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SOLUBILITY DATA SERIES

Volume 29

MERCURY IN LIQUIDS, COMPRESSED GASES, MOLTEN SALTS AND OTHER ELEMENTS

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Editor-in-Chief A. S. KERTES

Volume 29

MERCURY IN LIQUIDS, COMPRESSED GASES, MOLTEN SALTS AND OTHER ELEMENTS

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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 information, the formulation 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, 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 was excluded by design or by a 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, and thus obviously are superficial in treatment. Since they command a wide market, we believe that their service to the 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 at 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. With the status of current secondary and tertiary services being as 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 has developed a mechanism which involves a number of innovations in exploring the literature fully, and which contains new elements of a more imaginative approach for 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 data, 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 the treatment of 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 fitting of data, with suitable statistical tests, to mathematical functions;
- (ii) a set of recommended numerical data. Whenever possible, the set of recommended data includes weighted average and standard 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;
- (v) experimental values as they appear in the primary source. Whenever available, the data may be 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, formulated at the initiation of the project and perfected as experience has accumulated, 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, quality 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 the early 1970s to refrain from unnecessary publication has not achieved much. A good fraction of the literature is still cluttered with poor-quality articles. The Weinberg report (in 'Reader in Science Information', ed. 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

PREFACE

Mercury is a liquid metallic element of many useful applications. It is also an element with properties hazardous to the environment and work place, and corrosive to many materials. A knowledge of the solubility of mercury is useful in addressing problems requiring knowledge of the metal's concentration in the liquids and vapors of our surroundings.

The present volume of the Solubility Series presents all data published through 1986, June on the solubility of liquid mercury in water, aqueous electrolyte and nonelectrolyte solutions, hydrocarbons, alcohols, ethers, halocarbons, and nitrobenzene. The solubility of liquid mercury in molten and solid salts and in other elements is included as well as the solubility (enhanced vapor pressure) of liquid mercury in compressed gases.

The primary data are the solubility of liquid mercury in other liquids. By combining the solubility data with the mercury equilibrium vapor pressure, Henry's constant and Ostwald coefficients can be calculated. The Henry's and Ostwald solubilities not only give the solubility of liquid mercury in the solvent, but can be used to determine the mercury liquid-vapor distribution at pressures less than the equilibrium vapor pressure of liquid mercury. These measures of the solubility have been calculated in the evaluation of the mercury + water system. In principle they could be calculated for all of the mercury + liquid systems. The calculation assumes ideal gas behavior of the mercury vapor which appears to be justified at the low partial pressures usually encountered.

Mercury physical properties needed to convert to Henry's constant and Ostwald coefficients and to carry out other calculations of interest to scientists working with mercury are in the several appendixes. Included in these appendixes are various physical and thermodynamic data from several sources. There are density, vapor pressure, molar volume, enthalpy of vaporization, and solubility parameter of liquid mercury as a function of temperature, and the second viral coefficient of mercuy vapor.

A problem in evaluating the mercury solubility data was the effect of air (oxygen) on mercury. There is evidence that mercury may be oxidized by air in aqueous systems and possibly other systems. The evaluations are prejudiced in favor of workers that either used air (oxygen) free systems or traces of reducing agent to keep the mercury in a reduced state. In some papers it is not clear whether air was excluded or not, and some workers claim the effect of air is negligable. It is a point of some controversy which needs further work. Of course air is usually present in the environment, and the possible continous oxidation of mercury must be taken into account in the study of natural systems.

This volume is intended to compliment Solubility Series Volume 25, METALS IN MERCURY, edited by C. Hirayama, Z. Galus, and C. Guminiski. In the metals in mercury volume the mercury is the solvent for metals, while in the present volume the mercury is the solute in various liquids or gases. Data on a few of the mercury + other element systems may overlap in the two volumes, otherwise they are independent volumes.

We are aware of several on going studies of the solubility of mercury in liquids. There are new studies of the solubility of mercury in water at elevated temperatures and pressures, a redetermination of the solubility of mercury in some hydrocarbons and alcohols, and a projected study of the liquid-vapor distribution of mercury in hydrocarbon systems. The user will need to check for future publications of mercury solubility data to combine with the data summarized here.

H. Lawrence Clever

Atlanta, Georgia 1986, September

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L. Haar and J. M. H. Levelt Sengers J. Chem. Phys. <u>1970</u>, 52, 5069 - 79, published by the American Institute of Physics for figures on pages 191, 193, 194, 196, 198, and 199.

N. B. Vargaftik, Tables on the Thermophysical Properties of Liquids and Gases, 1975, 2nd Ed. (Engl. Transl.) published by the Hemisphere Publishing Co., New York for mercury vapor pressure values tabulated in Appendix IV.

We thank Professor A. F. Voigt, Iowa State University, and Dr. S. Okouchi, Honsei University, for providing the experimental data reported in their papers as equations from linear regressions.

We appreciate the advice and encouragement of colleagues associated with IUPAC Commission V.8. Especially Steven Kertes, Mark Salomon, and Allan Barton, all of whom took and early interest in the preparation of the volume, and Colin Young who prepared the indexes. Although the present project had no outside support, it was initiated from the literature search for a project on the solubility of sparingly soluble mercury salts supported by the Office of Standard Reference Data of the US National Bureau of Standards. We are greatful for that support.

