365	0.7950		22.89	-	0.2368
	27.58	0.0473	0.7910		24.13	-	0.2394

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic pump at ambient temperature. Samples analysed by thermal conductivity. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Details in ref. 1.

SOURCE AND PURITY OF MATERIALS:

1. No details given.
2. Hydrogen contained approximately 0.21% ortho-H_2, 99.79% para-H_2.

ESTIMATED ERROR:

$\delta T/K = \pm 0.005$; $\delta P/\text{bar} = \pm 0.03$; δx_{He}, $\delta y_{He} = \pm 0.001$.

REFERENCES:

1. Streett, W. B., *Cryogenics*, 1965, *5*, 27.

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Hydrogen; H_2; 1333-74-0

ORIGINAL MEASUREMENTS:

Sonntag, R. E., Van Wylen, G. J. and Crain, R. W., *J. Chem. Phys.*, 1964, *41*, 2399.

EXPERIMENTAL VALUES:

T/K	*P*/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	*P*/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
31.00	25.27	0.1255	0.2353	31.50	17.24	0.0455	0.1568
	26.92	0.1812	0.1844		18.96	-	0.1697
31.50	12.17	0.0107	0.0634		20.68	0.0808	0.1713
	14.00	0.0239	0.1099		21.72	0.0928	0.1870
	15.51	-	0.1402		22.89	0.1490	0.1657

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Hydrogen; H_2; 1333-74-0	Streett, W. B., Sonntag, R. E. and Van Wylen, G. J., *J. Chem. Phys.*, 1964, *40*, 1390.
VARIABLES: Temperature, pressure	**PREPARED BY:** C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
15.50	3.41	-	0.9378	20.40	12.07	0.0154	0.8603
	5.17	0.0029	0.9551		13.79	0.0167	0.8713
	6.89	0.0046	0.9631		17.24	0.0205	0.8841
	8.62	0.0051	0.9677		20.68	0.0236	0.8897
	10.34	0.0055	0.9702		27.58	0.0296	0.9008
	12.07	0.0064	0.9714		34.47	0.0339	0.9035
	13.79	0.0071	0.9729	23.00	3.45	0.0038	0.3700
	17.24	0.0082	0.9741		5.17	0.0075	0.5344
	20.68	0.0087	0.9748		6.89	0.0115	0.6290
17.07	3.90	0.0036	0.8967		8.62	0.0136	0.6787
	5.17	0.0043	0.9186		10.34	0.0172	0.9828
	6.89	0.0057	0.9330		12.07	0.0215	0.9785
	8.62	0.0072	0.9412		13.79	0.0239	0.9761
	10.34	0.0080	0.9464		17.24	0.0291	0.9709
	12.07	0.0089	0.9503		20.68	0.0355	0.9645
	13.79	0.0100	0.9515		27.58	0.0458	0.9542
	17.24	0.0114	0.9556		34.47	0.0546	0.9454
	20.68	0.0131	0.9582	26.00	5.58	0.0067	0.9933
	27.58	0.0151	0.9590		6.89	0.0097	0.9903
20.40	2.41	0.0034	0.5360		8.62	0.0143	0.9857
	3.45	0.0041	0.6545		10.34	0.0192	0.9808
	5.17	0.0061	0.7540		13.79	0.0286	0.9714
	6.89	0.0084	0.8030		17.24	0.0364	0.9636
	8.62	0.0105	0.8320		20.68	0.0476	0.9524
	10.34	0.0130	0.8480		27.58	0.0664	0.9336

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Details of apparatus given in ref. 1. Recirculating vapor flow apparatus with magnetic pump at ambient temperature. Samples of coexisting phases analysed by mass spectrometry.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$ or less; $\delta P/\text{bar} = \pm 0.03$; $\delta x_{He} = \pm 0.0002$; $\delta y_{He} = \pm 0.002$ (estimated by compiler).

REFERENCES:

1. Streett, W. B., *Cryogenics*, 1965, *5*, 27.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Hydrogen; H_2; 1333-74-0	Streett, W. B., Sonntag, R. E. and Van Wylen, G. J., *J. Chem. Phys.*, 1964, *40*, 1390.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
26.00	34.47	0.0848	0.9152	31.50	15.51	0.0361	0.1564
29.00	8.76	0.0091	0.9909		17.27	0.0483	0.1835
	10.41	0.0150	0.9850		18.96	0.0626	0.2030
	12.07	0.0220	0.9780		20.68	0.0818	0.2137
	13.79	0.0307	0.9693		22.41	0.1047	0.2149
	17.24	0.0459	0.9541		24.20	0.1659	0.1758
	20.68	0.0621	0.9379	31.90	12.03	0.0081	0.0400
	27.58	0.0963	0.9037		13.79	0.0207	0.0831
	34.47	0.1335	0.8665		15.17	0.0317	0.1175
30.60	20.68	0.0729	0.3032		16.44	0.0429	0.1386
	27.58	0.1324	0.3260		17.27	0.0499	0.1482
	34.47	0.1795	0.3036		18.03	-	0.1562
31.00	12.17	0.0149	0.9851		19.00	0.0687	0.1619
	13.72	0.0251	0.9749		19.96	0.0871	0.1635
	17.24	0.0478	0.9522		20.68	0.1010	0.1588
	20.68	0.0749	0.9251		21.27	0.1202	-
	22.41	0.0873	0.9127	32.50	13.00	0.0098	0.9688
	24.13	0.1103	0.8897		13.79	0.0168	0.9520
	25.86	0.1293	0.8707		15.17	0.0310	0.9255
	27.58	0.1564	0.8436		16.69	0.0509	-
	28.48	0.2087	0.7913		17.24	0.0599	-
31.50	12.20	0.0127	0.0767		17.79	0.0675	-
	13.72	0.0230	0.1194				

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Hydrogen; H_2; 1333-74-0	Streett, W. B., *Astrophysical J.*, 1973, *186*, 1107.
VARIABLES: Temperature, pressure	PREPARED BY: C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in hydrogen rich phase, x_{He}	Mole fraction of helium in helium rich phase, y_{He}	T/K	P/bar	Mole fraction of helium in hydrogen rich phase, x_{He}	Mole fraction of helium in helium rich phase y_{He}
26.00	5.9	0.0058	0.2637	27.80	124	0.2660	0.6295
	8.7	0.0137	0.4290		145	-	0.6770
	13.1	0.0258	0.5700	28.47	145	0.3735	0.5384
27.18	59	0.1624	0.6264		152	0.3364	0.5833
	70	0.1795	0.6409		159	0.3147	0.6150
	83	0.2015	0.6513		172	-	0.6853
	97	0.2142	0.6665		207	0.2347	0.7335
	110	0.2157	0.6775	29.00	22	0.0664	0.4498
	124	0.2133	0.7045		25	0.0801	0.4698
	138	0.2061	0.7236		30	0.1059	0.4865
	172	0.1846	0.7734		35	0.1335	0.4913
	210	0.1619	0.8163		179	0.3650	0.5695
	241	0.1461	0.8470		188	0.3271	0.6196
	275	0.1314	0.8686		207	0.2839	0.6815
	310	0.1176	0.8800		241	0.2335	0.7485
	345	0.1079	0.8910		276	0.1999	0.7933
	414	0.0897	0.923		345	0.1566	0.8473
	486	0.0747	0.944		414	0.1270	0.8715
	552	0.0640	0.963		468	0.1101	0.903
	621	0.0549	0.967		552	0.0911	0.931
	637	0.0532	0.973		621	0.0778	0.9495
27.80	69	0.2092	0.5787		683	0.0689	0.963
	83	0.2459	0.5704		755	0.0610	0.969
	103	0.2721	0.5973	31.00	299	0.3574	0.6180

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus components made of specially selected stainless steel. Temperature measured with platinum resistance thermometer; pressure measured with magnanin resistance gauge. Samples of liquid and gas analysed by thermal conductivity.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$; $\delta P/bar = \pm 0.1\%$;

δx_{He}, δy_{He} = ±0.0002.

REFERENCES:

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Hydrogen; H_2; 1333-74-0

ORIGINAL MEASUREMENTS:

Streett, W. B., *Astrophysical J.*, 1973, *186*, 1107.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in hydrogen rich phase x_{He}	Mole fraction of helium in helium rich phase y_{He}	T/K	P/bar	Mole fraction of helium in hydrogen rich phase x_{He}	Mole fraction of helium in helium rich phase y_{He}
31.00	311	0.3066	0.6770	61.50	3789	0.1445	0.911
	371	0.2234	0.7960	70.30	3668	0.393	0.754
	412	0.1930	0.8297		3723	0.362	0.778
	483	0.1521	0.8735		3864	0.311	0.810
	552	0.1273	0.908		4071	0.261	0.844
	621	0.1074	0.902		4282	0.232	0.870
	689	0.0919	0.948		4346	0.222	-
	758	0.0831	0.954		4482	0.197	0.982
	896	-	0.968		4916	0.157	0.914
34.95	507	0.4455	0.6300	77.61	4491	0.4243	0.7042
	524	0.3614	0.7105		4640	0.3527	0.7715
	531	0.3413	0.7266		4830	0.3061	0.8187
	586	0.2780	0.7880		5192	0.1944	0.8980
	689	0.1877	0.841		5912	0.1655	0.905
	824	0.1419	0.887	84.82	5516	0.3711	-
	965	0.1137	0.946		5654	0.3326	0.7830
	1103	0.0899	0.964		5864	0.2843	0.8090
	1179	0.0824	0.968		6205	0.2403	0.842
38.88	745	0.4301	0.7055		6584	0.2066	0.870
	769	0.3517	0.7563		6984	0.1756	0.895
	831	0.3051	0.7895	93.00	6550	0.4270	0.7330
	897	0.2347	0.822		6902	0.3578	0.7960
	1036	0.1851	0.860		7239	0.2703	0.8357
	1173	0.1427	0.907		7564	0.2360	0.864
	1380	0.1095	-		7943	0.2020	0.885
	1493	0.0939	0.957		8137	0.1837	0.889
61.50	2758	0.3731	0.7750	100.00	7598	0.4351	0.7203
	2785	0.3449	0.7912		7957	0.3420	0.7850
	2896	0.2989	0.821		8274	0.2876	0.8210
	3110	0.2515	0.858		8618	0.2464	-
	3349	0.2033	0.882		8977	0.2185	0.872
	3527	-	0.901		9170	0.2020	0.892
	3544	0.1764	-		9377	0.1870	0.896

COMPONENTS:

(1) Helium; He^4; 7440-59-7

(2) n-Hydrogen; n-H_2; 1333-74-0

ORIGINAL MEASUREMENTS:

Hiza, M. J., *Nat. Bur. Standards Tech. Note 621*, 1972.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He^4}	T/K	P/bar	Mole fraction of helium in liquid, x_{He^4}
20.00	0.9067	0.0000	26.00	3.9334	0.0000
	7.346	0.0110		8.481	0.0150
	11.208	0.0172		10.925	0.0238
	15.965	0.0211		12.490	0.0283
	20.112	0.0244		13.959	0.0307
22.00	1.5824	0.0000		16.024	0.0373
	5.8606	0.0107		18.050	0.0430
	9.777	0.0204		20.257	0.0471
	14.655	0.0266	28.00	5.730	0.0000
	20.623	0.0343		8.356	0.0141
24.00	2.5648	0.0000		11.707	0.0267
	7.388	0.0155		11.793	0.0264
	10.908	0.0231		17.020	0.0458
	16.547	0.0333		19.981	0.0566
	20.067	0.0411			

(cont.)

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with copper equilibrium cell. Recirculating pump described in ref. 1. Temperature measured with platinum resistance thermometer and pressure measured with a double-revolution Bourdon gauge. Samples of gas and liquid analysed by gas chromatography using thermistor thermal conductivity detectors. Details in source and ref. 2.

SOURCE AND PURITY OF MATERIALS:

(1) Nat. Bureau of Mines A grade sample.

(2) Purified sample equilibrated for several months.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.004$;

δx_{He^4}, δy_{He^4} = ±3% or 0.001 whichever is greater.

REFERENCES:

1. Hiza, M. J. and Duncan, A. G., *Rev. Sci. Instr.*, 1969, *40*, 513.

2. Duncan, A. G. and Hiza, M. J., *Adv. Cryog. Engng.*, 1970, *15*, 42.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) n-Hydrogen; n-H_2; 1333-74-0	Hiza, M. J., *Nat. Bur. Standards, Tech. Note 621*, 1972.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in vapor, y_{He}
20.00	0.9067	0.0000
	6.233	0.8049
	10.414	0.8630
	15.062	0.8867
	19.281	0.8953
24.00	2.565	0.0000
	6.726	0.5301
	10.852	0.6543
	15.517	0.7161
	20.202	0.7506
26.00	3.9334	0.0000
	8.735	0.4151
	12.186	0.5335
	16.289	0.5990
	19.960	0.6218
28.00	5.730	0.0000
	8.749	0.2259
	11.931	0.3540
	16.095	0.4374
	20.343	0.4909

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) p-Hydrogen; H_2; 1333-74-0

ORIGINAL MEASUREMENTS:

Sneed, C. M., Sonntag, R. E. and Van Wylen, G. J., *J. Chem. Phys.*, 1968, *49*, 2410.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
20.40	58.0	0.0461	0.903
	73.2	0.0459	0.908
	86.7	0.0442	0.914
	103.4	0.0446	0.922
27.80	19.7	0.049	0.482
	34.5	0.104	0.546
	51.7	0.170	0.548
	65.6	0.227	0.530
	82.5	0.281	0.509
	89.4	0.293	0.493
	100.7	0.308	0.483
29.00	36.7	0.143	0.447
	43.2	0.191	0.424
	47.4	0.249	0.382
	48.0	0.261	0.359
	48.6	0.305	0.305

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic pump at ambient temperature. Samples analysed by mass spectrometry. Temperature measured with platinum resistance thermometer. Pressure measured using Bourdon gauge. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. Bureau of Mines high purity sample.
2. Matheson ultrapure sample obtained as boil-off gas from equilibrated liquid at 0.68 bar.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/\text{bar} = \pm 0.1$; $\delta x_{He} = \pm 0.003$ or less; $\delta y_{He} = \pm 0.001$

REFERENCES:

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Krypton; Kr; 7439-90-9

ORIGINAL MEASUREMENTS:

Kidnay, A. J., Miller, R. C. and Hiza, M. J., *Ind. Eng. Chem. Fundam.*, 1971, *10*, 459.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid phase, x_{He}
117.09	10.03	0.000252
	19.91	0.000794
	41.01	0.00155
120.85	10.13	0.000294
	20.21	0.000806
	40.36	0.00182
	80.65	0.00376
	121.4	0.00571
129.60	4.77	0.0000315
	10.22	0.000507
	20.42	0.00124
	20.42	0.00144
	42.04	0.00272
	80.25	0.00521
	120.6	0.00816
	120.6	0.00824
139.56	10.35	0.000526
	20.52	0.00161
	40.51	0.00364
	80.6	0.00778
	118.8	0.0116

T/K	P/bar	Mole fraction of helium in liquid phase, x_{He}
150.00	10.38	0.000417
	20.57	0.00197
	20.57	0.00197
	40.82	0.00518
	81.87	0.0116
	115.11	0.0159

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Liquid samples analysed by gas chromatography. Details in source and ref.1.

SOURCE AND PURITY OF MATERIALS:

1. Bureau of Mines Grade A sample.
2. Krypton Research grade sample purity better than 99.9975 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.05$; $\delta P/\text{bar} = \pm 0.3\%$;
$\delta x_{He} = \pm 1\%$ (estimated by compiler)

REFERENCES:

1. Duncan, A. G. and Hiza, M. J., *Am. Inst. Chem. Eng. J.*, 1970, *16*, 733.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Neon; Ne; 7440-01-9	Colin Young, School of Chemistry, University of Melbourne, Parkville, Victoria 3052, AUSTRALIA.

CRITICAL EVALUATION:

There are only two published sets of results on this system. The temperature and pressure ranges of the data of Knorn (1) and Heck and Barrick (2) do not overlap appreciably. It is therefore difficult to establish the extent of agreement of the two sets of data solely on the basis of values in the overlapping range. Knorn's data are thought to be more accurate at low pressure. Both sets of data are classified as tentative.

References

1. Knorn, M., *Cryogenics*, 1967, *7*, 177.

2. Heck, C. K. and Barrick, P. L., *Adv. Cryog. Engng.*, 1966, *12*, 714.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Neon; Ne; 7440-01-9	Heck, C. K. and Barrick, P. L., *Adv. Cryog. Engng.*, 1966, *12*, 714.

VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}
41.90	23.0	0.0100	0.0784	35.90	34.7	0.0562	-
	25.6	0.0219	0.119		36.7	0.0598	0.613
	28.0	0.0307	0.153		45.6	-	0.633
	29.2	0.0366	0.172		47.6	0.0831	-
	34.1	0.0602	0.215		54.1	0.103	0.637
	38.1	0.0801	0.221		55.4	0.111	-
	39.9	0.0993	0.226		64.2	0.134	0.631
	42.3	0.173	0.225		73.3	0.168	0.615
38.88	15.9	-	0.140		84.1	0.212	0.580
	23.3	0.0248	0.339		91.4	0.256	-
	28.6	0.0416	0.408		96.9	-	0.537
	37.3	0.0701	0.461	32.89	8.1	-	0.410
	49.8	0.113	0.485		22.3	0.0271	0.702
	58.0	0.169	0.463		40.8	0.0563	0.760
	61.5	0.205	0.443		57.1	0.0870	0.763
	63.8	-	0.412		76.9	0.1170	0.753
	64.1	0.230	-		90.8	-	0.735
35.90	10.7	-	0.239		91.7	0.143	-
	17.8	-	0.458		116.5	0.205	0.715
	18.4	0.0195	-		138.7	-	0.661
	22.3	-	0.538		141.0	0.272	0.661
	23.5	0.0311	-		160.2	0.356	0.575
	26.1	0.0372	-	29.91	6.9	-	0.658
	29.0	-	0.587		15.3	0.0087	0.798
	33.9	-	0.605		30.5	0.0279	0.854

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Vapor recirculated through cell. Liquid and vapor samples analysed by gas chromatography. Pressured measured by Bourdon gauge and temperature measured with platinum resistance thermometer. Details in source and ref. 1.

SOURCE AND PURITY OF MATERIALS:

1. Impurities of 20 parts per million mainly neon.
2. Impurities of 80 parts per million mainly helium.

ESTIMATED ERROR:

$\delta T/K = \pm 0.05$; $\delta P/bar = \pm 0.1$ up to 100 bar $= \pm 0.3$ between 100 and 300 bar; $\delta x_{He} = \delta y_{He} = \pm 3\%$.

REFERENCES:

1. Herring, R. N. and Barrick, R. L., *Adv. Cryog. Engng.*, 1965, *10*, 151.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Neon; Ne; 7440-01-9	Heck, C. K. and Barrick, P. L., *Adv. Cryog. Engng.*, 1966, *12*, 714.

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}
29.91	50.4	0.0492	0.863
	71.5	0.0734	0.855
	90.9	0.0893	0.844
	112.7	0.106	0.831
	130.2	0.126	-
	131.9	-	0.815
	156.4	0.155	-
	162.1	-	0.794
	190.5	-	0.770
	199.6	0.197	-
	203.4	-	0.760
26.95	2.8	-	0.625
	5.4	-	0.810
	9.8	-	0.877
	20.6	0.0111	0.9013
	41.6	0.0291	0.9262
	61.8	0.0420	-
	62.0	-	0.9220
	83.6	0.0532	0.9132
	113.0	-	0.9033
	120.6	0.0723	-
	142.1	-	0.8919
	142.3	0.0824	-
	172.3	0.0896	0.885
	194.9	0.103	-
	203.1	-	0.875

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Neon; Ne; 7440-01-9

ORIGINAL MEASUREMENTS:

Knorn, M., *Cryogenics*, 1967, *7*, 177.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid x_{He}	in gas y_{He}
24.71	6.1	0.0024	0.897
	11.1	0.0041	0.931
	16.2	0.0057	0.944
	21.3	0.0073	0.950
	26.3	0.0086	0.951
	31.4	0.0105	0.951
26.00	6.1	0.0029	0.842
	11.1	0.0048	0.900
	16.2	0.0068	0.924
	21.3	0.0086	0.931
	26.3	0.0107	0.936
26.00	31.4	0.0130	0.938
	41.5	0.0170	0.938
	51.7	0.0204	0.937
27.03	6.1	0.0030	0.803
	11.1	0.0054	0.872
	16.2	0.0076	0.900
	21.3	0.0106	0.910
	26.3	0.0135	0.914
	31.4	0.0150	0.915
	41.5	0.0206	0.914
	51.7	0.0255	0.913

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Flow apparatus described in ref. 1. Gas and liquid phases analysed using gas chromatography and gas interferometer.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$; $\delta P/bar = \pm 0.01$; $\delta x_{He} = \pm 0.0002$; $\delta y_{He} = \pm 0.001$.

REFERENCES:

1. Schmidt, K., *Kaltetechnik*, 1966, *18*, 331.

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Nitrogen; N_2; 7727-37-9	Colin Young, School of Chemistry, University of Melbourne, Parkville, Victoria 3052, AUSTRALIA.

CRITICAL EVALUATION:

This is the most extensively studied system containing helium. The data of Kharakhorin (1) and Gonikberg and Fastowsky (2) appear to be higher than the data obtained by interpolation of more recent results and are both classified as doubtful.

The data of Tully *et al.* (3), Burch (4), De Vaney *et al.* (5), Rodewald *et al.* (6), Davis *et al.* (7) and Streett and coworkers (8), (9) and (10) are in reasonable agreement in overlapping ranges of pressure and temperature. The data of Streett and coworkers (8), (9) and (10) cover a much wider range of pressure than other data on this system. These six sets of data are classified as tentative.

The data of Skripka and Dykhno (11) are slightly lower than the data obtained by interpolation of the results given in references above and are therefore classified as doubtful.

The data of Davydov and Budnevich (12) are rejected as they are presented in small scale graphical form.

References

1. Kharakhorin, F. F., *Zhur. Tech. Fiz.*, 1940, *10*, 1533 (Russian), *Foreign Petrol. Tech.*, 1941, *9*, 397 (Eng. Trans.).
2. Gonikberg, M. G. and Fastowsky, W. G., *Acta Physicochimica U.R.S.S.*, 1940, *12*, 67.
3. Tully, P. C., De Vaney, W. E. and Rhodes, H. L., *Adv. Cryog. Engng.*, 1971, *16*, 98.
4. Burch, R. J., *J. Chem. Engng. Data*, 1964, *9*, 19.
5. De Vaney, W. E., Dalton, B. J. and Meeks, J. C. Jr., *J. Chem. Engng. Data*, 1963, *8*, 473.
6. Rodewald, N. C., Davis, J. A. and Kurata, F., *Am. Inst. Chem. Engnrs. J.*, 1964, *10*, 937.
7. Davis, J. A., Rodewald, N. and Kurata, F., *Ind. Eng. Chem.*, 1963, *55*, no. 11, 36.
8. Streett, W. B., *Chem. Eng. Prog. Symp. Ser. No. 61*, 1967, *63*, 37.
9. Streett, W. B. and Hill, J. L. E., *J. Chem. Phys.*, 1970, *52*, 1402.
10. Streett, W. B. and Erickson, A. L., *Physics Earth Planetary Interiors*, 1972, *5*, 357.
11. Skripka, V. G. and Dykhno, N. M., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1964, *8*, 163.
12. Davydov, I. A. and Budnevich, S. S., *Inzh. Fiz. Zhur.*, 1971, *20*, no. 6, 82.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Nitrogen; N_2; 7727-37-9	Streett, W. B. and Hill, J. L. E., *J. Chem. Phys.*, <u>1970</u>, *52*, 1402.
VARIABLES: Temperature, pressure	PREPARED BY: C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
77.48	344.5	0.0426	0.9868	95.47	1379.0	0.1600	0.9665
	548.2	0.0542	0.9814		1661.7	0.1606	0.9695
	686.0	0.0592	-		1930.2	0.1612	0.9715
	820.7	0.0623	0.9860		2205.8	0.1616	0.9715
	896.7	0.0648	0.9849		2482.5	0.1605	0.9715
	931.2	0.065	0.985		2623.3	0.1591	0.9715
87.82	130.7	0.0366	0.9550		2068.0	0.1587	0.9722
	272.6	0.0632	0.9677		2202.8	0.1591	-
	410.4	0.0805	0.9709		2340.6	0.1557	0.9824
	548.2	0.0927	0.9755		2482.5	0.1539	0.9838
	693.1	0.1010	0.9773		2620.3	0.151	0.984
	827.8	0.1064	0.9792	100.61	713.3	0.1822	0.9494
	958.5	0.1074	0.9803		827.8	0.1885	0.9490
	1103.4	0.1120	0.9822		965.6	0.1948	0.9523
	1216.9	0.1132	0.9814		1103.4	0.1983	0.9568
	1376.0	0.1148	0.9837		1234.1	0.2000	0.9604
	1516.8	0.1153	0.9851		1379.0	0.2010	0.9631
	1654.6	0.1151	0.9862		1661.7	0.2003	-
	1789.4	0.1153	0.9870		1930.2	0.1981	-
	1826.9	0.115	0.987		2205.8	0.1943	0.9746
95.47	713.3	0.1324	0.9579		2482.5	0.1903	0.9777
	827.8	0.1429	-		2623.3	0.1884	0.9792
	965.6	0.1498	0.9539		2761.1	0.1862	0.9798
	1103.4	0.1546	0.9630		3058.0	0.1815	0.9792
	1234.1	0.1582	0.9704		3102.6	0.182	0.979

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic pump at ambient temperature. Samples analysed by thermal conductivity. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Details in source and ref. 1.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 7$;
$\delta x_{He} \simeq \delta y_{He} = \pm 0.001$.

REFERENCES:

1. Streett, W. B., *Cryogenics*, <u>1965</u>, *5*, 27.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Nitrogen; N_2; 7727-37-9	Streett, W. B. and Hill, J. L. E., *J. Chem. Phys.*, 1970, *52*, 1402.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}
107.32	454.9	0.2052	0.8931	120.59	971.7	0.5570	0.7188
	552.2	0.2230	0.9029		1010.2	0.5393	0.7399
	689.0	0.2411	0.9119		1027.4	0.5346	0.7501
	830.9	0.2515	0.9185		1089.2	0.5231	-
	968.7	0.2581	0.9264		1120.7	0.5166	0.7712
	1103.4	0.2614	0.9308		1224.0	0.5006	0.7977
	1241.2	0.2628	0.9470		1323.3	0.4890	0.8182
	1379.0	0.2628	0.9430		1523.9	0.4648	0.8490
	1516.8	0.2621	0.9454		1775.2	0.4433	0.8714
	1654.6	0.2600	0.9493		2062.0	0.4225	0.8926
	1799.5	0.2589	0.9530		2402.4	0.3999	0.9098
	1930.2	0.2561	0.9572		2719.6	0.3820	0.9236
	2199.8	0.2509	0.9618		3102.6	0.3640	0.9358
	2482.5	0.2435	0.9647		3447.1	0.3474	0.9438
	2751.0	0.2380	0.9670		3764.2	0.3357	0.9491
	3033.7	0.2316	0.9701	124.05	1613.1	0.6400	0.6970
	3309.3	0.2257	0.9730		1657.7	0.5856	-
	3584.9	0.2207	0.9759		1696.2	0.5782	0.7844
	3964.8	0.2150	0.9796		1792.4	0.5517	0.8071
	4053.0	0.2118	0.9827		1930.2	0.5225	0.8341
112.10	551.2	0.2808	0.8589		2072.0	0.5011	0.8503
	689.0	0.3008	0.8723		2126.8	0.6185	0.7333
	827.8	0.3111	0.8850		2161.3	0.6032	0.7694
	965.6	0.3171	0.8943		2202.8	0.5919	0.7899
	1103.4	0.3197	0.9031		2350.7	0.5554	0.8317
	1241.2	0.3197	0.9098		2482.5	0.5265	0.8485
	1351.7	0.3189	0.9174		2774.3	0.4911	0.8768
	1516.8	0.3167	0.9238		3092.4	0.4600	0.8980
	1792.4	0.3124	0.9344		3451.1	0.4354	0.9123
	2068.0	0.3043	0.9423		3802.7	0.4126	0.9247
	2344.7	0.2946	0.9497		4137.1	0.3945	0.9313
	2620.3	0.2870	0.9540	130.00	2778.3	0.5988	-
	2895.9	0.2785	0.9604		2830.0	0.5862	-
	3122.8	0.2708	0.9630		2896.9	0.5733	-
117.13	489.4	0.3545	0.7699		3047.9	0.5469	0.8124
	620.1	0.3869	0.7914		3316.4	0.5126	0.8552
	689.0	0.3970	0.8015		3726.7	0.4716	0.8930
	827.8	0.4086	0.8198		4137.1	0.4450	0.9083
	965.6	0.4091	0.8376	134.00	3481.5	0.6181	-
	1103.4	0.4072	0.8539		3515.8	0.6085	-
	1241.2	0.4034	0.8675		3596.0	0.5905	0.8139
	1379.0	0.3984	0.8794		3653.8	0.5819	-
	1516.8	0.3922	0.8841		3795.6	0.5620	0.8489
	1654.6	0.3859	0.8986		4133.0	0.5184	0.8802
	1792.4	0.3814	0.9069	136.50	3930.4	0.6400	0.7405
	2068.0	0.3677	0.9211		4036.8	0.6073	0.7738
	2344.7	0.3556	0.9304		4109.7	0.5910	0.7750
	2551.4	0.3999	0.9367				
	2854.3	0.3355	0.9451				
119.60	562.4	0.4905	0.6772				
	689.0	0.5011	0.7159				
	830.9	0.5058	0.7429				
	965.6	0.4938	0.7763				
	1106.5	0.4792	0.8082				

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Nitrogen; N_2; 7727-37-9	Streett, W. B., and Erickson, A. L., *Physics Earth Planetary Interiors* 1972, *5*, 357.
VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
112.10	2463	0.3035	0.9544	124.05	3123	0.4294	0.9206
	3102	0.2866	0.9644		3151	-	0.9217
	3453	0.2780	0.9680		3598	0.4017	0.9289
	3798	0.2694	0.9716		4177	0.3768	0.9463
	4171	0.2603	0.975		4672	-	0.9539
	4505	0.2517	0.9769		5059	0.3390	0.9592
	4515	0.251	0.9763		5522	0.3263	0.9642
	4710	0.2474	0.9778		6072	0.3122	0.9691
	4828	0.2457	0.9975		6603	0.3006	0.9695
	4839	0.2456	0.9984		6841	0.2948	0.9733
	4921[a]	0.244	0.979		6962[a]	0.290	0.974
117.13	1105	0.4224	0.8568	130.00	4083	0.4521	0.9157
	1368	0.4106	0.8754		4563	0.4247	0.9290
	1969	0.3835	0.9135		4918	0.4073	0.9406
	2803	0.350	0.9441		5600	0.3811	0.9525
	3446	0.3248	0.9565		6268	0.3578	0.9602
	3798	0.3126	0.9602		6736	0.3434	0.9783
	4149	0.3051	0.9638		7204	0.3344	0.9781
	4508	0.3003	0.9665		7681	0.3247	0.9649
	5112	0.2757	0.9725		7864	0.3219	0.9693
	5574	0.2660	0.9760		7913	0.3164	0.9689
	5652	-	0.9765		7983	0.3150	0.9680
	5721[a]	0.262	0.977		8051	0.3143	-
124.05	2420	0.4773	0.8850		8111	0.3133	-
	2741	0.4537	0.8950		8175[a]	0.312	0.971
	2782	0.4494	0.9048	134.00	4145	0.5231	0.8773

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic pump. Temperature measured with platinum resistance thermometer. Pressure measured with magnanin resistance gauge. Samples of liquid and gas analysed by thermal conductivity. Details in source.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 5$; δx_{He}, δy_{He} = ±1 mole per cent (estimated by compiler).

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Nitrogen; N_2; 7727-37-9	Streett, W. B., and Erickson, A. L., *Physics Earth Planetary Interiors* 1972, *5*, 357.

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor y_{He}
134.00	4851	0.4737	0.9141	144.00	5693	0.6121	0.8694
	5383	0.4475	0.9255		5783	0.6019	0.8735
	5892	0.4124	0.9399		5884	0.5929	0.8789
	6386	0.3949	0.9473		5996	0.5826	0.8852
	6954	0.3756	0.9534		6255	0.5532	0.8987
	7430	0.3611	-	154.00	7617[b]	0.755	0.755
	7918	0.3483	0.9564		7734	0.6723	0.8805
	8209	0.3354	0.9581		7927	0.6388	0.8643
	8446	0.3324	0.960		8064	0.6210	0.8754
	8824	0.3252	0.9666		8292	0.6025	0.9192
	8974	0.3218	0.9693		8458	0.5851	0.8878
	9057[a]	0.321	0.970		8692	0.5679	0.9147
138.00	4163[b]	0.734	0.734		8967	0.5480	0.9118
	4250	0.6468	0.9292		9313	0.5295	0.9188
	4282	0.6307	0.8159		9643	0.5136	0.9243
	4251	0.6181	0.8447		9808	0.5042	0.9329
	4428	0.6051	0.8578	158.0	8568[b]	0.760	0.760
	4494	0.5926	0.8651		8581	0.6938	0.8626
	4563	0.5855	0.8706		8623	0.6880	0.8665
	4651	0.5733	0.8774		8664	0.6780	0.8622
	4983	0.5429	0.8938		8699	0.6744	0.8580
	5398	0.5093	0.9089		8719	0.6699	0.8473
	5877	0.4817	0.9234		8802	0.6512	0.8576
	6355	0.4577	0.9345		8989	0.6316	0.8716
	6362	0.4540	0.9349		9250	0.6071	0.9041
	6913	0.4315	0.9391		9505	0.5871	0.8971
	7427	0.4105	0.9430		9726	0.5682	0.9000
	7948	0.3970	0.9505		9926	0.559	0.9096
	8407	0.3802	0.9562		10133	0.5461	0.9138
	8822	0.3716	0.9574	162.00	9574	0.767	0.767
	9379	0.3597	-		9657	0.6887	0.8445
	9557	0.3566	0.9628		9726	0.6719	0.852
	9926[a]	0.347	0.963		9781	0.6639	0.8585
144.0	5356[b]	0.749	0.749		9912	0.6442	0.8699
	5432	0.6653	0.8663		10064	0.6289	0.8789
	5528	0.6311	0.8529		10201	0.6152	0.8861
	5610	0.6312	0.8634				

[a] Three-phase pressure ±10 bar.