Last, but not least, I want to express my appreciation to Marian Iwamoto who helped compile the data, recalculated many solubility values, carried out numerous linear regressions, prepared figures, and then with a NEC APC III computer, WordStar, and a NEC Spinwriter typed and printed the camera ready manuscript.

HLC

Mercury in Water

COMPONENTS:	EVALUATOR:
(1) Mercury; Hg; [7439-97-6] (2) Water; H ₂ O; [7732-18-5]	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA <u>1986</u> , July

CRITICAL EVALUATION:

An Evaluation of the Solubility of Mercury in Water from 273 to 773 K.

Christoff (ref. 1) was the first to show that metallic mercury is soluble in water. He passed ten liters of water slowly over a mercury sample and measured the amount dissolved by weight loss of the mercury. The solubility values he reported are only about 30 percent of the values accepted today. Since Christoff's pioneering work the solubility of mercury in water has been reported in at least seventeen papers from fifteen laboratories. The reported solubility values were measured over the 273 to 773 K temperature interval and the 0.1 to 100 MPa pressure range. The molal (mol kg⁻¹) solubility increases with increasing temperature, and decreases with increasing total pressure. However, when expressed as Henry's constant the solubility shows a maximum, and as the Ostwald coefficient the solubility shows a minimum as a function of temperature. These inflections vary with the total pressure and occur between 473 K and 512 K.

There are two earlier evaluations of the solubility of mercury in water. They are Khodakovskii *et al.* (ref. 19) and Clever *et al.* (ref. 20). The present work uses additional data not available at the time of the earlier evaluations.

Table 1 summarizes the analytical methods used by various workers to determine the amount of dissolved mercury. Some workers used more than one method.

Table 1. Analytical methods used to determine dissolved mercury.

Met	hod	References
1.2.	Mercury weight loss Ultraviolet absorption	1
3.	(253.7 nm, 256.0 nm, 236.5 nm) Weight increase on amalgamation with gold	2, 7, 11 2, 10, 13
5.	Colorimetry with dithizone Radioactive Hg-203	4, 10, 13 5, 8, 18
7. 8. 9.	Neutron activation Cold vapor atomic absorption Titration with ammonium thiocyanate	6 9, 12, 14, 15, 16, 17 10, 13

Most of the workers equilibrated liquid mercury directly with the water. Sanemasa (ref. 12) and Hursh (ref. 18) equilibrated mercury vapor with the water. Sanemasa controlled the mercury pressure by controlling the tem-perature of a sample of pure liquid mercury. He tested Henry's law by doing experiments with the mercury at several temperatures below the temperature of the solubility measurement. When both the mercury and the water were at the same temperature the result was the equivalent of the liquid mercury in contact with the water. The Henry law test is shown Hursh (ref. 18) equilibrated at an unknown mercury presonly on graphs. sure at less than the equilibrium vapor pressure of mercury. He experi-mentally measured the concentration of the mercury in both vapor and solution phase to obtain an Ostwald coefficient. By using the equilibrium vapor pressure of mercury to calculate the vapor concentration at the temperature of the solubility determination one can obtain the solubility of liquid mercury in water. The value agrees satisfactorily with the results of those who equilibrated with liquid mercury. The Sanemasa solubility values at room temperature also agree satisfactorily with the liquid mercury solubility values. The Sanemasa values at other temperatures are discussed in more detail below.

Voigt and co-workers (ref. 5 and 8) used radioactive mercury-203. They found it was necessary to add a small amount of reducing agent, hypophosphorous acid, to prevent the oxidation of mercury by the products of radiolysis. Hursh (ref. 18) also used mercury-203. He used either an oxygen free carrier gas or added ethanol (to blood, plasma, and hemoglobin solutions) to prevent mercury oxidation.

Most workers have agreed with Reichardt and Bonhoeffer (ref. 2) that mercury dissolved in air-free water is monatomic and unionized with the zero-valent mercury in the spherically symmetric ${}^{1}S_{0}$ ground state. Glew and Hames (ref. 9) have been the most careful to insure a non-oxidizing environment. They avoided the use of radioactive mercury, they rigorously excluded oxygen, and they added trace amounts of reducing agent. Most other workers have tried to keep their systems air-free. Recently Sanemasa (ref. 12) has carried out experiments in which he obtains the same solubility in the presence and in the absence of air. In Sanemasa's experiment either air or nitrogen is circulated over liquid mercury and water in separate compartments. Mercury liquid-vapor equilibrium and mercury vapor-aqueous solution equilibrium are stated to be established within thirty minutes.

When the solubility values from the two laboratories are compared it is observed that at 278 K Sanemasa's values are smaller than Glew and Hames, near 298 K there is a cross-over and the values agree within a few percent, but by 333 K Sanemasa's values are three times larger than Glew and Hames. It is the evaluator's opinion that the Glew and Hames values are too large below 293 K and that Sanemasa's values are too small below 293 K and too large above 303 K. The evaluator has tried to test several models for the air oxidation of mercury in aqueous solution with available thermodynamic data. It is not possible to obtain a definitive answer, but the possibility of air oxidation of the mercury appears to be real. We suspect that the Sanemasa solubility values at the higher temperatures are too large because of air oxidation. Some of the solubility results of Choi and Tuck (ref. 6) and of Onat (ref. 11) agree with the higher Sanemasa results.

The problem of possible air oxidation of aqueous metallic mercury is not settled. The Sanemasa results may fall on a different line from the other values because pure liquid mercury may have different properties than liquid mercury in contact with water. However, this seems unlikely to us. We are concerned by the short time used by Sanemasa to establish both pure mercury liquid-vapor equilibrium and mercury vapor-saturated aqueous solution equilibrium. The short time could lead to undersaturation and the low solubility values at 278 and 283 K. The air oxidation may have a kinetic component, and be important at only the higher temperatures where the Sanemasa values are higher than others. We do not want to be overly critical of the Sanemasa experiment. Future work may show he is correct and all the other values are wrong. However, in this work the evaluator prefers the lower solubility results from air-free systems.

At temperatures of 473 K and above all of the data are from Sorokin and co-workers (ref. 10 and 13). The experiments reported in the two papers clearly show that the molal and mole fraction solubility decrease with increasing total pressure at 473, 573, 673, and 773 K. The solubilities at 573, 673 and 773 K (ref. 10) fall on a curve that is a reasonable extension of the lower temperature data (Figure 2). The solubilities at 473 K (ref. 13) show a greater variation with pressure than the values at the higher temperatures and do not fit the overall pattern as well as might be expected. It is possible that the solubility shows a different pressure dependence below and above the water critical temperature. It would take more experiments to clarify the matter.

Table 2 summarizes the available experimental mercury solubility values. The literature values have been calculated as concentration, $c_1/\text{mol} \text{ dm}^{-3}$, molality, $m_1/\text{mol} \text{ kg}^{-1}$, mole fraction, x_1 , Henry's constant in the two units $(p_1/\text{kPa})/(m_1/\text{mol} \text{ kg}^{-1})$ and $(p_1/\text{kPa})/(x_1)$, and the Ostwald coefficient, $(c_1(\text{liq})/\text{mol} \text{ dm}^{-3})/(c_1(\text{gas})/\text{mol} \text{ dm}^{-3})$. The last two columns of the table give mercury liquid-vapor equilibrium properties. There is the equilibrium vapor pressure, p_1/kPa , and concentration in the vapor, c_1/mol dm⁻³. The mercury vapor pressure and vapor concentration were calculated from the evaluation of mercury vapor pressure of Ambrose and Sprake (ref. 21). The equilibrium mercury vapor pressure was corrected for any excess external pressure by (d ln f/dp)_T = V/RT and assuming ideal gas behavior.

							Mercury	Vapor	
T/K	107 c1/mol dm-3	107 m ₁ /mo1 kg ⁻¹	10° x ₁	$10^{-3}H = p_1/m_1$	$10^{-4}\text{H} = p_1/x_1$	$L = c_1(1)/c_1(g)$	p ₁ /kPa	c1/mo1 dm-3	R
393.15	50	53	95	20	105	0.163	1.002 x 10 ⁻¹	3.066 x 10 ^{-s}	
303.15	1.0 - 1.5	1.3	2.3	3.0	17	0.820	3.857 x 10 ⁻⁴	1.53 x 10-7	
358.15	15	15	28	11	57	0.280	1.595 x 10 ⁻²	5.36 x 10 ⁻⁴	
73.15	30	31	56	12	66	0.253	3.690 x 10 ⁻²	1.189 x 10 ^{-s}	
801.15	1.5	1.5	2.7	2.2	12	1.15	3.280 x 10 ⁻⁴	1.310 x 10-7	
98.15	3.0	3.0	5.4	0.85	4.7	2.90	2.562 x 10 ⁻⁴	1.034 x 10-7	
	2.9	2.9	5.2	0.88	4.9	2.80			
	3.0	3.0	5.4	0.85	4.7	2.90			
98,15	3.14	3.15	5.67	0.813	4.52	3.04	2.562 x 10^{-4}	1.034 x 10 ⁻⁷	
08.15	5.40	5.43	9.79	1.055	5.85	2.41	5.731 x 10 ⁻⁴	2.237 x 10-7	
23.15	8.72	8.82	15.9	1.98	11.0	1.34	1.744 x 10 ⁻³	6.491 x 10-7	
38.15	10.6	10.8	19.5	4.44	24.6	0.621	4.798 x 10-3	1.707 x 10-6	
353.15	12.6	13.0	23.4	9.31	51.7	0.306	1.210×10^{-2}	4.121 x 10-6	
63.15	16.1	16.7	30.0	12.9	71.5	0.227	2.146 x 10 ⁻²	7.107 x 10 ⁻⁶	
298.15	1	1	1.8	2.6	14	0.97	2.562 x 10 ⁻⁴	1.034 x 10 ⁻⁷	
273.15	1.2	1.2	2.2	0.22	1.2	10.35	2.632 x 10 ^{-s}	1.159 x 10 ⁻⁸	
288.65	2.1	2.1	3.8	0.54	3.0	4.46	1.131 x 10 ⁻⁴	4.713 x 10 ⁻⁸	
293.15	2.4	2.4	4.3	0.70	3.9	3.48	1.677 x 10-4	6.880 x 10 ⁻⁸	
298.15	2.8	2.8	5.1	0.92	5.0	2.71	2.562 x 10 ⁻⁴	1.034 x 10-7	
303.15	2.9	2.9	5.2	1.3	7.4	1.89	3.857 x 10 ⁻⁴	1,530 x 10-7	
808.15	3.4	3.4	6.2	1.7	9.2	1.52	5.731 x 10^{-4}	2.237 x 10-7	
277.45	2.33	2,33	4.19	0.172	0.957	13.40	4.01 x 10 ^{-s}	1.738 x 10 ⁻⁸	
	2.21	2.21	3.99	0.181	1.005	12.72			
84.56	2.37	2.38	4.28	0.329	1.83	7.18	7.82 x 10 ^{-s}	3.305 x 10 ^{-*}	
	2.31	2.31	4.17	0.339	1.88	6.99			
	2.22	2.23	4.01	0.351	1.95	6.72			
88.12	2.14	2.14	3.86	0.504	2.80	4.75	1.079 x 10 ⁻⁴	4.504 x 10 ⁻⁸	
.92.95	2.39	2.39	4.31	0.690	3.82	3.53	1.648 x 10 ⁻⁴	6.766 x 10 ⁻⁸	
	2.49	2.49	4.49	0.661	3.67	3.68			
98.17	2.98	2.99	5.39	0.858	4.76	2.88	2.566 x 10-4	1.035 x 10-7	
03.17	3.58	3.59	6.47	1.076	5.97	2.34	3.864 x 10 ⁻⁴	1.533 x 10-7	