[b] Critical pressure ±20 bar.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Nitrogen; N_2; 7727-37-9	Kharakhorin, F. F., *Zhur. Tekh. Fiz.*, 1940, *10*, 1533 (Russian); *Foreign Petrol. Tech.*, 1941, *9*, 397 (Eng. Trans.).
VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor y_{He}
68.0	4.54	0.00107	0.8325	90.1	18.75	0.0052	0.8025
	11.77	0.00195	0.9648		19.35	0.0054	0.8070
	22.60	0.00370	0.9745		22.60	0.0084	0.8170
	49.14	0.00885	0.9822		29.38	0.0110	0.8500
	93.98	0.01145	0.9860		30.40	0.0112	0.8540
	96.97	0.01160	0.9865		34.45	0.0130	0.8695
	109.43	0.01240	0.9880		41.64	0.0135	0.8845
	146.41	0.01480	0.9896		49.14	0.0162	0.9045
77.3	4.91	0.00098	0.8060		58.77	0.0208	0.9165
	11.75	0.00300	0.9190		68.65	0.0227	0.9280
	22.60	0.00460	0.9600		74.98	0.0234	0.9295
	34.35	0.00730	0.9659		84.61	0.0283	0.9380
	49.14	0.00960	0.9775		88.66	-	0.9415
	59.38	0.01125	0.9800		102.84	0.0372	0.9445
	72.19	0.01520	0.9815		107.91	0.0382	0.9570
	79.03	0.01585	0.9820		137.80	0.0437	0.9585
	98.59	0.02030	0.9822		167.69	0.0500	0.9595
	112.88	0.02100	-		181.07	0.0505	0.9610
	122.60	0.02325	0.9830		195.25	0.0563	0.9627
	146.92	0.02545	0.9847		207.21	0.0600	0.9621
	148.44	0.02550	0.9853		217.34	0.0618	0.9653
	160.30	0.02715	0.9860	107.	23.406	0.0085	-
	160.60	0.02740	0.9874		35.464	0.0220	0.5225
90.1	4.90	0.0003	0.1575		50.460	0.0330	0.6165
	11.80	0.0038	0.6320		74.778	0.0535	0.7160

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Vapor recirculated using magnetic pump. Analysis of samples of liquid by thermal conductivity. Details in source.	No details given.
	ESTIMATED ERROR: $\delta T/K = \pm 0.1$; $\delta P/bar = \pm 0.01$ (below 6 bar), ± 0.1 (between 6 and 75 bar), ± 0.5 (above 75 bar); $\delta x_{He} = \pm 0.0001$ to 0.001; $\delta y_{He} = \pm 0.0002$ to 0.003.
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Nitrogen; N_2; 7727-37-9	Kharakhorin, F. F., *Zhur. Tekh. Fiz.*, 1940, *10*, 1533 (Russian); *Foreign Petrol. Tech.*, 1941, *9*, 397 (Eng. Trans.).

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor y_{He}
107.	98.285	0.0682	0.7685	111.5	69.91	0.0575	0.6120
	115.511	0.0792	0.7900		73.46	0.0612	0.6155
	153.000	0.1012	0.8235		92.21	0.0765	0.6800
111.5	19.66	0.0033	0.1390		118.04	0.0945	0.7195
	20.47	0.0037	0.1510		122.10	0.0998	0.7315
	22.49	0.0065	0.1925		127.16	0.1040	0.7395
	24.62	0.0080	-		135.78	0.1080	0.7575
	28.67	0.0140	-		142.36	0.1145	0.7640
	39.03	0.0275	-		177.01	0.1310	0.7805
	45.39	0.0329	0.5070		197.58	0.1395	0.7900
	57.00	0.0449	0.5655				

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Nitrogen; N_2; 7727-37-9	Tully, P. C., DeVaney, W. E., and Rhodes, H. L., *Adv. Cryog. Engng.*, 1971, *16*, 88.
VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}
122.00	31.1	0.0064	0.0480	123.00	153.2	0.3400	0.3400
	34.5	0.0131	0.0893	123.20	138.0	0.2558	0.3756
	41.5	0.0263	0.1608	123.275	138.2	0.2875	0.3497
	55.2	0.0525	0.2632	124.00	34.5	0.0095	0.0426
	68.9	0.0774	0.3319		41.1	0.0253	0.1014
	103.2	0.1380	0.4319		55.2	0.0599	0.1937
	137.8	0.2024	0.4780		68.9	0.0926	0.2504
	172.4	0.2679	0.4935		82.7	0.1296	0.2871
	193.2	0.3147	0.4858		96.5	0.1729	0.3033
	200.0	0.3355	0.4774		103.6	0.2045	0.2988
	203.3	0.3476	0.4699		106.1	0.2202	0.2886
	206.7	0.3641	0.4603		106.9	0.2267	0.2834
	208.1	0.3715	0.4529		107.5	0.2350	0.2829
	209.0	0.3803	0.4424		108.1	0.2560	0.2560
	209.8	0.4075	0.4075	124.10	103.6	0.2163	0.2788
123.00	34.5	0.0115	0.0652	124.40	68.8	0.0998	0.2298
	41.4	0.0257	0.1304	124.80	68.9	0.1102	0.2020
	55.2	0.0552	0.2284	125.00	37.7	0.0159	0.0500
	68.9	0.0839	0.2942		41.2	0.0258	0.0731
	103.3	0.1578	0.3836		55.0	0.0671	0.1487
	124.0	0.2056	0.4051		68.9	0.1228	0.1798
	138.1	0.2421	0.4053		70.5	0.1360	0.1737
	144.9	0.2659	0.3984		71.7	0.1575	0.1575
	148.1	0.2830	0.3890	125.05	68.9	0.1312	0.1677
	151.7	0.3107	0.3678	125.30	55.2	0.0744	0.1310

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with beryllium-copper windowed cell. Vapor recirculated through external loop. Temperature measured with platinum resistance thermometer and pressure measured by pressure transducer and Bourdon gauge calibrated against a dead weight gauge. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. Pure sample containing less than 10 parts per million impurity.
2. Pure sample containing less than 50 parts per million impurity.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.15$; $\delta x_{He} = \delta y_{He} = \pm 0.004$.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Nitrogen; N_2; 7727-37-9	Tully, P. C., DeVaney, W. E., and Rhodes, H. L., *Adv. Cryog. Engng.*, 1968, *16*, 88.

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}
125.40	37.9	0.0158	0.0416	125.80	41.4	0.0289	0.0504
	41.4	0.0264	0.0635		43.1	0.0356	0.0572
	53.1	0.0690	0.1181		44.8	0.0458	0.0623
	55.2	0.0787	0.1228		45.4	0.0510	0.0626
	57.2	0.0898	0.1242		45.9	0.0585	0.0585
	57.8	0.0975	0.1201	125.90	41.4	0.0305	0.0456
	57.9	0.0995	0.1190	125.93	41.4	0.0324	0.0431
	58.4	0.1092	0.1092	126.00	37.0	0.0130	0.0211
125.475	55.2	0.0857	0.1116		39.3	0.0232	0.0318
125.80	38.1	0.0162	0.0333		39.6	0.0290	0.0290

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Nitrogen; N_2; 7727-37-9

ORIGINAL MEASUREMENTS:

Burch, R. J., *J. Chem. Engng. Data* 1964, *9*, 19.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	10^2 Mole fraction of helium in liquid, $10^2 x_{He}$	in vapor, $10^3 y_{He}$
82.70	5.07	0.108	63.8
	10.13	0.268	81.8
	15.20	0.418	87.7
	20.26	0.560	90.5
	30.40	0.825	92.9
	40.53	1.07	93.5
	50.66	1.31	94.8
113.13	20.26	0.340	8.47
	25.33	0.930	20.2
	30.40	1.47	28.4
	40.53	2.51	40.4
	50.66	3.54	49.9

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Vapor passed once through magnetically stirred cell. Temperature measured using thermocouple and pressure measured with Bourdon gauge. Liquid and vapor samples analysed using mass spectrometer.

SOURCE AND PURITY OF MATERIALS:

1. Bureau of Mines sample purity better than 99.994 mole per cent.
2. Airco prepurified sample purity better than 99.997 mole per cent.

(Details in source.)

ESTIMATED ERROR:

$\delta T/K = \pm 0.2$; $\delta P/\text{bar} = \pm 0.01$ at 5.07 bar, $= \pm 0.07$ at other pressures; $\delta x_{He} \leq \pm 2\%$ (Details in source).

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Nitrogen; N_2; 7727-37-9	Skripka, V. G. and Dykhno, N. M., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1964, *8*, 163.

VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	P^+/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
67.5	6.08	5.82	0.00068	0.9624
	11.06	10.80	0.00129	0.9777
	16.08	15.82	0.00181	0.9841
	21.20	20.93	0.00242	0.9874
	26.26	26.00	0.00301	0.9893
72.0	6.17	5.63	0.00086	0.9214
	11.12	10.58	0.00167	0.9550
	16.13	15.59	0.00243	0.9677
	21.20	20.66	0.00321	0.9750
	26.08	25.54	0.00397	0.9783
78.0	6.02	4.88	0.00104	0.8144
	11.05	9.92	0.00211	0.8999
	16.13	15.00	0.00314	0.9287
	21.19	20.05	0.00416	0.9452
	26.22	25.09	0.00521	0.9536
84.0	6.07	3.98	0.00114	-
	11.06	8.98	0.00252	0.7967
	16.18	14.09	0.00402	0.8611
	21.19	19.10	0.00536	0.8905
	26.20	24.12	0.00681	0.9111
90.3	6.01	2.23	0.00089	-
	11.06	7.29	0.00277	-
	16.13	12.35	0.00470	0.7392
	21.20	17.42	0.00658	0.7971
	26.25	22.47	0.00856	0.8345

P^+ partial pressure of helium.

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Vapor flow apparatus with magnetic recirculating pump. Temperature measured with platinum resistance thermometer, pressure measured with Bourdon gauge. Samples of gas and liquid analysed by gas phase interferometry. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. High purity containing no more than 0.008% hydrogen, 0.02% nitrogen, 0.005% oxygen and 0.07% hydrocarbons.
2. Purity 99.5 mole per cent, oxygen main impurity.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$ to 0.03; δP less than 0.2 bar; $\delta x_{He} \simeq \delta y_{He} \simeq \pm 0.00001$ to 0.00002.

REFERENCES:

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Nitrogen; N_2; 7727-37-9

ORIGINAL MEASUREMENTS:

Rodewald, N. C., Davis, J. A. and Kurata, F., *Am. Inst. Chem. Engnrs. J.*, 1964, *10*, 937.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	*P*/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}
77.2	13.8	0.0031	0.920
	27.6	0.0062	0.955
	41.4	0.0091	0.968
	55.2	0.01175	0.975
	68.9	0.0138	0.979
69.3	13.8	0.0024	0.973
	27.6	0.0046	0.980
	41.4	0.0066	0.983
	55.2	0.0083	0.985
	68.9	0.0095	0.988
64.9	13.8	0.0019	0.977
	27.6	0.00365	0.981
	41.4	0.0051	0.985
	55.2	0.0063	0.988
	68.9	0.0073	0.992

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Static equilibrium cell temperature measured with platinum resistance thermometer and pressure measured with Bourdon gauge. Dew and bubble points measured for samples of known composition.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.7$; $\delta P/\text{bar} = \pm 0.5\%$; $\delta x_{He} = \pm 0.0005$; $\delta y_{He} = \pm 0.002$

REFERENCES:

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Nitrogen; N_2; 7727-37-9

ORIGINAL MEASUREMENTS:

Davis, J. A., Rodewald, N. and Kurata, F., *Ind. Eng. Chem.*, 1963, *55*, No.11, 36.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}
77.2	14.4	0.0031	-	77.2	51.4	0.0105	0.956
	17.9	0.0041	-		51.4	0.0112	0.977
	29.1	0.0067	-		56.4	0.0109	0.981
	29.1	0.0072	-		56.4	0.0112	0.974
	36.2	0.0080	0.945		56.5	0.0124	0.962
	36.2	0.0084	0.968		56.5	0.0129	0.975
	36.5	0.0093	0.947		60.8	0.0117	0.989
	36.5	0.0102	0.967		60.8	0.0120	0.974
	42.6	0.0086	0.946		62.6	0.0124	0.974
	42.6	0.0090	0.966		62.6	0.0131	0.975
	44.3	0.0099	0.949		67.4	0.0129	0.977
	44.3	0.0108	0.973		67.4	0.0133	0.974
	49.7	0.0098	0.951		68.1	0.0134	0.981
	49.7	0.0101	0.974		68.1	0.0146	0.976

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Static equilibrium cell temperature measured with platinum resistance thermometer and pressure measured with Bourdon gauge. Composition of vapor and liquid phases estimated from overall composition and amount of each phase. Details in source.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.5$; $\delta P/bar = \pm 0.2$;
$\delta x_{He} = \pm 0.0002$; $\delta y_{He} = \pm 0.002$
(estimated by compiler)

REFERENCES:

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Nitrogen; N_2; 7727-37-9

ORIGINAL MEASUREMENTS:

Streett, W. B., *Chem. Eng. Prog. Symp. Ser. No. 61*, 1967, *63*, 37.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
77.60	66.9	0.0123	0.9784	117.13	485.7	0.3577	0.7729
	143.6	0.0235	0.9866		553.6	0.3750	0.7833
	209.3	0.0310	0.9906		622.9	0.3880	0.7935
	277.9	0.0377	0.9931		681.9	0.3956	0.8024
	341.6	0.0426	0.9893	119.60	70.3	0.0710	0.4243
	417.1	0.0474	0.9904		137.9	0.1635	0.5780
	482.6	0.0513	0.9910		205.1	0.2415	0.6288
	550.9	0.0540	0.9910		275.1	0.3127	0.6523
	610.2	0.0563	0.9920		311.3	0.3404	0.6585
100.61	68.2	0.0347	0.8211		349.2	0.3760	0.6626
	137.2	0.0672	0.8863		380.9	0.4010	0.6653
	206.5	0.0932	0.9072		416.4	0.4250	0.6631
	272.7	0.1138	0.9188		481.3	0.4607	0.6670
	343.0	0.1312	0.9261		519.9	0.4834	0.6694
	409.5	0.1445	0.9295		579.2	0.4969	0.6790
	481.6	0.1562	0.9351		630.2	0.5047	0.6909
	552.3	0.1665	0.9376		679.1	0.5080	0.7055
	606.4	0.1718	0.9411	119.80	372.0	0.4090	0.6500
	653.6	0.1775	0.9418		455.4	0.4670	0.6477
117.13	67.6	0.0605	0.4870		488.8	0.4894	0.6429
	137.9	0.1404	0.6473		516.8	0.5037	0.6419
	214.1	0.2101	-		550.5	0.5207	0.6398
	282.7	0.2616	0.7208		603.3	0.5321	0.6478
	352.7	0.3019	0.7480		689.1	0.5310	0.6815
	422.3	0.3337	0.7608	119.86	500.2	0.5078	0.6274

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow with magnetic pump. Samples of phases analysed by thermal conductivity. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Details in source and ref. 1.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$; $\delta P/bar = \pm 0.1$; $\delta x_{He} = \delta y_{He} = \pm 0.002$ to ± 0.01 (at pressure above 500 bar).