Mercury in Water

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Table :	2. (continued)						Mercury	Vapor	
<i>T/</i> K	107 c ₁ /mol dm ⁻³	107 m ₁ /mol kg ⁻¹	10° x ₁	$10^{-3}H = p_1/m_1$	$10^{-4}\text{H} = p_1/x_1$	$L = c_1(1)/c_1(g)$	p ₁ /kPa	<i>c₁</i> /mo1 dm ⁻³	Ref
303.24	3.43	3.44	6.20	1.129	6.27	2.23	3.885 x 10 ⁻⁴	1.541 x 10 ⁻⁷	9
	3.48	3.49	6.29	1.113	6.18	2.26			
312.31	4.35	4.39	7.90	1.73	9.62	1.49	7.600 x 10 ⁻⁴	2.927 x 10-7	
318.22	4.58	4.62	8.33	2.65	14.69	0,990	1.224×10^{-3}	4.626 x 10 ⁻⁷	
	4.40	4.45	8.01	2.75	15.28	0.951			
322.95	5.42	5.48	9.88	3.04	16.88	0.873	1.668 x 10 ⁻³	6.212 x 10 ⁻⁷	
323.39	4.51	4.56	8.22	3,88	21.5	0,684			
	5.32	5.38	9.70	3.33	18.2	0.806			
	4.85	4.91	8.85	3.60	20.0	0.735			
326.86	5.31	5.38	9.70	4.08	22.6	0.657	2,197 x 10 ⁻³	8.084 x 10 ⁻⁷	
333.13	6.77	6.88	12.4	5,02	27.9	0.543	3,455 x 10 ⁻³	1.247 x 10-4	
	6.06	6.16	11.1	5.61	31.1	0.486			
335.43	7.25	7.38	13.3	5.32	29.5	0.515	3.927 x 10 ⁻³	1.408 x 10 ⁻⁶	9
341.34	8.75	8.94	16.1	6,58	36.5	0.422	5.882 x 10 ⁻³	2.073×10^{-6}	
	8,31	8.49	15.3	6.93	38.4	0.401			
345.59	9.48	9.71	17.5	7.75	43.0	0.362	7.524 ± 10^{-3}	2.619 x 10 ⁻⁶	
	c ₁ /mo1 dm ⁻	<i>m₁/mol kg⁻¹</i>	10° x1						
		0.0014							
573.15	0.0010	0.0014	0.026	27.8	150	0.123	38.88	8,159 x 10 ⁻³	10
	0.00085	0.0012	0.022	33.9	185	0.099	40.71	8.543 x 10^{-3}	
571.15	0.00064	0.0009	0.017	47.3	250	0.071	42.53	8.956 x 10""	
673.15	0.00884	0.0168	0.302	14.0	77.9	0.210	235.4	4.206×10^{-3}	10
	0.00800	0.0138	0.248	17.6	97.7	0.185	242.3	4.329×10^{-3}	
	0.00932	0.0161	0.289	15.0	83.7	0.216	242.0	4.324 x 10 ⁻²	
	0.00786	0.0123	0.222	20.9	116	0.171	256,6	4.585×10^{-2}	
	0.00895	0.0140	0.251	18.3	102	0.195	256.6	4.885×10^{-2}	
671.15	0.00758	0.0111	0.200	23.9	133	0.160	265.1	4.751×10^{-2}	
674.15	0.00722	0.0106	0.191	26.1	145	0.146	276.8	4.938 x 10 ⁻³	
773.15	0.03161	0.1202	2.162	7.76	43.1	0.218	932.7	0.1450	10
775.15	0.03191	0.1182	2.125	8.09	45.0	0.215	956.7	0.1484	
773.15	0.02812	0.1008	1.812	9.29	51.7	0.193	936.9	0.1457	
768.15	0.04048	0.0920	1.654	10.2	56.7	0.276	938.4	0.1469	
780.15	0,0407	0.0992	1.784	10.7	59.6	0,248	1064.0	0.1640	
771.15	0.0432	0.0816	1.467	12.6	70.4	0.268	1032.1	0.1610	

Table 2.	(continued)						Mercury	Vapor	
<i>T/</i> K	c1/mol dm-3	m ₁ /mo1 kg ⁻¹	10° x ₁	$10^{-3}H = p_1/m_1$	$10^{-4}\text{H} = p_1/x_1$	$L = c_1(1)/c_1(g)$	p ₁ /kPa	c ₁ /mo1 dm ⁻³	Re
776.15	0.0347	0,0667	1.202	16.3	90.3	0.206	1085.0	0.1681	10
	107 c1/mol dm ⁻³	107 m ₁ /mol kg ⁻¹	10° x ₁						
298.15	3.05	3.06	5.51	0.837	4.65	2.95	2.562 x 10^{-4}	1.034 x 10 ⁻⁷	1:
313.15	5.12	5.16	9.30	1.63	9.04	1.59	8.405 x 10^{-4}	3.228 x 10 ⁻⁷	
323.15	7.43	7.52	13.5	2.32	12.9	1.14	1.744 x 10 ⁻³	6.491 x 10 ⁻⁷	
333.15	10.78	11.0	19.8	3.15	17.5	0.863	3.460 x 10 ⁻³	1.249 x 10 ⁻⁶	
343.15	13.33	13.6	24.6	4.85	26.8	0.577	6.591 x 10 ⁻³	2.310×10^{-6}	
353.15	16.37	16.8	30.3	7.20	39.9	0.397	1.210×10^{-3}	4.121 x 10 ⁻⁶	
278.15	0.957	0,96	1,72	0.447	2.49	5.16	4.289 x 10 ⁻⁵	1.855 x 10 ⁻⁸	1
283.15	1.37	1.37	2.46	0.501	2.79	4.70	6.869 x 10 ^{-s}	2.918 x 10 ^{-*}	
293.15	2.24	2,25	4.04	0.745	4.15	3.14	1.677 x 10 ⁻⁴	7.123 x 10 ^{-*}	
303.15	4.05	4.07	7.33	0.948	5.26	2.65	3.857 ± 10^{-4}	1.530 x 10-7	
313.15	6.83	6.88	12.4	1.221	6.78	2.12	8.405 ± 10^{-4}	3.228 x 10 ⁻¹	
323.15	10.7	11.0	19.8	1.585	8.81	1.68	1.744 x 10 ⁻³	6.491 x 10 ⁻⁷	
333.15	18.3	18.7	33.6	1.85	10.30	1.47	3.460 ± 10^{-3}	1.249 x 10 ⁻⁶	
378.15		22.3	40.2	34.8	193	0.086	0.0777	2.471 x 10 ^{-s}	1
473.15		2580	4650	8.98	49.8	0.379	2.317	5.890 x 10-4	
		1220	2200	23.3	129	0.146	2.838	7.214 x 10 ⁻⁴	
475.15		608	1100	60.0	332	0.057	3.650	9.239 x 10 ⁻⁴	
310.15	4.4	4.4	8.0	1,52	8.36	1.70	6.689 x 10 ⁻⁴	2.594 x 10-7	1
303.15	3.14	3.15	5.68	1.22	6.79	2.05	3.857 x 10 ⁻⁴	1,530 x 10-7	1
278.15	2.2	2.2	3.9	0.20	1.1	11.9	4.289 x 10 ^{-s}	1.855 x 10 ^{- #}	1
283.15	2.3	2.3	4.2	0.30	1.6	7.9	6.869 x 10 ^{-s}	2.918 x 10 ⁻ *	
293.15	2.7	2.7	4.8	0.62	3.5	3.8	1.677 ± 10^{-4}	7.123 x 10 ^{-*}	
298.15	3.0	3.0	5.4	0.85	4.7	2.9	2.562×10^{-4}	1.034 x 10-7	
303.15	3.2	3.2	5.8	1.21	6.7	2.1	3.857 x 10-4	1.530 x 10-7	
313.15	4.1	4.1	7.4	2.05	11.4	1.27	8.405 x 10 ⁻⁴	3.228 x 10 ⁻⁷	
Room	0.4	0.4	0.7						1
298.15	2,88	2.89	5.21	0.887	4.92	2,78	2.562 x 10^{-4}	1.034 x 10 ⁻⁷	1