REFERENCES:

1. Streett, W. B., *Cryogenics*, 1965, *5*, 27.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Nitrogen; N_2; 7727-37-9	Streett, W. B., *Chem. Eng. Prog. Symp. Ser. No. 61*, 1967, *63*, 37.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
119.86	507.1	0.5150	0.6244
	515.7	0.5188	0.6274
	524.3	0.5240	0.6268
	534.7	0.5345	0.6219
	540.9	0.5340	0.6278
	552.6	0.5382	0.6270
	569.2	0.5435	0.6283
	580.9	0.5453	0.6331
	606.0	0.5514	0.6320
	655.7	0.5482	-
	689.5	0.5470	0.6686
	757.0	0.5351	0.7001
	827.4	0.5269	0.7302
119.92	221.7	0.2732	0.6261
	277.9	0.3312	0.6393
	348.9	0.3980	0.6449
	415.8	0.4513	0.6379
	449.9	0.4799	0.6349
	484.7	0.5093	0.6223
	503.7	0.5556	0.5940
	669.9	0.5841	0.6343
	680.9	0.5704	0.6524
	690.9	0.5671	0.6587
	758.4	0.5470	0.6977
	830.8	0.5354	0.7261
120.40	205.8	0.2616	0.5970
	310.3	0.3915	0.6051
	342.7	0.4377	0.5890
	357.8	0.4665	0.5769
121.00	67.6	0.0707	0.3628
	145.5	0.1937	0.5373
	206.5	0.2837	0.5686
	276.8	0.4039	0.5478
	290.3	0.4743	0.5108
121.74	67.2	0.0729	0.3356
	112.0	0.1522	0.4624
	146.9	0.2109	0.5039
	203.1	0.3120	0.5152
	214.8	0.3476	0.5020
	221.3	0.3680	0.4964
	224.1	0.3883	0.4896

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Nitrogen; N_2; 7727-37-9	DeVaney, W. E., Dalton, B. J. and Meeks, J. C. Jr., *J. Chem. Engng. Data*, 1963, *8*, 473.
VARIABLES: Temperature, pressure	PREPARED BY: C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}
76.5	13.9	0.00265	0.9111	85.0	82.9	0.0223	0.9578
	27.7	0.0034	0.9573		96.3	0.0248	0.9626
	41.4	0.0062	0.9702		111.0	0.0290	0.9626
	55.7	0.0091	0.9759		124.1	0.0326	0.9653
	69.1	0.0107	0.9796		137.8	0.0359	0.9683
	83.2	0.0131	0.9832	90.0	13.9	0.0041	0.6962
	96.2	0.0152	0.9826		27.7	0.0097	0.8395
	110.5	0.0172	0.9836		41.6	0.0133	0.8799
	124.1	0.0192	0.9844		55.4	0.0183	0.9135
	138.3	0.0213	0.9859		68.9	0.0224	0.9232
80.0	13.9	0.0031	0.8793		82.8	0.0280	0.9336
	27.5	0.0048	0.9341		96.5	0.0315	0.9401
	41.3	0.0075	0.9576		110.8	0.0381	0.9451
	55.6	0.0114	0.9652		123.9	0.0412	0.9467
	69.0	0.0136	0.9702		137.9	0.0458	0.9511
	83.2	0.0163	0.9722	95.0	13.9	0.0048	0.5495
	96.2	0.0189	0.9769		27.8	0.0109	0.7703
	110.5	0.0215	0.9771		41.7	0.0165	0.8339
	124.2	0.0244	0.9769		55.4	0.0220	0.8671
	138.0	0.0266	0.9820		68.7	0.0272	0.8921
85.0	13.9	0.0039	0.8088		83.0	0.0341	0.9008
	27.9	-	0.8990		96.4	0.0404	0.9118
	41.6	0.0102	0.9282		110.5	0.0464	0.9214
	55.6	0.0148	0.9447		124.0	0.0515	0.9233
	69.1	0.0175	0.9503		137.6	0.0561	0.9300

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Windowed equilibrium cell fitted with stirrer and copper constantan thermocouple. Pressure measured by dead weight gauge. Samples of coexisting phases analysed using gas chromatography. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. Minimum purity 99.995 mole per cent.
2. Minimum purity by mass spectrometry 99.9 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.5$; $\delta P/bar = \pm 0.07$; $\delta x_{He} = \pm 0.002$ for $x_{He} \geq 0.01$, ± 0.003 for $x_{He} < 0.01$; $\delta y_{He} = \pm 0.002$.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Nitrogen; N_2; 7727-37-9	DeVaney, W. E., Dalton, B. J. and Meeks, J. C. Jr., *J. Chem. Engng. Data*, 1963, *8*, 473.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in gas, y_{He}
100.0	14.1	0.0045	0.3586
	27.6	-	0.6294
	41.5	0.0197	0.7576
	55.3	0.0275	0.8106
	68.4	0.0345	0.8370
	82.7	0.0438	0.8591
	96.3	0.0507	0.8677
	110.7	0.0586	0.8830
	123.9	0.0627	0.8840
	138.4	0.0684	0.8933
105.0	14.1	0.0027	0.1671
	27.6	0.0104	0.4957
	41.5	0.0213	0.6330
	55.5	0.0315	0.7139
	68.9	0.0412	0.7597
	83.2	0.0519	0.8086
	96.9	0.0613	0.8252
	110.5	0.0726	0.8309
	124.0	0.0760	0.8379
	138.0	0.0828	0.8478
110.0	27.6	0.0103	0.3400
	41.6	0.0241	0.5071
	55.4	0.0375	0.6084
	69.0	0.0496	0.6672
	82.8	0.0619	0.6964
	96.7	0.0731	0.7350
	110.7	0.0820	0.7729
	124.5	0.0904	0.7883
	138.1	0.0983	0.7940
115.0	27.6	0.0102	0.1860
	41.5	0.0252	0.3694
	55.2	0.0437	0.4712
	69.6	0.0597	0.5524
	82.7	0.0723	0.6109
	96.7	0.0860	0.6489
	110.7	0.0962	0.6771
	124.3	0.1051	0.6993
	138.2	0.1068	0.7201
120.0	41.5	0.0253	0.2211
	55.6	0.0495	0.3465
	69.5	0.0749	0.4197
	82.7	0.0915	0.4874
	96.5	0.1026	0.5210
	110.6	0.1190	0.5623
	124.0	0.1300	0.5813
	138.1	0.1404	0.6052

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Nitrogen; N_2; 7727-37-9

ORIGINAL MEASUREMENTS:

Gonikberg, M. G. and Fastowsky, W. G., *Acta Physicochimica U.R.S.S.*, 1940, *12*, 67.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
78.0	18.1	0.005	0.921
	43.6	0.009	0.946
	67	0.015	0.965
	103	0.022	0.969
	144	0.026	0.978
	204	0.037	0.984
	264	0.046	0.983
	289	0.050	-
90.1	20.3	0.006	0.733
	34.4	0.011	0.829
	58	0.021	0.887
	93	0.035	0.902
	154	0.049	0.923
90.1	183	0.056	0.931
	216	0.062	0.941
	248	0.070	0.944
	279	0.079	0.945
109	27.0	0.023	0.455
	43.6	0.035	0.583
	79	0.065	0.663
	110	0.082	0.705
	136	0.106	0.755
	177	0.131	0.766
	228	0.159	0.797
	244	0.167	0.814
	280	0.183	0.825

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus. Method described in ref. 1. and source.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.1$; $\delta P/bar = \pm 1$; $\delta x_{He} \simeq \delta y_{He} = \pm 0.001$ (compiler).

REFERENCES:

1. Sokolov, V. A., "Methods for investigating nature gases", 1932, (Russian).

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Nitrous oxide; N_2O; 10024-97-2

ORIGINAL MEASUREMENTS:

Parrish, W. R. and Stewart, W. G., *J. Chem. Engng. Data*, 1975, *20*, 412.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
195.0	103.3	0.0052	-	255.0	86.7	0.0147	-
	103.6	0.0052	-		87.4	0.0154	-
	136.4	0.0070	-		101.8	0.0186	-
	137.8	0.0068	-		103.0	0.0182	-
215.0	49.9	0.0029	-		103.2	0.0180	-
	51.8	0.0027	-		104.5	0.0184	-
	86.1	0.0054	-		104.7	0.0185	-
235.0	51.2	0.0056	-		121.2	0.0209	-
	51.6	0.0055	-		121.7	0.0214	-
	84.8	0.0096	-		133.2	0.0241	-
	86.2	0.0104	-		135.4	0.0246	-
	136.5	0.0170	-		136.2	0.0242	-
245.0	71.0	0.0098	-	265.0	52.5	0.0077	-
	103.2	0.0157	-		52.8	0.0075	-
	103.7	0.0155	-		71.6	0.0127	-
	131.3	0.0204	-		71.7	0.0128	-
	133.9	0.0205	-		72.1	0.0122	-
	137.6	0.0209	-		104.9	0.0215	-
	137.8	0.0209	-		105.5	0.0222	-
255.0	38.8	0.0042	-		135.4	0.0291	-
	38.9	0.0041	-		136.8	0.0299	-
	58.2	0.0087	-	285.0	81.8	0.0173	-
	58.3	0.0090	-		94.3	0.0238	-
	75.6	0.0127	-		94.6	0.0233	-
	76.0	0.0130	-		114.6	0.0177	-
	86.1	0.0145	-		116.9	0.0334	-

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Vapor recirculation system similar to that in ref. 1. Pressure measured with Bourdon gauge. Temperature measured with platinum resistance thermometer. Samples of liquid and vapor analysed by gas chromatography. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. No details given.
2. Purity better than 98 mole per cent. Vapor over liquid vented several times.

ESTIMATED ERROR:

$\delta T/K = \pm 0.13$; $\delta P/\text{bar} = \pm 0.07$; $\delta x_{He} = \delta y_{He} = \pm 0.002$ or $\pm 2\%$ whichever is greater.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Nitrous Oxide; N_2O; 10024-97-2	Parrish, W. R. and Stewart, W. G., *J. Chem. Engng. Data*, 1975, *20*, 412.

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
285.0	135.5	0.0414	-	245.0	98.2	-	0.8211
	136.1	0.0416	-		125.9	-	0.8558
	136.7	0.0418	-	255.0	50.0	-	0.5611
235.0	19.7	-	0.4563		70.1	-	0.6628
	35.6	-	0.6855		103.8	-	0.7630
	52.0	-	0.7775		128.5	-	0.8042
	69.3	-	0.8269	265.0	41.6	-	0.3128
	104.5	-	0.8819		72.5	-	0.5674
	132.9	-	0.9055		98.3	-	0.6628
245.0	40.3	-	0.6007		99.6	-	0.6670
	51.7	-	0.6780		106.0	-	0.6828
	67.6	-	0.7470		136.5	-	0.7403

COMPONENTS:	EVALUATOR:
1. Helium; He; 7440-59-7 2. Oxygen; O_2; 7782-44-7	Colin Young, School of Chemistry, University of Melbourne, Parkville, Victoria 3052, AUSTRALIA.

CRITICAL EVALUATION:

There are few sets of data for this system. Herring and Barrick(1) did not present tabulated data but gave the following smoothing equations for the mole fraction solubility

$$x = D(P - P_s) + E(P - P_s)^2$$

where P is the total pressure in units of atmosphere; P_s is the vapor pressure of oxygen in units of atmosphere and D and E are constants given in Table 1.

Table 1. Constants given by Herring and Barrick (1)

T/K	10^3D	-10^6E
70	2.4356943	1.6908251
76	4.0101437	4.0894999
90	8.8673682	7.0547135
110	23.268528	20.804676
130	51.895458	46.479906
144	97.089510	103.08746
150	135.87904	74.331705

In view of the lack of information regarding the degree of fit of such smoothing equations, these data should be regarded with some caution and are classified as doubtful.

The three other sets of data are all in reasonable agreement in the overlapping ranges of temperature and pressure. The solubility values of Skripka and Lobonova (2) are slightly greater than the values of Sinor and Kurata (3) at the highest pressures studied by the latter. The data of Skripka and coworker (2) and (4) and of Sinor and Kurata (3) are classified as tentative.

References

1. Herring, R. N. and Barrick, P. L., *Internat. Adv. Cryogenic Engng.*, 1964, *10*, 151.
2. Skripka, V. G. and Lobonova, N. N., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1971, *13*, 90.
3. Sinor, J. E. and Kurata, F., *J. Chem. Engng. Data*, 1966, *11*, 537.
4. Skripka, V. G. and Dykhno, N. M., *Trudy Vses. Nauch.-Issled. Inst. Kislorodn.*, 1964, *8*, 163

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Oxygen; O_2; 7782-44-7

ORIGINAL MEASUREMENTS:

Skripka, V. G. and Lobonova, N. N., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1971, *13*, 90.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
65.12	9.8	0.0002	-	77.81	58.8	0.0023	0.9925
	19.6	0.0003	-		68.6	0.0027	0.9935
	29.4	0.0004	-		78.5	0.0031	0.9940
	39.2	0.0005	-		88.3	0.0036	0.9945
	49.0	0.0006	-		98.1	0.0041	0.9945
	58.8	0.0008	0.9990		107.9	0.0046	0.9950
	68.6	0.0009	0.9990		117.7	0.0050	0.9950
	78.5	0.0010	0.9995		127.5	0.0055	0.9950
	88.3	0.0013	0.9990		137.3	0.0058	0.9950
	107.9	0.0015	0.9990		147.1	0.0062	0.9950
	117.7	0.0016	0.9990		156.9	0.0066	0.9950
	127.5	0.0018	0.9980		166.7	0.0070	0.9950
	137.3	0.0020	0.9980		176.5	0.0074	0.9950
	147.1	0.0021	0.9980		186.3	0.0079	0.9950
	156.9	0.0023	0.9975		196.1	0.0083	0.9950
	166.7	0.0023	0.9970		205.9	0.0087	0.9950
	176.5	0.0026	0.9965		215.7	0.0092	0.9945
	186.3	0.0028	0.9960	90.58	9.8	0.0006	-
	196.1	0.0030	0.9960		19.6	0.0014	-
	205.9	0.0032	0.9960		29.4	0.0021	0.9480
	215.7	0.0034	0.9955		39.2	0.0029	0.9565
77.81	9.8	0.0004	-		49.0	0.0037	0.9630
	19.6	0.0007	-		58.8	0.0045	0.9680
	29.4	0.0011	0.9875		68.6	0.0054	0.9710
	39.2	0.0015	0.9895		78.5	0.0062	0.9730
	49.0	0.0019	0.9910		88.3	0.0070	0.9750

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Rocking autoclave partially filled with liquid and then pressurized with gas. Samples of phases analysed by interferometry. Temperature measured with platinum resistance and pressure measured with Bourdon gauge. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. High purity sample; purity 99.9 mole per cent.
2. High purity sample; purity 99.8 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/\text{bar} = \pm 0.4$; $\delta x_{He} = \delta y_{He} = \pm 0.0002$.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Oxygen; O_2; 7782-44-7	Skripka, V. G. and Lobonova, N. N., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1971, *13*, 90.

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}	in vapor, y_{He}
90.58	98.1	0.0080	0.9765	103.06	166.7	0.0262	0.9540
	107.9	0.0087	0.9780		176.5	0.0275	0.9555
	117.7	0.0095	0.9800		186.3	0.0289	0.9565
	127.5	0.0103	0.9810		196.1	0.0301	0.9570
	137.3	0.0111	0.9810		205.9	0.0313	0.9570
	147.1	0.0119	0.9820		215.7	0.0323	0.9575
	156.9	0.0127	0.9830	116.22	9.8	0.0005	-
	166.7	0.0135	0.9830		19.6	0.0036	-
	176.5	0.0143	0.9835		29.4	0.0067	0.5650
	186.3	0.0150	0.9835		39.2	0.0097	0.6700
	196.1	0.0155	0.9835		49.0	0.0128	0.7290
	205.9	0.0165	0.9835		58.8	0.0158	0.7680
	215.7	0.0172	0.9830		68.6	0.0188	0.7940
103.06	9.8	0.0012	-		78.5	0.0216	0.8130
	19.6	0.0030	-		88.3	0.0243	0.8280
	29.4	0.0049	0.8300		98.1	0.0268	0.8410
	39.2	0.0066	0.8640		107.9	0.0294	0.8520
	49.0	0.0083	0.8905		117.7	0.0320	0.8610
	58.8	0.0100	0.9060		127.5	0.0344	0.8690
	68.6	0.0118	0.9115		137.3	0.0370	0.8760
	78.5	0.0133	0.9230		147.1	0.0394	0.8815
	88.3	0.0149	0.9295		156.9	0.0419	0.8865
	98.1	0.0165	0.9350		166.7	0.0443	0.8910
	107.9	0.0180	0.9390		176.5	0.0467	0.8950
	117.7	0.0195	0.9430		186.3	0.0490	0.8985
	127.5	0.0208	0.9460		196.1	0.0513	0.9020
	137.3	0.0221	0.9485		205.9	0.0536	0.9055
	147.1	0.0234	0.9510		215.7	0.0560	0.9085
	156.9	0.0248	0.9520				

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Oxygen; O_2; 7782-44-7

ORIGINAL MEASUREMENTS:

Sinor, J. E. and Kurata, F.,
J. Chem. Engng. Data, 1966, *11*, 537.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of helium in liquid, x_{He}	T/K	P/bar	Mole fraction of helium in liquid, x_{He}
77.35	17.2	0.0004	113.15	68.95	0.0154
	34.5	0.0014		86.18	0.0195
	51.7	0.0020		103.4	0.0232
	68.95	0.0025		120.7	0.0267
	86.18	0.0032		137.9	0.0302
	103.4	0.0036	128.15	34.5	0.0086
	120.7	0.0043		51.7	0.0159
	137.9	0.0048		68.95	0.0237
93.15	17.2	0.0014		86.18	0.0314
	34.5	0.0033		103.4	0.0384
	51.7	0.0053		120.7	0.0446
	68.95	0.0068		137.9	0.0508
	86.18	0.0083	143.15	51.7	0.0180
	103.4	0.0099		68.95	0.0330
	120.7	0.0114		86.18	0.0461
	137.9	0.0127		103.4	0.0598
113.15	17.2	0.0027		120.7	0.0725
	34.5	0.0074		137.9	0.0860
	51.7	0.0113			

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Static equilibrium cell (0.1 ℓ capacity) fitted with magnetic stirrer. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Components charged into cell, equilibrated liquid samples withdrawn and analysed by G.C. Details in source and ref. 1.