Mercury in Water

MIL--B

T/K	Total	Pure Mercury	Mercury Vapor	Mercury Co	ncentration	Ostwald	Water Density	
	Pressure	vapor Pressure	Total Pressure	In Vapor	In Liquid	Coefficient		
	p _t /MPa	p _l /kPa	p ₁ /kPa	$c_1(g)/mol dm^{-3}$	$c_1(1)/mol dm^{-3}$	L	ρ ₂ /Mg m ⁻³	
378	101.3	0.0479	0.0777	2.47 x 10 ⁻⁵	2.13 x 10 ⁻⁶	0.086	0.9547	
473	1.6	2.303	2.317	5.89 x 10 ⁻¹	2.23 x 10 ⁻	0.379	0.8649	
n	53.7	2.303	2.838	7.21 x 10 ⁻	1.06 x 10 ⁻⁺	0.146	n	
475	102.3	2.456	3.650	9.24 x 10-*	0.524 x 10 ⁻	0.057	0.8625	
573	50.7	32,94	38.88	8.16 x 10 ⁻³	1.00 x 10 ⁻³	0.123	0.7127	
n	64.8	32.94	40.71	8.54×10^{-3}	0.85×10^{-3}	0.100	π	
571	91.2	31.53	42.53	8.96 x 10 ⁻³	0.64×10^{-3}	0.071	0.7166	
647.14	Critical	Temperature of Pu	re Water.					
673	40.5	210.0	235.4	4.21 x 10 ⁻²	8.84 x 10 ⁻³	0.210	0.526	
11	50.7		242.3	4.33×10^{-2}	8.00×10^{-3}	0.185	0.580	
n	50.2	11	242.0	4.32×10^{-2}	9.32×10^{-3}	0.193	0.579	
Ħ	70.9	er	256.6	4.59×10^{-2}	7.86 x 10 ⁻³	0.171	0.639	
π	70.9	n	π	π	8.95×10^{-3}	0.195	n	
671	93.2	203.5	265.1	4.75 x 10 ⁻²	7.58 x 10 ⁻³	0.160	0.683	
674	92.2	213.3	276.8	4.94 x 10 ⁻²	7.22 x 10 ⁻³	0.146	0.681	
773	50.7	822.1	932.2	0.1450	0.0316	0.218	0.263	
775	51.7	841.8	956.7	0.1485	0.0319	0.215	0.270	
773	52.7	822.1	936.9	0.1457	0.0281	0.193	0.279	
768	76.5	774.5	938.4	0.1469	0.0405	0.276	0.440	
780	70.9	892.7	1064.0	0.1640	0.0407	0.248	0.410	
771	100.3	802.8	1032.1	0.1610	0.0432	0.268	0.529	
776	97.3	851.8	1085.0	0.1681	0.0347	0,206	0.520	

Table 3. Ostwald coefficents at elevated total pressures.

The equilibrium vapor pressures of pure mercury were calculated from equations in the evaluation of Ambrose and Spraake (ref. 21).

The equilibrium vapor pressure of mercury at the total pressure of the solubility measurements was calculated from the thermodynamic equation $(dln f/dp)_{\pi} = V/RT$ assuming f = p.

The concentration of mercury in the vapor phase was calculated from the vapor pressure of mercury at the total pressure of the solubility measurement assuming ideal vapor behavior of the mercury.

Density of pure liquid water. Values below the critical temperature were taken from handbook tables, values above the critical temperature were taken from Sengers and Kamgar-Parsi (ref. 22).

Mercury in Water

COMPONENTS :	EVALUATOR:
(1) Mercury; Hg; [7439-97-6] (2) Water; H ₂ O; [7732-18-5]	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA
	<u>1986</u> , July

I. The concentration (mol dm⁻³), molality (mol kg⁻¹), and mole fraction solubilities.

The experimental values of solubility are given in either volume (mol The experimental values of solubility are given in conditioned model with dm^{-3}) or weight (mol kg⁻¹) units. The concentration and molal values differ negligibly from 273 to 323 K. Between 323 and 393 K the difference increases from 1 to 6 percent. At higher temperatures and into the water supercritical region the difference is much larger. The concentration, molal, and mole fraction values in Table 2 can be converted from one to another assuming the pure water density is a measure of the solution density. The assumption seems well justified for the dilute mercury solutions with the possible exception of the water supercritical region. The density of pure liquid water was taken from standard sources. The supercritical pure water density was taken from Sengers and Kamgar-Parsi (ref. 22). The densities have been used to calculate the solubility in the three units of concentration, molal, and mole fraction which are given in columns 2, 3, and 4 of Table 2. The molal values are shown in Figure 1 and 2. In the supercritical region the solubility decreases with increasing total pressure (increasing water density). Table 3 gives the water densities used in the calculations of solubility in the various units in the supercritical region. It also gives the mercury vapor pressures corrected for the total pressure.

Only the molal and mole fraction values are smoothed in this section. Between 273 and 393 K one can use the concentration and molal values interchangeably and probably be within the experimental error.

The molal solubility. There are eight experimental values of the solubility of mercury in water at 298.15 K. They are:

10'm ₁ /mol kg ⁻¹	(ref.)
2.81 2.89 2.99 3.00 3.00 3.06 3.15 3.18	<pre>(ref. 8) (ref. 18) (ref. 9) (ref. 16) (ref. 5) (ref. 11) (ref. 6) (ref. 12)</pre>

Av. $(3.01 \pm 0.12) \times 10^{-7} \mod \text{kg}^{-1}$

We take the value as the recommended solubility of mercury in water at 298.15 K. The smoothed curves for the temperature dependence of the solubility of mercury do not go exactly through the recommended value, but the curve is within a standard deviation of the value.

In an earlier evaluation (ref. 20) 36 experimental mercury molal solubility values were treated by a linear regression to obtain the tentative solubility values between 273 and 393 K. We have added about 10 values from (ref. 14, 15, 16, and 18) to the data base and repeated the linear regression. Both three and four constant equations were tried. The four constant equation gave unacceptable curvature and was not satisfactory. The three constant equation agrees well our earlier result (ref. 20), although it gives slightly higher results from 273.15 to about 303.15 K.