SOURCE AND PURITY OF MATERIALS:

1. U.S. Bureau of Mines sample, maximum impurity 12 parts per million.
2. Linde Co. sample purity 99.7 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$; $\delta P/bar = \pm 0.1$;

$\delta x_{He} = \pm 1\%$ or ± 0.0003 (whichever is greater)

REFERENCES:

1. Sinor, J. E., Schindler, D. L. and Kurata, F., *Am. Inst. Chem. Engnrs. J.*, 1966, *12*, 353.

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Oxygen; O_2; 7782-44-7

ORIGINAL MEASUREMENTS:

Skripka, V. G. and Dykhno, N. M., *Trudy Vses. Nauch.-Issled. Inst. Kislorodn. Mashinostr.*, 1964, *8*, 163.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	P^+/bar	Mole fraction of helium in liquid, x_{He}	Mole fraction of helium in vapor, y_{He}
67.5	6.02	5.98	0.000126	0.9956
	11.16	11.12	0.000228	0.9973
	16.14	16.10	0.000336	0.9974
	21.30	21.26	0.000433	0.9979
	26.30	26.26	0.000541	0.9983
72.0	6.01	5.92	0.000178	0.9828
	11.26	11.17	0.000321	0.9904
	16.22	16.13	0.000472	0.9929
	21.29	21.20	0.000619	0.9943
	25.99	25.90	0.000759	0.9952
78.0	6.06	5.83	0.000240	0.9539
	11.04	10.81	0.000427	0.9732
	16.20	15.97	0.000622	0.9819
	21.22	20.98	0.000822	0.9858
	26.26	26.03	0.000998	0.9881
84.0	6.01	5.48	0.000349	0.8939
	11.05	10.53	0.000660	0.9418
	16.02	15.49	0.000947	0.9606
	21.19	20.66	0.001267	0.9687
	26.30	25.78	0.001592	0.9737
90.3	6.05	4.99	0.000448	0.7791
	11.05	9.99	0.000880	0.8804
	16.13	15.07	0.001338	0.9178
	21.14	20.07	0.001791	0.9352
	26.24	25.18	0.002249	0.9472

P^+ partial pressure of helium

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Vapor flow apparatus with magnetic recirculating pump. Temperature measured with platinum resistance thermometer pressure measured with Bourdon gauge. Samples of gas and liquid analysed by gas phase interferometry. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. High purity containing no more than 0.008% hydrogen, 0.02% nitrogen, 0.05% oxygen and 0.07% hydrocarbons.
2. Purity 99.5 mole per cent or better major impurities argon and water vapor.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$ to 0.03; δP less than 0.2 bar; $\delta x_{He} \simeq \delta y_{He} = \pm 0.00001$ to 0.00002.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Xenon; Xe; 7440-63-3	De Swaan Arons, J. and Diepen, G.A.M., *J. Chem. Phys.*, 1966, *44*, 2322.
VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T^+/K	P^+/bar	Mole fraction of helium	T^+/K	P^+/bar	Mole fraction of helium
278.30	51.7	0.0491	287.95	90.3	0.1535
283.00	58.4	0.0491	289.45	98.9	0.1535
285.35	62.2	0.0491	290.60	109.2	0.1535
288.05	68.3	0.0491	291.40	127.7	0.1535
289.30	73.7	0.0491	291.55	133.7	0.1535
289.40	76.7	0.0491	291.65	139.4	0.1535
287.65	92.0	0.0491	291.80	157.1	0.1535
281.75	103.7	0.0491	290.25	205.1	0.1535
278.45	108.6	0.0491	286.40	263.7	0.1535
278.90	59.9	0.1054	281.75	325.2	0.1535
282.50	66.5	0.1054	282.65	91.3	0.2385
285.45	73.4	0.1054	285.40	101.6	0.2385
285.60	73.7	0.1054	286.65	107.2	0.2385
287.65	80.4	0.1054	288.55	118.2	0.2385
289.65	92.7	0.1054	290.75	137.9	0.2385
290.00	102.7	0.1054	292.15	163.5	0.2385
290.05	104.2	0.1054	292.80	187.3	0.2385
290.15	120.0	0.1054	292.85	188.5	0.2385
289.85	127.7	0.1054	292.90	189.6	0.2385
287.65	150.5	0.1054	294.00	253.2	0.2385
284.05	175.4	0.1054	293.40	354.5	0.2385
281.25	192.8	0.1054	290.85	506.6	0.2385
278.45	209.8	0.1054	287.75	724.4	0.2385
281.25	70.2	0.1535	284.70	1034.9	0.2385
285.35	81.0	0.1535	284.10	1433.5	0.2385

(cont.)

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Sample confined in glass vessel enclosed in autoclave. Sample agitated by electromagnetic stirrer. Pressure measured on pressure balance. Details in source and ref. 1.

SOURCE AND PURITY OF MATERIALS:

(1) Ohio Chemical and Surgical Equipment Co. purity 99.99 mole per cent.

(2) Hoechst AG sample.

ESTIMATED ERROR:

δT/K = ±0.05; δP/bar = ±0.01%;

δx_{He} (maximum) = ±1%.

REFERENCES:

1. van Hest, J.A.M. and Diepen, G.A.M., *Symp. Phys. Chem., High Pressure, London, 1962*, 1962.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Helium; He; 7440-59-7 (2) Xenon; Xe; 7440-63-3	De Swaan Arons, J. and Diepen, G.A.M., *J. Chem. Phys.*, 1966, *44*, 2322.

EXPERIMENTAL VALUES:

T^+/K	P^+/bar	Mole fraction of helium	T^+/K	P^+/bar	Mole fraction of helium
278.25	83.3	0.2544	299.10	465.4	0.5053
282.10	95.1	0.2544	302.05	574.3	0.5053
285.70	110.3	0.2544	303.25	617.0	0.5053
289.25	134.2	0.2544	305.45	705.9	0.5053
289.40	135.8	0.2544	310.40	910.1	0.5053
290.80	153.3	0.2544	315.90	1160.2	0.5053
292.20	191.4	0.2544	320.60	1390.7	0.5053
292.35	196.7	0.2544	325.60	1651.4	0.5053
292.40	199.8	0.2544	331.65	1965.8	0.5053
292.45	200.6	0.2544	278.35	181.7	0.5587
292.55	205.1	0.2544	283.40	221.8	0.5587
293.80	285.8	0.2544	288.45	276.3	0.5587
293.80	314.7	0.2544	293.25	351.5	0.5587
293.45	373.6	0.2544	298.30	469.8	0.5587
292.85	432.4	0.2544	303.35	637.6	0.5587
291.00	573.6	0.2544	306.10	743.5	0.5587
289.60	705.1	0.2544	306.45	762.7	0.5587
287.95	973.8	0.2544	307.80	808.9	0.5587
288.50	1612.2	0.2544	315.80	1133.1	0.5587
278.30	93.8	0.3036	322.55	1426.9	0.5587
282.70	110.0	0.3036	329.30	1741.2	0.5587
287.95	140.0	0.3036	333.75	1965.8	0.5587
290.85	171.0	0.3036	278.45	207.6	0.6028
293.00	223.8	0.3036	283.70	254.2	0.6028
293.20	229.7	0.3036	287.55	296.0	0.6028
293.25	231.8	0.3036	293.60	394.3	0.6028
293.40	237.7	0.3036	298.90	516.1	0.6028
293.50	241.5	0.3036	305.15	713.3	0.6028
293.50	242.5	0.3036	311.15	942.4	0.6028
293.95	260.1	0.3036	313.80	1046.6	0.6028
295.20	317.0	0.3036	317.30	1189.5	0.6028
295.25	320.2	0.3036	324.80	1504.8	0.6028
296.70	491.2	0.3036	331.15	1786.2	0.6028
296.80	762.7	0.3036	336.65	2046.8	0.6028
297.70	1126.9	0.3036	283.00	289.4	0.6518
281.60	114.7	0.3537	290.70	395.0	0.6518
286.30	139.1	0.3537	297.60	532.2	0.6518
291.15	185.9	0.3537	303.00	676.9	0.6518
292.05	198.1	0.3537	308.60	862.1	0.6518
294.00	242.9	0.3537	315.10	1105.6	0.6518
295.70	302.3	0.3537	321.15	1349.5	0.6518
299.15	455.9	0.3537	321.15	1350.6	0.6518
302.75	762.7	0.3537	323.85	1462.9	0.6518
305.95	1126.9	0.3537	330.75	1759.2	0.6518
309.78	1561.5	0.3537	336.50	2015.3	0.6518
280.00	126.8	0.4053	278.20	265.8	0.6786
282.80	142.0	0.4053	284.20	331.2	0.6786
288.10	181.6	0.4053	287.90	381.8	0.6786
293.30	259.6	0.4053	292.55	460.1	0.6786
296.90	380.7	0.4053	298.50	586.3	0.6786
297.15	390.5	0.4053	303.20	711.3	0.6786
300.85	550.0	0.4053	309.05	897.0	0.6786
304.25	739.4	0.4053	315.85	1145.4	0.6786
309.15	1078.0	0.4053	321.70	1379.0	0.6786
313.75	1427.9	0.4053	328.50	1664.0	0.6786
317.80	1741.3	0.4053	332.05	1820.4	0.6786
279.55	163.2	0.5053	338.60	2109.5	0.6786
283.75	192.8	0.5053	278.30	290.1	0.7016
289.35	249.6	0.5053	283.40	348.2	0.7016
294.85	343.5	0.5053	289.55	437.5	0.7016

(cont.)

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Xenon; Xe; 7440-63-3

ORIGINAL MEASUREMENTS:

De Swaan Arons, J. and Diepen, G.A.M., *J. Chem. Phys.*, 1966, *44*, 2322.

EXPERIMENTAL VALUES:

T^+/K	P^+/bar	Mole fraction of helium	T^+/K	P^+/bar	Mole fraction of helium
295.85	557.6	0.7016	303.20	1031.4	0.8270
302.05	710.2	0.7016	310.75	1250.4	0.8270
311.10	991.2	0.7016	316.10	1420.2	0.8270
318.35	1254.0	0.7016	322.70	1651.4	0.8270
324.95	1519.6	0.7016	328.85	1875.0	0.8270
333.90	1903.0	0.7016	334.55	2100.5	0.8270
277.85	348.7	0.7534	278.55	717.5	9.8783
284.65	439.6	0.7534	283.20	816.5	0.8783
291.10	548.5	0.7534	288.80	942.7	0.8783
295.85	644.2	0.7534	295.25	1104.9	0.8783
301.35	774.2	0.7534	302.55	1310.4	0.8783
307.30	939.0	0.7534	308.95	1509.1	0.8783
314.00	1146.0	0.7534	314.80	1701.8	0.8783
319.70	1344.7	0.7534	322.50	1974.8	0.8783
324.85	1538.5	0.7534	285.75	1314.1	0.9275
330.00	1741.2	0.7534	288.85	1400.0	0.9275
335.35	1965.8	0.7534	292.80	1519.6	0.9275
282.05	551.6	0.8270	297.80	1669.4	0.9275
287.30	647.6	0.8270	303.05	1849.6	0.9275
293.20	770.5	0.8270	308.95	2074.0	0.9275
298.65	912.0	0.8270			

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Santowax R;

ORIGINAL MEASUREMENTS:

Grove, N. H., and Whitby, F. P.,
J. Appl. Chem., 1960, *10*, 101.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	*P*/bar	Solubility*	Ostwald coefficient
506	1.81	5.3	0.114
511	2.58	6.3	0.097
511	4.04	9.0	0.089
598	2.13	9.3	0.189
599	3.04	11.0	0.157
600	4.76	16.0	0.146
674	2.43	12.7	0.236
679	3.48	16.3	0.212
679	5.41	24.3	0.203

* Moles of helium per mg of Santowax R

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Static cell with null pressure transducer. Pressure measured with Bourdon gauge. Temperature measured with thermocouple. Sample placed in cell and gas added at room temperature. Cell then heated to experimental temperature. Pressures on both sides of transducer kept approximately equal. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. No details given.
2. Analysis by infrared method showed sample to be 11.8% σ-terphenyl, 56.3% m-terphenyl, 29.3% p-terphenyl, 2.6% diphenyl and higher polyphenyls. Obtained from Monsanto Chemicals Ltd.

ESTIMATED ERROR:

$\delta T/K = \pm 1$; $\delta P/\text{bar} = \pm 0.01$;

$\delta x_{He} = \pm 10\%$.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Neon; Ne; 7440-01-9 (2) Methane; CH_4; 74-82-8	Streett, W. B. and Hill, J. L. E., *Progr. Refrig. Sci. Technol. XIII Proc. Internat. Congr. Refrig.*, 1971, *1*, 309.
VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
95.26	20.3	0.0059	-	112.27	344.5	0.0795	0.9684
	34.5	0.0093	-		551.2	0.0953	0.9677
	47.6	0.0111	0.9902		689.0	0.1014	0.9690
	68.9	0.0165	0.9914		826.8	0.1027	0.9706
	103.4	0.0222	-		964.6	0.1050	0.9720
	137.8	0.0275	-		1102.4	0.0993	0.9738
	175.3	0.0310	0.9889		1240.2	0.0980	0.9744
	206.7	0.0354	0.9890		1324.3	0.097	0.975
	275.6	0.0399	0.9883	117.49	344.5	0.0919	0.9592
	344.5	0.0410	0.988		551.2	0.1087	0.9581
102.91	34.5	0.0107	0.9710		689.0	0.1125	0.9589
	68.9	0.0196	0.9817		826.8	0.1215	0.9604
	103.4	0.0275	0.9828		964.6	0.1202	0.9619
	137.8	0.0342	0.9808		1102.4	0.1203	0.9640
	206.7	0.0423	-		1240.2	0.1189	0.9662
	275.6	0.0528	0.9820		1378.0	0.1178	0.9684
	413.4	0.0617	-		1515.8	0.1137	0.9701
	551.2	0.0689	0.9804		1653.6	0.1106	0.9739
	689.0	0.0695	0.9796		1730.6	0.109	0.976
	771.1	0.071	0.979	126.61	413.4	0.1337	0.9357
112.27	34.5	0.0127	0.9507		551.2	0.1504	0.9350
	68.9	0.0245	0.9681		689.0	0.1606	0.9366
	137.8	0.0434	0.9728		826.8	0.1641	0.9401
	172.3	0.0509	0.9732		964.6	0.1679	0.9425
	206.7	0.0571	0.9728		1240.2	0.1638	0.9496

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic pump at ambient temperature. Samples analysed by thermal conductivity. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Details in ref. 1.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$; $\delta P/bar = \pm 1$;

δx_{Ne}, δy_{Ne} = ±0.001 (estimated by compiler)

REFERENCES:

1. Streett, W. B. and Jones, C. H., *Adv. Cryogenic Engng.*, 1965, *11*, 355.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Neon; Ne; 7440-01-9 (2) Methane; CH_4; 74-82-8	Streett, W. B. and Hill, J. L. E., *Progr. Refrig. Sci. Technol. XIII Proc. Internat. Congr. Refrig.*, <u>1971</u>, *1*, 309.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
126.61	1515.8	0.1592	0.9557	154.05	1653.6	0.4137	0.8188
	1791.4	0.1520	0.9611		1791.4	0.3954	0.8381
	2067.0	0.1425	0.9680		2067.0	0.3595	0.8682
	2301.1	0.1329	0.9711		2411.5	0.3266	0.8931
	2394.3	0.129	0.973		2757.1	0.2985	0.9117
139.08	344.5	0.1716	0.8873		3101.6	0.2710	0.9251
	413.4	0.1922	0.8848		3446.1	0.2528	0.9358
	551.2	0.2237	0.8843		4135.1	0.2199	0.9496
	689.0	0.2417	0.8842	161.49	83.1	0.0636	0.6389
	826.8	0.2508	0.8874		103.4	0.0845	0.6716
	964.6	0.2535	0.8934		137.8	0.1170	0.7023
	1102.4	0.2543	0.8996		172.3	0.1546	0.7107
	1240.2	0.2507	0.9059		206.7	0.1890	0.7110
	1378.0	0.2463	0.9129		241.2	0.2276	0.7057
	1653.6	0.2378	0.9226		275.6	0.2699	0.6905
	2067.0	0.2137	0.9393		310.1	0.3139	0.6698
	2411.5	0.1981	0.9486		344.5	0.3685	0.6356
	2757.1	0.1848	0.9567		360.7	0.4100	0.5610
	3100.5	0.1759	0.9615		371.9	0.515	0.515
	3456.2	0.167	0.967	166.24	2536.2	0.655	0.655
148.08	413.4	0.2490	0.8230		2619.3	0.5377	-
	551.2	0.3051	0.8097		2660.8	0.5207	0.7774
	703.2	0.3417	0.8037		2722.6	0.4918	0.7966
	826.8	0.3606	0.8070		2853.3	0.4652	0.8183
	964.6	0.3659	0.8163		2894.9	0.4507	0.8279
	1102.4	0.3634	0.8285		3032.7	0.4236	0.8479
	1240.2	0.3539	0.8426		3480.5	0.3655	0.8840
	1515.8	0.3342	0.8653		3825.0	0.3326	0.9031
	1791.4	0.3173	0.8859		4135.0	0.3144	0.9168
	2067.0	0.2926	0.9030	167.16	68.9	0.0534	0.5184
	2411.5	0.2756	0.9187		103.4	0.0919	0.5931
	2757.1	0.2462	0.9340		137.8	0.1344	0.6257
	3156.3	0.2234	0.9437		172.3	0.1788	0.6505
	3474.4	0.2083	0.9505		206.7	0.2198	0.6487
	3790.6	0.1966	0.9502		234.1	0.2650	0.6250
	4135.1	0.1840	0.9618		248.2	0.2959	0.6003
	4272.9	0.179	0.964		261.4	0.3301	0.5700
152.95	413.4	0.3087	0.7673		274.5	0.455	0.455
	551.2	0.3892	0.7345	170.17	2979.0	0.657	0.657
	703.2	0.4835	0.6886		3067.1	-	0.7766
	826.8	0.5700	0.6593		3115.7	0.5133	0.7918
	909.9	0.5316	0.6639		3170.5	0.4937	0.8064
	964.6	0.5240	0.6858		3308.3	0.4563	0.8300
	1033.5	0.5166	0.7057		3446.1	0.4317	0.8480
	1102.4	0.4964	0.7266		3517.0	0.3901	0.8790
	1378.0	0.4418	0.7905		4135.1	0.3614	0.9499
	1791.4	0.3820	0.8486	175.00	34.5	0.0072	0.1090
154.05	344.5	0.2685	0.7701		68.9	0.0550	0.3746
	413.4	0.3142	0.7530		103.4	0.1050	0.4585
	482.3	0.3649	0.7319		123.6	0.1445	-
	551.2	0.4181	0.7032		137.8	0.1660	0.4844
	620.1	0.4718	0.6642		152.0	0.1981	0.4780
	654.6	0.5055	-		165.2	0.2329	0.4595
	675.8	0.582	0.582		172.2	0.2568	-
	1226.0	0.620	0.630		175.3	0.2631	0.4319
	1294.9	-	0.7404		184.4	0.360	0.360
	1336.5	-	0.7532	180.50	4076.3	0.664	0.664
	1378.0	0.4818	0.7641		4162.4	0.5610	0.7688
	1446.9	0.4606	0.7805		4231.3	0.5220	0.8034
154.05	1515.8	0.4430	0.7954		4356.0	0.4950	0.8290

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Argon; Ar; 7440-37-1	Colin Young, School of Chemistry, University of Melbourne, Parkville, Victoria 3052, AUSTRALIA.

CRITICAL EVALUATION:

This system has been studied by three groups of workers. The data of Streett and coworkers (1,2,3) are the most detailed and are in good agreement with the data of Trappeniers and Schouten (4) where the two sets of data overlap. The solubility values of Skripka and Dykhno (5) and Skripka and Lobonova (6) are somewhat higher than those obtained by Streett (1).

The data of Streett (1,2), Streett and Hill (3) and Trappeniers and Schouten (4) are classified as tentative whereas those of Skripka and Dykhno and Skripka and Lobonova are classified as doubtful.

References

1. Streett, W. B., *J. Chem. Phys.*, 1965, *42*, 500.

2. Streett, W. B., *J. Chem. Phys.*, 1967, *46*, 3282.

3. Streett, W. B. and Hill, J. L. E., *J. Chem. Phys.*, 1971, *54*, 5088.

4. Trappeniers, N. J. and Schouten, J. A., *Physica*, 1974, *73*, 539.

5. Skripka, V. G. and Dykhno, N. M., *Trudy Vses. Nauch.-Issled. Inst. Kislorodn. Mashinostr.*, 1964, *no. 8*, 163.

6. Skripka, V. G. and Lobonova, N. N., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1971, *no. 13*, 90.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Neon; Ne; 7440-01-9 (2) Argon; Ar; 7440-37-1	Skripka, V. G. and Dykhno, N. M., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinstr.*, 1964, *8*, 163.
VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	P^+/bar	Mole fraction of neon in liquid, x_{Ne}	in vapor, y_{Ne}
90.5	6.06	4.66	0.0044	0.7242
	11.10	9.70	0.0092	0.8589
	16.15	14.75	0.0138	0.8903
	21.21	19.18	0.0185	0.9098
	26.19	24.79	0.0231	0.9220

P^+ partial pressure of neon

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Vapor flow apparatus with magnetic recirculating pump. Temperature measured with platinum resistance thermometer, pressure measured with Bourdon gauge. Samples of gas and liquid analysed by gas phase interferometry. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. High purity sample, purity 99.69 mole per cent, impurities helium and nitrogen.
2. No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$ to 0.03; δP less than 0.2 bar; $\delta x_{He} \simeq \delta y_{He} = \pm 0.0001$ to 0.0002.

REFERENCES:

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Streett, W. B. and Hill, J. L. E., *J. Chem. Phys.*, 1971, *54*, 5088.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
87.34	63.8	0.0542	0.9590	92.42	845.1	0.4369	0.7514
	107.4	0.0856	-		896.7	0.4479	0.7434
	141.9	0.1094	0.9485		934.2	0.4591	0.7384
	210.8	0.1457	0.9315		965.6	0.4616	0.7342
	273.6	0.1713	0.9186		1000.1	0.465	0.729
	275.6	0.1766	0.9160	93.01	872.4	0.4868	0.7159
	344.5	0.2019	0.9021		927.1	0.5069	0.6990
	415.4	0.2243	0.8898		968.7	0.5223	0.6856
	454.9	0.2373	0.8826		1010.2	0.5431	0.6711
	491.4	0.2445	-		1017.3	0.5576	-
	516.8	0.2518	-		1030.5	0.560	0.655
	538.0	0.252	0.874	93.25	606.9	0.3858	0.7764
90.47	558.3	0.3082	0.8379		693.1	0.4181	0.7525
	622.2	0.3272	0.8284		757.9	0.4491	-
	689.0	0.3420	0.8190		830.9	-	0.7102
	757.9	0.3547	0.8131		896.7	0.5181	0.6835
	823.8	0.365	0.808		927.1	-	0.6577
91.52	686.0	0.3681	0.7967		941.3	0.5567	-
	757.9	0.3837	0.7892	93.48	793.4	0.4818	-
	827.8	-	0.7827		862.3	0.5339	0.6732
	857.2	0.3982	0.7868		885.6	0.5672	0.6459
	902.8	0.407	0.785	93.91	462.0	0.3305	0.8120
92.42	361.7	0.2554	0.8610		555.3	0.3776	0.7802
	486.4	0.3130	0.8280		651.5	0.4318	0.7427
	585.7	0.3550	0.8023		706.2	0.4656	0.7171
	631.3	0.3707	0.7934		772.1	0.5189	0.6742
	765.0	0.4161	0.7654		796.4	0.5572	-

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic pump at ambient temperature. Samples analysed by thermal conductivity. Temperature measured with platinum resistance thermometer. Pressure measured using Bourdon gauge. Details in ref. 1.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.2$; $\delta P/\text{bar} = \pm 0.5$; $\delta x_{Ne} \simeq \delta y_{Ne} = \pm 0.001$.

REFERENCES:

1. Streett, W. B., *Cryogenics*, 1965, *5*, 27.

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Streett, W. B., *J. Chem. Phys.*, 1967, *46*, 3282.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
95.82	103.3	0.0962	0.9245	110.78	122.0	0.1448	0.8278
	140.0	0.1290	0.9165		201.0	0.2552	0.7852
	208.6	0.1848	0.8925		239.2	0.3237	0.7423
	276.1	0.2357	0.8650		272.7	0.4058	0.6781
	343.3	0.2842	0.8358		282.0	0.4503	0.6379
	417.1	0.3361	0.8046		286.1	0.4898	0.6034
	477.8	0.3727	0.7733	121.36	75.2	0.0925	0.6773
	566.1	0.4453	0.7109		99.6	0.1348	0.6991
	593.6	0.4917	0.6795		141.3	0.2087	0.6906
	606.7	0.5139	0.6642		169.6	0.2783	0.6561
	621.2	0.5710	0.6105		187.9	0.3341	0.6122
101.94	114.8	0.1213	0.8903		195.1	0.3722	0.5811
	132.0	0.1383	-		197.9	0.3990	0.5575
	206.2	0.2124	0.8543	129.93	93.1	0.1318	0.5572
	275.1	0.2887	0.8104		113.1	0.1787	0.5610
	344.7	0.3776	0.7536		129.3	0.2228	0.5463
	382.7	0.4474	0.6932		141.3	0.2668	0.5195
	396.1	0.5188	0.6362		148.9	0.3090	0.4849
					151.7	0.3309	0.4573

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic pump at ambient temperature. Samples analysed by thermal conductivity. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Details in ref. 1.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.1$; $\delta x_{Ne} = \pm 0.001$; $\delta y_{Ne} = \pm 0.001$.
(estimated by compiler)

REFERENCES:

1. Streett, W. B., *Cryogenics*, 1965, *5*, 27.

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Streett, W. B., *J. Chem. Phys.*, 1965, *42*, 500.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
84.42	3.83	0.0024	0.7984	95.82	54.81	0.0517	0.9198
	6.96	0.0052	0.8888		69.40	0.0652	0.9228
	13.65	0.0111	0.9420	101.94	7.45	0.0038	0.4638
	21.20	0.0178	0.9505		14.27	0.0112	0.6947
	27.72	0.0229	0.9584		21.37	0.0192	0.7772
	34.47	0.0284	0.9662		28.17	0.0262	0.8191
	42.16	0.0348	0.9665		34.82	0.0337	0.8419
	48.19	0.0408	0.9668		41.61	0.0408	0.8592
	54.99	0.0448	0.9681		48.57	0.0487	0.8694
	69.19	0.0549	0.9693		55.23	0.0562	0.8760
87.42	7.48	0.0064	0.8486		62.12	0.0635	0.8819
	14.13	0.0118	0.9107		70.57	0.0726	0.8868
	21.13	0.0183	0.9307	110.78	10.38	0.0039	0.2863
	27.72	0.0241	0.9445		15.20	0.0101	0.4813
	34.44	0.0293	0.9501		21.06	0.0171	0.5993
	41.64	0.0361	0.9552		27.34	0.0246	0.6701
	48.16	0.0412	0.9582		34.51	0.0337	0.7200
	55.22	0.0475	0.9605		41.64	0.0422	0.7508
	68.88	0.0573	0.9623		55.30	0.0593	0.7871
95.82	4.76	0.0020	0.4870		69.22	0.0764	0.8103
	10.55	0.0079	0.7545	121.36	20.27	0.0092	0.2901
	14.82	0.0123	0.8157		29.13	0.0224	0.4540
	22.44	0.0194	0.8661		36.27	0.0329	0.5278
	28.48	0.0258	0.8892		42.37	0.0417	0.5747
	35.13	0.0319	0.8970		58.05	0.0653	0.6467
	41.58	0.0387	0.9064		69.88	0.0833	0.6728

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus; details given in ref. 1. Temperature measured with platinum resistance thermometer. Pressure measured using Bourdon gauge. Samples of coexisting phases analysed by thermal conductivity.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.01$; $\delta x_{Ne} = \pm 0.0002$ to 0.0004; $\delta y_{Ne} = \pm 0.002$.

REFERENCES:

1. Streett, W. B., *Cryogenics*, 1965, *5*, 27.

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Streett, W. B., *J. Chem. Phys.*, 1965, *42*, 500.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid x_{Ne}	in vapor, y_{Ne}
129.93	26.44	0.0097	0.1703
	34.85	0.0237	0.3055
	42.92	0.0373	0.3877
	49.54	0.0487	0.4335
	56.19	0.0603	0.4709
	72.39	0.0898	0.5277

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Skripka, V. G. and Lobonova, N. N., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1971, *13*, 90.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
90.61	9.8	0.0092	-	99.75	68.6	0.0726	0.8925
	19.6	0.0194	-		78.5	0.0832	0.8945
	29.4	0.0296	0.9245		88.3	0.0936	0.8960
	39.2	0.0400	0.9340		98.1	0.1044	0.8960
	49.0	0.0502	0.9385		107.9	0.1128	0.8960
	58.8	0.0604	0.9400		117.7	0.1260	0.8950
	68.6	0.0706	0.9395		127.5	0.1370	0.8935
	78.5	0.0809	0.9395		137.3	0.1480	0.8905
	88.3	0.0911	0.9390		147.1	0.1590	0.8870
	98.1	0.1005	0.9380		156.9	0.1705	0.8835
	107.9	0.1095	0.9365		166.7	0.1815	0.8790
	117.7	0.1185	0.9350		176.5	0.1920	0.8760
	127.5	0.1275	0.9330		186.3	0.2025	0.8720
	137.3	0.1364	0.9310		196.1	0.2130	0.8690
	147.1	0.1452	0.9290	109.67	19.6	0.0140	-
	156.9	0.1538	0.9270		29.4	0.0273	-
	166.7	0.1622	0.9245		39.2	0.0404	0.7305
	176.5	0.1700	0.9220		49.0	0.0550	0.7580
	186.3	0.1775	0.9200		58.8	0.0675	0.7800
	196.1	0.1846	0.9180		68.6	0.0805	0.7955
99.75	9.8	0.0079	-		78.5	0.0930	0.8070
	19.6	0.0189	-		88.3	0.1060	0.8150
	29.4	0.0296	-		98.1	0.1190	0.8180
	39.2	0.0404	0.8635		107.9	0.1320	0.8190
	49.0	0.0510	0.8780		117.7	0.1450	0.8000
	58.8	0.0620	0.8865		127.5	0.1594	0.8180

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Rocking autoclave partially filled with liquid and then pressurized with gas. Samples of phases analysed by interferometry. Temperature measured with platinum resistance thermometer and pressure measured with Bourdon gauge. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. High purity sample, purity 99.7 mole per cent.
2. High purity sample, purity 99.99 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.4$; $\delta x_{Ne} = \delta y_{Ne} = \pm 0.0002$.

REFERENCES:

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Skripka, V. G. and Lobonova, N. N., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1971, *13*, 90.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	in vapor, y_{Ne}
109.67	137.3	0.1736	0.8155
	147.1	0.1882	0.8125
	156.9	0.2034	0.8080
	166.7	0.2180	0.8020
	176.5	0.2328	0.7950
	186.3	0.2484	0.7830
	196.1	0.2644	0.7695
	205.9	0.2814	-
120.09	19.6	0.0110	-
	29.4	0.0260	-
	39.2	0.0400	0.5370
	49.0	0.0555	0.5935
	58.8	0.0700	0.6028
	68.6	0.0860	0.6510
	78.5	0.1020	0.6670
	88.3	0.1180	0.6765
	98.1	0.1350	0.6840
	107.9	0.1530	0.6880
	117.7	0.1720	0.6880
	127.5	0.1925	0.6835
	137.3	0.2140	0.6780
	147.1	0.2360	0.6705
	156.9	0.2610	0.6605
	166.7	0.2870	0.6490
	176.5	0.3140	0.6365

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Neon; Ne; 7440-01-9 (2) Argon; Ar; 7440-37-1	Trappeniers, N. J. and Schouten, J. A., *Physica*, 1974, *73*, 539.
VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
137.83	36.02	0.0140	0.1252	121.32	50.78	0.0545	0.6176
	45.94	0.0342	0.2280		66.03	0.0766	0.6640
	60.03	0.0755	0.3457		81.35	0.1012	0.6910
	81.55	0.1137	0.3830		101.53	0.1355	0.7042
	96.68	0.1594	0.3930		126.80	0.1801	0.7026
	101.46	0.1753	0.3923		152.12	0.2312	0.6911
	107.54	0.2037	0.3793		177.45	0.2958	0.6492
	111.80	0.2334	0.3614		192.63	0.3510	0.6038
129.94	25.65	0.0086	0.1559		202.74	0.4274	0.5335
	35.04	0.0232	0.3108	103.04	10.62	0.0073	0.5709
	45.70	0.0413	0.4143		20.43	0.0187	0.7522
	55.91	0.0593	0.4745		50.98	0.0523	0.8635
	71.06	0.0896	0.5280		91.32	0.0966	0.8853
	86.26	0.1169	0.5564		152.15	0.1611	0.8750
	101.42	0.1497	0.5678		212.90	0.2246	0.8431
	116.61	0.1837	0.5642		273.69	0.2983	0.8059
	126.74	0.2114	0.5568		334.48	0.3846	0.7440
	138.69	0.2432	0.5390		364.87	0.4475	0.6920
	142.00	0.2641	0.5247		374.99	0.4853	0.6549
	143.96	-	0.5193	93.22	608.06	0.3822	0.7817
	148.07	0.2963	0.5042		982.92	0.5405	0.6593
	153.13	0.3302	0.4685		1013.42	0.5677	0.6338
121.32	18.76	0.0810	0.2488	92.84	5.52	0.0023	0.6578
	25.68	0.0168	0.4038		10.30	0.0085	0.8057
	35.68	0.0326	0.5247		20.84	0.0171	0.8908

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Static high pressure equilibrium cell. Pressure measured with dead weight balance and temperature with resistance thermometer. Samples analysed by thermal conductivity. Details in ref. 1.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.003$; $\delta P/bar = \pm 0.1$ or better; $\delta x_{Ne} \simeq \delta y_{Ne} = \pm 0.0005$.