All of the molal solubility values between 273 and 773 K were treated in one linear regression. This ignores the pressure dependence of the solubility at 473 K and higher temperatures. The pressure dependence is taken into account in the treatment of Henry's constant and the Ostwald coefficient later in the evaluation. The equation gives values which are probably reliable to within 50 % at the higher temperatures. Although the

equation is intended for use over the 423 to 773 K temperature interval it gives results within 2 % of the three constant linear regression over the 298.15 to 343.15 K temperature interval and could be used over the 298 to 773 K temperature interval to give values that are probably within the range of experimental error.								
The linear regression constan	ts for an eq	uation of	the type					
$\ln (m_1/mol kg^{-1}) = A_1 + A_2$	/(T/100 K) +	A ₃ ln(T/	100 K) + A ₄ (<i>T/</i> 100 K)				
are in Table 4. Smoothed val 6. The line drawn in Figure the line drawn in Figure 2 is	lues of mola e l is from t from the fo	l solubil the three our consta	ity are in constant ec nt equation.	Tables 5 and guation, and				
Table 4. Regression paramet water.	ers for the	molal so	olubility o	f mercury in				
Temperature interval <i>T</i> /K	^A1	A2	^A 3	A4				
273.15 to 393.15	-42.4014	25.6254	17.1591					
423 to 773	-112.8354	126.4586	62.9768	-4.4945				
Table 5. Tentative values of between 273.15 and	of the molal 393.15 K.	solubil	ity of merce	ury in water				
$\frac{T/K}{10^7 m_1/mol k}$	g -1	T/K	10' m ₁ /mol	kg -1				
273.15 1.41 278.15 1.62		333.15 338.15	7.83 9.03					
283.15 1.87		343.15	10.40					
293.15 2.49		353.15	13.8					
298.15 2.88 202.15 2.20		358.15	15.9					
308.15 3.83		368.15	20.9					
313.15 4.42		373.15	24.0					
318.15 5.11 323.15 5.89		378.15	27.6					
328.15 6.79		388.15	36.2					
	****	393.15	41.5	w				
Table 6. Tentative values c between 423 and 773	of the molal K. No acco	. solubil ount taken	ity of mercu of total p	iry in water cessure.				
$T/K m_1/mol k$	g -1	<i>т/</i> к	$m_1/mol kg^{-1}$					
423 0.00001	48	598	0.00264					
448 0.00003	36	623	0.00486					
473 0.00007 498 0.00016	54 3	648 673	0.00858					
523 0.00034	6	698	0.0242					
548 0.00070 573 0.00130	4	723	0.0386					
575 0.00139		773	0.0887					
The mole fraction solubility. A linear regression of the mole fraction solubilities from the same data set as used for the molal solubilities was carried out. For the 273.15 to 393.15 K temperature interval the three constant equation is								

COMPONENTS:	EVALUATOR:	
(1) Mercury; Hg; [7439-97-6] (2) Water; H ₂ O; [7732-18-5]	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA	
	<u>1986</u> , July	
CRITICAL ENALMATION.		

Smoothed values from the equation are given below in Table 7.

Table 7. Tentative values of the mole fraction solubility of mercury in water between 273.15 and 393.15 K.

T/K	10°x ₁	T/K	10°x ₁
			-
273.15	2.53	333.15	14.1
278.15	2.92	338.15	16.3
283.15	3.37	343.15	18.7
288.15	3.89	348.15	21.6
293.15	4.49	353.15	24.8
298.15	5.18	358.15	28.5
303.15	5,98	363.15	32.8
308.15	6.91	368.15	37.6
313.15	7.97	373.15	43.2
318.15	9.20	378.15	49.6
323.15	10.6	383.15	56.8
328.15	12.2	388.15	65.1
	حة حد بدو حت هو هو هو عن عل	393.15	74.5

The mole fraction solubility data were not treated further in this evaluation. Total pressure has an effect on the solubility of mercury in the supercritical region of water. There is a suggestion of a pressure effect, perhaps of somewhat different character, below the water critical temperature. The effect of total pressure on the solubility of mercury seems to be better treated with the Henry's constant or the Ostwald coefficient which is done in the following two sections. Both the Henry's constant and the Ostwald coefficient can be used at mercury vapor pressures less than the saturation pressure of mercury. When they are used at the saturation vapor pressure they also represent the solubility when in equilibrium with liquid mercury. It is assumed that the solubility of water in mercury is negligible and does not effect the properties of pure mercury.