REFERENCES:

1. Trappeniers, N. J. and Schouten, J. A., *Physica*, 1974, *73*, 527.

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Argon; Ar; 7440-37-1

ORIGINAL MEASUREMENTS:

Trappeniers, N. J. and Schouten, J. A., *Physica*, 1974, *73*, 539.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	in vapor, y_{Ne}
92.84	50.77	0.0457	0.9350
	91.31	0.0837	0.9420
	126.81	0.1131	0.9345
	167.28	0.1435	0.9236
	207.81	0.1707	0.9110
	253.49	0.1992	0.8948
	304.10	0.2297	0.8791
	354.76	0.2575	0.8635
	405.39	0.2794	0.8525
	648.56	0.3818	0.7832
	952.55	0.4870	0.7195
	1013.4	solid phase	0.7225

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Krypton; Kr; 7439-90-9	Colin Young, School of Chemistry, University of Melbourne, Parkville, Victoria 3052, AUSTRALIA.

CRITICAL EVALUATION:

There are three sets of measurement on this system. The first measurements by Trappeniers and Schouten (1) were presented in graphical form and were undertaken to establish that this system exhibits gas-gas immiscibility of the second kind (2). These data are rejected. The measurements by Miller *et al.* (3) are restricted to pressures up to 100 bar between 120 K and 150 K and the mole fraction of neon in the liquid phase is generally slightly greater than the value obtained by interpolation of the more extensive data reported by Trappeniers and Schouten in their second paper (4). Both sets of measurement in references (3) and (4) were made with apparatus capable of good precision results and therefore both are classified as tentative.

1. Trappeniers, N. J. and Schouten, J. A., *Phys. Lett.*, 1968, *A27*, 340.

2. Scheider, G. M., in *Chemical Thermodynamics Vol. 2 Special Periodical Report*, Chapter 4, ed. McGlashan, M. L., Chemical Society, 1978.

3. Miller, R. C., Kidnay, A. J. and Hiza, M. J., *J. Chem. Thermodynamics*, 1972, *4*, 807.

4. Trappeniers, N. J. and Schouten, J. A., *Physica*, 1974, *73*, 546.

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Krypton; Kr; 7439-90-9

ORIGINAL MEASUREMENTS:

Trappeniers, N. J. and Schouten, J. A., *Physica*, 1974, *73*, 548.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
178.15	41.01	0.0180	0.3731	163.15	41.01	0.0203	0.6257
	61.21	0.0354	0.5190		61.09	0.0335	0.7182
	101.28	0.0718	0.6378		101.17	0.0594	0.7901
	152.16	0.1186	0.6890		202.73	0.1224	0.8329
	202.74	0.1645	0.7023		304.06	0.1805	0.8330
	304.01	0.2660	0.6810		405.37	0.2329	0.8237
	354.65	0.3272	0.6532		506.69	0.2810	0.8116
	385.07	0.3850	0.6192		608.01	0.3253	0.7963
	395.19	0.4070	0.6001		709.33	0.3628	0.7836
	405.37	0.4531	0.5621		810.65	0.3957	0.7723
166.15	25.93	0.0082	0.4055		1013.3	0.4475	0.7553
	41.01	0.0200	0.5821		1114.6	0.4637	0.7523
	61.19	0.0359	0.6834		1215.9	0.4731	0.7530
	101.18	0.0618	0.7642		1317.2	-	0.7576
	202.73	0.1294	0.8125		1418.6	0.4740	0.7655
	304.03	0.1927	0.8124		1621.2	0.4603	0.7842
	405.34	0.2525	0.7992		1874.5	0.4421	0.8092
	506.66	0.3109	0.7799	148.15	15.85	0.0056	0.5738
	607.98	0.3658	0.7587		25.92	0.0104	0.7204
	709.30	0.4185	0.7343		41.00	0.0187	0.8060
	835.95	0.4958	0.6913		61.17	0.0288	0.8529
	881.54	0.5346	0.6598		101.28	0.0476	0.8899
166.25	1823.9	0.6042	0.6800		202.74	0.0916	0.9074
	1874.5	0.5659	0.7160		304.04	0.1294	0.9078
163.15	25.93	0.0090	0.4678		405.33	0.1598	0.9035

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Static high pressure equilibrium cell. Pressure measured with dead weight balance and temperature with resistance thermometer. Samples analysed by thermal conductivity. Details in source and ref. 1.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

δT/K = ±0.003; δP/bar = ±0.1 or better

δx_{Ne}, δy_{Ne} = ±0.005.

REFERENCES:

1. Trappeniers, N. J. and Schouten, J. A., *Physica*, 1974, *73*, 527.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Neon; Ne; 7440-01-9 (2) Krypton; Kr; 7439-90-9	Trappeniers, N. J. and Schouten, J. A., *Physica*, 1974, 73, 548.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
148.15	506.66	0.1863	0.9002	123.17	131.88	-	0.9703
	607.97	0.2071	0.8976		182.51	0.0497	0.9717
	709.30	0.2230	0.8958		253.38	0.0629	0.9705
	810.62	0.2356	0.8943		354.65	0.0798	0.9691
	1215.9	0.2594	0.9003		456.03	0.0896	0.9693
	1519.9	0.2624	0.9085	164.92	1063.9	0.5373	0.6842
	1874.5	0.2579	0.9168		1114.6	0.5873	0.6645
133.16	8.23	0.0026	0.6608		1469.2	0.5839	0.6780
	15.84	0.0057	0.8122		1519.9	0.5630	0.7000
	25.91	0.0098	0.8775	164.725	1083.5	0.5392	0.6836
	40.99	0.0158	0.9127		1215.9	0.5942	0.6469
	61.06	0.0233	0.9331		1317.2	0.5910	0.6546
	101.28	0.0371	0.9474		1418.6	0.5668	0.6948
	202.70	0.0673	0.9526	164.685	1216.0	0.5778	0.6631
	304.08	0.0916	0.9500		1246.4	0.5817	0.6644
	405.39	0.1113	0.9490		1266.6	0.5816	0.6637
	506.70	0.1252	0.9461		1286.8	0.5827	0.6661
	608.00	0.1372	0.9449		1317.2	0.5762	0.6706
	709.31	0.1461	0.9448	164.665	810.65	0.4303	0.7424
	810.02	0.1519	0.9455		1114.58	0.5440	0.6825
	1013.25	0.1618	0.9517		1215.90	0.5710	0.6670
123.17	5.43	0.0015	-		1257.3	0.5742	0.6679
	8.18	0.0026	0.8217		1266.7	0.5770	0.6892
	15.83	0.0053	0.9032		1297.0	0.5738	0.6703
	25.88	0.0089	0.9354		1337.5	0.5700	0.6793
	30.89	0.0100	0.9432		1418.6	0.5597	0.6980
	51.06	0.0162	0.9597		1519.9	0.5393	0.7208
	91.43	0.0275	0.9695		1874.5	0.4864	0.7794

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Neon; Ne; 7440-01-9 (2) Krypton; Kr; 7439-90-9	Miller, R. C., Kidnay, A. J. and Hiza, M. J., *J. Chem. Thermodynamics*, 1972, *4*, 807.
VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid phase, x_{Ne}
120.00	10.31	0.00310
	20.09	0.00653
	32.53	0.0110
	45.29	0.0152
	61.5	0.0204
	81.9	0.0264
	100.3	0.0320
130.00	10.63	0.00341
	20.98	0.00798
	40.02	0.0160
	54.3	0.0215
	67.3	0.0264
	102.4	0.0399
140.00	13.04	0.00443
	23.81	0.0101
	39.74	0.0181
	60.69	0.0283
	81.8	0.0385
	100.4	0.0472
150.00	13.22	0.00380
	26.24	0.0122
	43.22	0.0221
	61.3	0.0326
	81.3	0.0455
	102.3	0.0564

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor-flow apparatus. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Gas and liquid samples analysed by gas chromatography. Details in source and ref. 1 and 2.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/\text{bar} = \pm 0.05$; $\delta x_{Ne} \simeq \delta y_{Ne} = \pm 5\%$.

REFERENCES:

1. Kidnay, A. J., Miller, R. C. and Hiza, M. J., *Ind. Eng. Chem. Fund.* 1971, *10*, 459.
2. Duncan, A. G. and Hiza, M. J., *A.I.Ch.E.J.*, 1970, *16*, 733.

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Nitrogen; N_2; 7727-37-9	Colin Young, School of Chemistry, University of Melbourne, Parkville, Victoria 3052, AUSTRALIA.

CRITICAL EVALUATION:

This svstem has been studied bv three grouos. The work of Burch (1) was restricted to two temoeratures and relativelv low pressures but is in good agreement with data obtained in the more extensive study of Streett (2,3). The early work of Skripka and Dykhno (4) was limited to pressures up to 25 bar and is probably of lower accuracy than the more recent work of Skripka and Lobonova (5). The work of Skripka and Lobonova (5) is in good agreement with the work of Streett (2,3) where the temperature and pressure ranges overlap. The data of Burch (1) and Skripka and Dykhno (4) are classified as restricted data of moderate accuracy whereas that of Streett (2,3) and Skripka and Lobonova (5) are classified as tentative. Because of partly overlapping but different ranges of temperature and pressure studied it is not desirable to classify either of the latter works as recommended at present.

1. Burch, R. J., *J. Chem. Engng. Data*, 1964, *9*, 19.

2. Streett, W. B., *Cryogenics*, 1968, *8*, 88.

3. Streett, W. B., *Cryogenics*, 1965, *5*, 27.

4. Skripka, V. G. and Dykhno, N. M., *Trudy Vses. Nauch.-Issled. Inst. Kislorodn. Mashinostr.*, 1964, *no. 8*, 163.

5. Skripka, V. G. and Lobonova, N. N., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1971, *no. 13*, 90.

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Nitrogen; N_2; 7727-37-9

ORIGINAL MEASUREMENTS:

Burch, R. J., *J. Chem. Eng. Data*, 1964, *9*, 19.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	10^2 mole fraction of neon in liquid, 10^2 x_{Ne}	in vapor, 10^2 y_{Ne}
82.70	5.066	1.010	62.0
	10.13	2.60	79.8
	15.20	4.20	85.7
	20.26	5.80	88.3
	30.40	8.96	90.6
	40.53	12.2	92.3
	50.66	15.4	92.7
113.13	20.26	0.900	8.32
	25.33	2.70	20.2
	30.40	4.52	28.5
	40.53	8.22	40.7
	50.66	11.9	49.6

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Single pass flow method. Vapor passed through magnetically stirred cell. Temperature measured using thermocouple and pressure measured with Bourdon gauge. Liquid and vapor samples analysed using mass spectrometer.

SOURCE AND PURITY OF MATERIALS:

1. Airco spectroscopic sample purity better than 99.985 mole per cent.
2. Airco prepurified sample purity better than 99.997 mole per cent. (Details in source.)

ESTIMATED ERROR:

$\delta T/K = \pm 0.2$; $\delta P/\text{bar} = \pm 0.007$ at 5.066 bar $= \pm 0.07$ at other pressures; $\delta x_{Ne} \leq \pm 2\%$ (Details in source.)

REFERENCES:

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Nitrogen; N_2; 7727-37-9

ORIGINAL MEASUREMENTS:

Skripka, V. G. and Dykhno, N. M., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinstr.*, 1964, *8*, 163.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	P^+/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
67.4	6.03	5.77	0.0180	0.9577
	11.08	10.82	0.0343	0.9733
	16.10	15.84	0.0503	0.9784
	21.22	20.95	0.0663	0.9805
	26.27	26.01	0.0837	0.9824
72.0	6.03	5.49	0.0164	0.9052
	11.08	10.55	0.0315	0.9429
	16.25	15.72	0.0475	0.9570
	21.27	20.73	0.0620	0.9620
	26.24	25.71	0.0772	0.9664
78.0	5.92	4.78	0.0140	0.7933
	11.07	9.94	0.0287	0.8792
	16.15	15.02	0.0445	0.9092
	21.26	20.12	0.0595	0.9242
	26.27	25.14	0.0740	0.9332
84.0	6.07	3.98	0.0114	-
	11.06	8.98	0.0249	0.7753
	16.13	14.04	0.0390	0.8348
	21.19	19.10	0.0530	0.8655
	26.16	24.07	0.0670	0.8819
90.3	6.03	2.25	0.0070	-
	11.06	7.29	0.0219	-
	16.24	12.46	0.0364	0.6953
	21.25	17.47	0.0521	0.7593
	26.26	22.48	0.0667	0.7948

P^+ partial pressure of neon

AUXILIARY INFORMATION

METHOD /APPARATUS/PROCEDURE:

Vapor flow apparatus with magnetic recirculating pump. Temperature measured with platinum resistance thermometer, pressure measured with Bourdon gauge. Samples of gas and liquid analysed by gas phase interferometry. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. High purity sample, purity 99.69 mole per cent; impurities helium and nitrogen.
2. Purity 99.5 mole per cent; oxygen main impurity.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$ to 0.03; δP less than 0.2 bar; $\delta x_{Ne} \simeq \delta y_{Ne} = \pm 0.0001$ to 0.0002.

REFERENCES:

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Nitrogen; N_2; 7727-37-9

ORIGINAL MEASUREMENTS:

Streett, W. B., *Cryogenics*, 1968, *8*, 88.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
66.13	79.9	0.2293	-	86.19	147.1	0.5570	0.7209
	89.6	0.2546	0.9634		148.5	0.5862	0.7125
	99.9	0.2783	-	90.65	78.2	0.2316	0.8498
	127.6	-	0.9447		99.1	0.3061	0.8258
	134.5	0.3527	-		111.7	0.3638	0.8053
	160.6	0.4140	0.9061		132.7	0.4826	0.7409
	184.7	0.4702	0.8629		137.5	0.5278	-
	216.4	0.5689	0.7765	100.78	89.0	0.2832	0.7111
	219.9	0.5946	-		103.4	0.3579	0.6793
77.35	101.3	0.2988	0.9196		111.0	0.4152	0.6396
	135.5	0.4172	0.8691		114.1	0.4578	0.6027
	158.6	0.5261	0.7981	108.91	82.1	-	0.5535
	166.1	0.6004	0.7315		87.2	0.3113	0.5325
86.19	98.2	0.2984	0.8723		90.3	0.3404	0.5107
	114.8	0.3640	0.8424		92.0	-	0.4892
	132.3	0.4438	0.8050	114.34	74.2	0.2617	0.4029
	141.7	0.5019	0.7669				

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow with magnetic pump. Samples of phases analysed by thermal conductivity. Temperature measured with platinum resistance thermometer and pressure measured with Bourdon gauge. Details in ref. 1.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$; $\delta P/\mathrm{bar} = \pm 0.1$; $\delta x_{Ne} \approx \delta y_{Ne} = \pm 0.0005$ (estimated by compiler)

REFERENCES:

1. Streett, W. B., *Cryogenics*, 1965, *5*, 27.

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Nitrogen; N_2; 7727-37-9

ORIGINAL MEASUREMENTS:

Skripka, V. G. and Lobonova, N. N.,

Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., 1971, *13*, 90.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	*P*/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	*P*/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
65.97	9.8	0.0029	0.977	89.68	9.8	0.0018	-
	19.6	0.0058	0.981		19.6	0.0042	0.775
	29.4	0.0086	0.983		29.4	0.0075	0.823
	39.2	0.0114	0.983		39.2	0.0104	0.849
	49.0	0.0143	0.982		49.0	0.0135	0.857
	58.8	0.0169	0.980		58.8	0.0166	0.858
	68.6	0.0195	0.978		68.6	0.0198	0.858
	78.5	0.0219	0.973		78.5	0.0231	0.856
	88.3	0.0241	0.968		88.3	0.0268	0.854
	98.1	0.0261	0.962		98.1	0.0306	0.847
	107.9	0.0278	0.955		107.9	0.0344	0.837
	117.7	0.0294	0.849		117.7	0.0381	0.823
77.69	9.8	0.0024	-	101.31	9.8	0.0004	-
	19.6	0.0051	0.925		19.6	0.0032	-
	29.4	0.0079	0.942		29.4	0.0061	0.606
	39.2	0.0107	0.949		39.2	0.0091	0.663
	49.0	0.0136	0.950		49.0	0.0122	0.698
	58.8	0.0168	0.948		58.8	0.0156	0.715
	68.6	0.0198	0.947		68.6	0.0191	0.725
	78.5	0.0227	0.944		78.5	0.0228	0.729
	88.3	0.0257	0.939		88.3	0.0271	0.724
	89.1	0.0286	0.931		98.1	0.0319	0.704
	107.9	0.0316	0.921		107.9	0.0374	0.665
	117.7	0.0347	0.910				

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Rocking autoclave partially filled with liquid and then pressurized with gas. Samples of phases analysed by interferometry. Temperature measured with platinum resistance thermometer and pressure measured with Bourdon gauge. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. High purity sample, purity 99.7 mole per cent.
2. High purity sample, purity 99.9 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/\text{bar} = \pm 0.4$;

$\delta x_{Ne} = \delta y_{Ne} = \pm 0.0002$.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Neon; Ne; 7440-01-9 (2) Nitrogen; N_2; 7727-37-9	Streett, W. B., *Cryogenics*, 1965, *5*, 27.
VARIABLES:	**PREPARED BY:**
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
66.13	3.90	-	0.9362	86.19	6.55	0.0116	0.5733
	6.93	0.0198	0.9634		10.72	0.0242	0.7205
	13.24	0.0387	0.9769		13.89	0.0334	-
	20.82	0.0614	0.9810		14.27	0.0337	0.7810
	27.37	0.0828	0.9828		20.44	0.0512	0.8319
	34.58	0.1031	0.9820		28.34	0.0746	0.8628
	41.33	0.1236	0.9825		34.47	0.0937	0.8753
	48.16	0.1428	0.9816		41.51	0.1142	0.8852
	55.26	0.1617	0.9804		48.06	0.1338	0.8897
	62.40	0.1811	0.9780		55.57	0.1559	0.8928
	69.98	0.2011	0.9749		62.40	0.1776	0.8930
77.50	5.48	0.0125	0.7738		71.02	0.2027	0.8912
	8.41	0.0213	0.8592	90.65	9.31	0.0155	0.5431
	12.34	0.0325	0.8951		15.17	0.0326	0.6929
	12.65	0.0333	0.8978		21.13	0.0503	0.7597
	16.55	0.0444	0.9142		28.54	0.0722	0.8017
	20.68	0.0576	0.9271		35.09	0.0921	0.8231
	27.85	0.0782	0.9386		41.37	0.1112	0.8358
	34.44	0.0978	0.9428		48.61	0.1330	0.8450
	41.58	0.1187	0.9460		55.40	0.1548	0.8502
	48.33	0.1288	0.9464		62.50	0.1772	0.8514
	55.40	0.1591	0.9456		69.46	0.2000	0.8512
	62.05	0.1793	0.9444	100.78	21.93	0.0406	0.5291
	69.22	0.1991	0.9418		30.58	0.0674	0.6186
86.19	4.48	0.0055	0.3957		43.78	0.1110	0.6878

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic pump at ambient temperature. Samples analysed by thermal conductivity. Temperature measured with platinum resistance thermometer. Pressure measured using Bourdon gauge. Details in source.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$ except at 66.13K; $\delta T/K = \pm 0.02$ at 66.13K; $\delta P/bar = \pm 0.01$; $\delta x_{Ne} = \pm 0.0002$ to 0.0004; $\delta y_{Ne} = \pm 0.002$.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Neon; Ne; 7440-01-9 (2) Nitrogen; N_2; 7727-37-9	Streett, W. B., *Cryogenics*, 1965, 5, 27.

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
100.78	53.71	0.1439	0.7100	114.34	67.71	0.2055	0.4227
	63.30	0.1768	0.7217	117.61	28.27	0.0218	0.1242
	68.71	0.1975	0.7207		35.06	0.0483	0.2156
103.91	24.13	0.0330	0.3153		41.99	0.0776	0.2766
	32.96	0.0619	0.4338		48.13	0.1055	0.3086
	40.33	0.0884	0.4892		58.47	0.1622	0.3294
	47.44	0.1105	0.5242		61.02	0.1755	0.3269
	52.92	0.1512	0.5538		63.09	0.1962	-
	69.57	0.2033	0.5630		66.88	0.2655	0.2703
114.34	22.58	0.0134	0.1123	120.64	32.44	0.0257	0.1016
	28.96	0.0354	0.2313		39.68	0.0578	0.1748
	33.75	0.0528	0.2930		46.54	0.0987	0.2073
	43.60	0.0914	0.3747		53.30	0.1448	0.2138
	54.95	0.1394	-				

COMPONENTS:	EVALUATOR:
1. Neon; Ne; 7440-01-9 2. Oxygen; O_2; 7782-44-7	Colin Young, School of Chemistry, University of Melbourne, Parkville, Victoria 3052, AUSTRALIA.

CRITICAL EVALUATION:

This system has been studied by Streett and Jones (1) and Skripka and coworkers (2,3). The study by Skripka and Dykhno (2) was over a limited range of pressure (up to 25 bar) and is probably of lower accuracy than the more recent work by Skripka and Lobonova (3). The data of Skripka and Lobonova (3) are only in fair agreement with the data of Streett and Jones (1). The solubility of neon reported by Skripka and Lobonova is generally greater than that reported by Jones and Streett (1) except at pressures below 50 bar where the opposite is usually true. Therefore the data of both Streett and Jones (1) and Skripka and Lobonova (3) are classified as tentative and that of Skripka and Dykhno (2) as doubtful.

References

1. Streett, W. B. and Jones, C. H., *Adv. Cryog. Engng.*, 1965, *11*, 356.

2. Skripka, V. G. and Dykhno, N. M., *Trudy Vses. Nauch.-Issled. Inst. Kislorodn. Mashinostr.*, 1964, *no. 8*, 163.

3. Skripka, V. G. and Lobonova, N. N., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1971, *no. 13*, 90.

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Oxygen; O_2; 7782-44-7

ORIGINAL MEASUREMENTS:

Skripka, V. G. and Dykhno, N. M., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1964, *8*, 163.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	P^+/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
67.0	6.06	6.02	0.00398	0.9940
	11.11	11.06	0.00744	0.9961
	16.18	16.14	0.01088	0.9966
	21.21	21.17	0.01403	0.9967
	26.16	26.12	0.01741	0.9968
72.0	6.06	5.88	0.0041	0.9837
	11.12	11.03	0.0078	0.9898
	16.18	16.10	0.0112	0.9919
	21.25	21.17	0.0146	0.9927
	26.26	26.18	0.0183	0.9932
77.7	6.06	5.83	0.0042	0.9606
	11.08	10.85	0.0080	0.9755
	16.18	15.95	0.0115	0.9814
	21.24	21.00	0.0153	0.9858
	26.34	26.11	0.0194	0.9872
84.0	6.07	5.54	0.0044	0.9041
	11.05	10.53	0.0086	0.9477
	16.12	15.59	0.0128	0.9611
	21.24	20.71	0.0169	0.9685
	26.25	25.73	0.0207	0.9724
90.2	6.07	5.01	0.0046	0.8045
	11.11	10.04	0.0092	0.8881
	16.18	15.12	0.0140	0.9198
	21.21	20.14	0.0183	0.9348
	26.35	25.29	0.0226	0.9431

P^+ partial pressure of neon

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Vapor flow apparatus with magnetic recirculating pump. Temperature measured with platinum resistance thermometer, pressure measured with Bourdon gauge. Samples of gas and liquid analysed by gas phase interferometry. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. High purity sample, purity 99.69 mole per cent; impurities helium and nitrogen.
2. Purity 99.5 mole per cent or better; major impurities argon and water vapor.

ESTIMATED ERROR:

$\delta T/K = \pm 0.02$ to 0.03; δP less than 0.2 bar; $\delta x_{Ne} \simeq \delta y_{Ne} = \pm 0.0001$ to 0.0002.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Neon; Ne; 7440-01-9 (2) Oxygen; O_2; 7782-44-7	Streett, W. B. and Jones, C. H., *Adv. Cryog. Engng.*, 1965, *11*, 356.
VARIABLES:	**PREPARED BY:**
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
63.35	2.76	0.0016	0.9947	89.44	2.76	0.0015	0.6404
	6.86	0.0041	0.9977		7.10	0.0058	0.8550
	13.76	0.0078	0.9987		13.98	0.0119	0.9183
	20.82	0.0137	0.9987		20.79	0.0178	0.9391
	27.30	0.0154	0.9988		27.68	0.0241	0.9494
	34.44	0.0212	0.9990		34.34	0.0298	0.9547
	39.78	0.0232	0.9988		45.02	0.0381	0.9596
	47.61	0.0278	0.9985		61.36	0.0501	0.9634
	54.61	0.0295	0.9984	89.17	107.2	0.0877	0.9601
	62.95	0.0334	0.9977		140.0	0.1096	0.9540
77.69	3.45	0.0029	0.9345		171.2	0.1291	0.9461
	6.96	0.0056	0.9652		207.8	0.1499	0.9361
	13.72	0.0109	0.9802		243.4	0.1686	0.9262
	20.68	0.0160	0.9843		274.1	0.1841	0.9177
	27.51	0.0216	0.9865		307.9	0.1998	0.9083
	34.06	0.0265	0.9873		345.1	0.2151	0.8987
	34.37	0.0257	0.9864	101.46	2.92	0.0000	0.0000
	42.89	0.0321	0.9878		4.34	0.0015	0.3098
	54.88	0.0491	0.9866		7.76	0.0050	0.6010
	69.50	0.0668	0.9852		13.27	0.0109	0.7493
	103.1	0.0822	0.9838		21.30	0.0190	0.8293
	138.9	0.1046	0.9788		27.75	0.0256	0.8594
	206.5	0.1228	0.9671		34.78	0.0322	0.8789
	278.5	0.1359	0.9562		41.71	0.0386	0.8910
	343.7	0.1359	0.9476		48.37	0.0468	0.8994

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic pump at ambient temperature. Samples analysed by thermal conductivity. Temperature measured with platinum resistance thermometer. Pressure measured using Bourdon gauge. Details in ref. 1.

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.1$ (up to 100 bar) $= \pm 0.7$ (above 100 bar); $\delta x_{Ne} = \pm 0.001$ to ± 0.0002; $\delta y_{Ne} = \pm 0.001$ to ± 0.0002.

REFERENCES:

1. Streett, W. B., *Cryogenics*, 1965, *5*, 27.

COMPONENTS:

(1) Neon; Ne; 7440-01-9

(2) Oxygen; O_2; 7782-44-7

ORIGINAL MEASUREMENTS:

Streett, W. B. and Jones, C. H., *Adv. Cryog. Engng.*, 1965, *11*, 356.

EXPERIMENTAL VALUES:

T/K	*P*/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	*P*/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
101.46	55.43	0.0538	0.9050	102.03	28.75	0.0238	0.5531
	65.36	0.0629	0.9103		35.37	0.0320	0.6127
	68.81	0.0678	0.9106		42.37	0.0415	0.6549
	104.8	0.1038	0.9133		49.47	0.0510	0.6845
	142.7	0.1398	0.9060		56.85	0.0608	0.7074
	183.4	0.1801	0.8916		64.19	0.0703	0.7249
	207.9	0.2037	0.8793		69.50	0.0785	0.7338
	241.3	0.2359	0.8620		90.87	0.1087	0.7554
	282.0	0.2756	0.8374		108.9	0.1359	0.7611
	312.3	0.3095	0.8158		140.3	0.1850	0.7552
	351.2	0.3540	0.7837		176.9	0.2533	0.7263
110.39	5.76	0.0000	0.0000		209.6	0.3358	0.6659
	6.65	0.0012	0.1447		227.9	0.4099	0.6024
	14.10	0.0095	0.5525	130.00	19.58	0.0028	0.0757
	19.88	0.0163	0.6619		32.58	0.0200	0.3520
	27.03	0.0240	0.7334		37.82	0.0288	0.4128
	35.44	0.0324	0.7801		44.47	0.0395	0.4692
	41.92	0.0420	0.8022		52.37	0.0498	0.5159
	55.74	0.0558	0.8296		57.00	0.0539	0.5376
	65.88	0.0699	0.8404		64.74	0.0708	0.5648
	69.64	0.0742	0.8432		83.29	0.1041	0.6050
	108.8	0.1210	0.8544		107.6	0.1502	0.6227
	140.0	0.1594	0.8484		140.4	0.2269	0.6064
	172.4	0.2008	0.8337		158.9	0.2805	0.5720
	209.5	0.2522	0.8084		170.3	0.3402	0.5165
	245.0	0.3088	0.7730	146.36	44.33	0.0195	0.1190
	279.0	0.3765	0.7230		69.36	0.0767	0.2697
	307.5	0.4931	0.6420		89.49	0.1406	0.2949
120.03	10.31	0.0000	0.0000		93.08	0.1622	0.2830
	12.10	0.0023	0.1252	152.29	50.88	0.0147	0.0434
	16.31	0.0074	0.3106		55.50	0.0302	0.0752
	21.48	0.0144	0.4454				

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Neon; Ne; 7440-01-9 (2) Oxygen; O_2; 7782-44-7	Skripka, V. G. and Lobonova, N. N., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1971, *13*, 90.
VARIABLES:	PREPARED BY:
Temperature, pressure	C. L. Young

EXPERIMENTAL VALUES:

T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	P/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
64.14	9.8	0.0035	-	77.81	49.0	0.0340	0.9815
	19.6	0.0072	0.9950		58.8	0.0410	0.9815
	29.4	0.0120	0.9955		68.6	0.0485	0.9810
	39.2	0.0170	0.9955		78.5	0.0570	0.9790
	49.0	0.0220	0.9950		88.3	0.0640	0.9770
	58.8	0.0280	0.9950		98.1	0.0710	0.9750
	68.6	0.0335	0.9945		107.9	0.0770	0.9730
	78.5	0.0390	0.9930		117.7	0.0820	0.9710
	88.3	0.0440	0.9915		129.5	0.0880	0.9690
	98.1	0.0470	0.9890		137.3	0.0940	0.9670
	107.9	0.0500	0.9875		147.1	0.0985	0.9650
	117.7	0.0530	0.9860		156.9	0.1030	0.9630
	127.5	0.0555	0.9835		166.7	0.1080	0.9610
	137.3	0.0590	0.9820		176.5	0.1125	0.9590
	147.1	0.0620	0.9800		186.3	0.1170	0.9570
	156.9	0.0660	0.9775		196.1	0.1210	0.9550
	166.7	0.0690	0.9750		205.9	0.1240	-
	176.5	0.0720	0.9720	90.73	9.8	0.0080	-
	186.3	0.0750	0.9680		19.6	0.0160	-
	196.1	0.0790	0.9630		29.4	0.0240	0.9295
	205.9	0.0825	-		39.2	0.0330	0.9305
77.81	9.8	0.0065	-		49.0	0.0440	0.9350
	19.6	0.0130	-		58.8	0.0550	0.9375
	29.4	0.0200	0.9780		68.6	0.0665	0.9380
	39.2	0.0270	0.9790		78.5	0.0780	0.9380

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Rocking autoclave partially filled with liquid and then pressurized with gas. Samples of phases analysed by interferometry. Temperature measured with platinum resistance thermometer and pressure measured with Bourdon gauge. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. High purity sample; purity 99.7 mole per cent.
2. High purity sample; purity 99.8 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/bar = \pm 0.4$; δx_{Ne}, $\delta y_{Ne} = \pm 0.002$.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Neon; Ne; 7440-01-9 (2) Oxygen; O_2; 7782-44-7	Skripka, V. G. and Lobonova, N. N., *Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr.*, 1971, *13*, 90.

EXPERIMENTAL VALUES:

T/K	*P*/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}	T/K	*P*/bar	Mole fraction of neon in liquid, x_{Ne}	Mole fraction of neon in vapor, y_{Ne}
90.73	88.3	0.0895	0.9370	103.0	147.1	0.1800	0.8645
	98.1	0.0995	0.9355		156.9	0.1925	0.8595
	107.9	0.1100	0.9335		166.7	0.2050	0.8540
	117.7	0.1200	0.9310		176.5	0.2190	0.8470
	129.5	0.1300	0.9290		186.3	0.2335	0.8370
	137.3	0.1400	0.9260		196.1	0.2485	0.8260
	147.1	0.1510	0.9220		205.9	0.2640	0.8120
	156.9	0.1625	0.9180	118.65	9.8	0.0005	-
	166.7	0.1695	0.9135		19.6	0.0130	-
	176.5	0.1790	0.9090		29.4	0.0250	-
	186.3	0.1885	0.9035		39.2	0.0375	0.5990
	196.1	0.1980	0.8970		49.0	0.0510	0.6275
	205.9	0.2065	0.8905		58.8	0.0690	0.6535
103.9	9.8	0.0070	-		68.6	0.0810	0.6755
	19.6	0.0180	-		78.5	0.0980	0.6940
	29.4	0.0290	0.8080		88.3	0.1165	0.7075
	39.2	0.0405	0.8330		98.1	0.1340	0.7150
	49.0	0.0520	0.8520		107.9	0.1525	0.7170
	58.8	0.0655	0.8650		117.7	0.1710	0.7155
	68.6	0.0760	0.8725		129.5	0.1895	0.7115
	78.5	0.0980	0.8760		137.3	0.2100	0.7050
	88.3	0.1030	0.8765		147.1	0.2320	0.6950
	98.1	0.1160	0.8760		156.9	0.2570	0.6820
	107.9	0.1290	0.8755		166.7	0.2850	0.6645
	117.7	0.1420	0.8740		176.5	0.3185	0.6415
	129.5	0.1550	0.8715		186.3	0.3475	-
	137.3	0.1675	0.8685				

SYSTEM INDEX

Underlined page numbers refer to the start of the evaluation text and those not underlined to the start of the compiled tables for that system. The compounds are listed in the order as in the Chemical Abstract indexes, for example toluene is listed as benzene, methyl- and dimethylsulfoxide is listed as methane, sulfinylbis-.

A

B

REGISTRY NUMBER INDEX

Underlined page numbers refer to evaluation text and those not underlined to compiled tables.