II. Henry's Constant.

Columns 5 and 6 of Table 2 contain values of Henry's constant. The constant is given in both molal and mole fraction forms. They are (K/(kPa kg mol⁻¹)) = $(p_1/kPa)/(m_1/mol kg^{-1})$ and (K'/kPa) = $(p_1/kPa)/x_1$. The two values differ by a factor of 55.508, the number of moles of water in 1 kg. Thus, K = K'/55.508. Only the molal form has been plotted and fitted to smoothing equations. Figure 3 displays the values as $\ln(K/kPa kg mol^{-1})$ vs. 1000/(T/K). The values go through a maximum and show the effect of total external pressure above 473 K. Figure 6 show the pressure dependence of the Henry's constant. The values are linear in pressure within experimental error, but the values below the water critical temperature (473, 573 K) have a much larger slope than the values above the critical temperature (673, 773 K). There are not enough experimental data to tell whether or not this is a significant difference. It is an area that deserves further experimental investigation. The curves on Figure 3 are reproduced by the equation

 $\ln(K/kPa \text{ kg mol}^{-1}) = A_1 + A_2/(T/100 \text{ K}) + A_3 \ln(T/100 \text{ K}) + A_4(T/100 \text{ K}).$

with the parameters given in Table 8. The 273 to 393 K equation does not merge as smoothly as one might like with the 473 to 773 K equations. It is believed this is an indication of the larger uncertainty in the higher temperature solubility values.

Mercury in Water

Table 8.	Linear 1	egression	parameters	for Henry	y's constant.	
Tomporat						* ** ** ** ** ** **
Interval	, T/K	Pressure p _t /MPa	Al	^A 2	A3	A4
273.15 -	393.15	0.1	254,1649			20.1528
473 -	773	50	126.5286	-196.93	18 - 60.0986	3.9986
473 -	773	75	107.8775	-170.55	53 - 47.5540	2.6886
4/3 -		100	94.1291	-151.5/		1.6065
The maxim 512 K, re	nums at 50 spective]	0,75, and ly.	100 MPa to	tal press	ure occur at 4	83, 500, and
Smoothed For Henry evaluatic pressure	values o 's consta on (ref. 2 in the su	f the Henr nt in the 0). More o percritica	y's constar form (press care was ta l region in	nt are in sure/mole ken to ev n the pres	the following fraction) see aluate the effe sent evaluation	two tables. the earlier ect of total •
Table 9.	Tentativ	e values o	of Henry's	constant.		
	 Т/к	K/kPa kg	mol ⁻¹	 Т/к	K/kPa kg mol	-1
	273.15	134		323.15	3045	
	283.15	308		333.15	4490	
	293.15	027		343.15	8443	
	298.15	860		363.15	10,940	
	202 15	1152		373.15	13,760	
	313.15	1942		393.15	20,395	
Table 10.	Tentati	ve values	of Henry's	constant.		
	T/K	Henry	's constant	t, K/kPa k	g mol ⁻¹ , at	
		50	MPa 7	/5 MPa	100 MPa	
	473	33,48	0 41, 0 max	,830	52,560	
	500	· · · · ·	43	210 max	_	
	512	-		-	56,270 max	
	523	25,75	0 42, 0 36.	,350 ,370	55,980 49,460	
	623	19,65	0 28	450	38,890	
	673	14,68	0 21,	,230	28,490	
	773	8,54	0 11	,410	13,820	
The values from 473 to 773 K are based on somewhat scattered data from one laboratory and should be used with caution.						
III. The	Ostwald	[Partition] Coefficio	ent.		
The Ostwald coefficient is the ratio of the equilibrium concentrations of solute in the liquid phase to the concentration in the gas phase. Thus, L = $(c_1(liq)/mol dm^{-3})/(c_1(gas)/mol dm^{-3})$.						
<i>Liquid ph</i> lated fro density o from star taken fro true Ostw	aase conco om papers of pure wa ndard com om (ref. 2 vald coeff	entration. reporting ter. The pilations 2). In the ficient, bu	The liqu molal or m densities o . The dens e water sup t a number	id phase o ole fract of subcrit sities of percritic that is t	concentrations ion solubilitic ical pure wate supercritical al region we do the ratio of the	were calcu- es using the r were taken water were o not have a e concentra-

COMPONENTS :	EVALUATOR:
(1) Mercury; Hg; [7439-97-6] (2) Water; H ₂ O; [7732-18-5]	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA
	<u>1986</u> , July

tion of mercury in the supercritical water to the concentration of mercury vapor above pure liquid mercury at the same total hydrostatic pressure.

Gas phase concentration. The concentration of mercury in the gas phase was calculated assuming ideal behavior of the vapor pressure of pure liquid mercury calculated from a literature evaluation (ref. 21). At elevated total pressures the Poynting correction was applied assuming fugacity and pressure to be equal. Some details of the calculation at the elevated pressures are shown in Table 3. Column 7 of Table 2 contains all of the Ostwald coefficient values. Figures 4 and 5 give two representations of the Ostwald coefficient as a function of temperature.

The Ostwald coefficients were fitted to four constant equations of the type

 $\ln L = A_1 + A_2/(T/100 \text{ K}) + A_3 \ln(T/100 \text{ K}) + A_4(T/100 \text{ K}).$

The constants for the equation over the 273.15 to 393.15 and 473 to 773 K temperature intervals are in the table below. Figure 4 shows the Ostwald coefficient as a function of temperature. The 350 to 785 K region is shown with an expanded scale for the Ostwald coefficient. Figure 5 shows the logarithm of the Ostwald coefficient as a function of the inverse Kelvin temperature. The lines are generated from the constants in Table 11.

Table 11. Linear regression parameters for the Ostwald coefficient.

Temperature Interval, T/K	Total Pressure p _t /MPa	A ₁	A ₂	A ₃	A4
273.15 - 393.15	0.1	-236.5852	358.1516	158.1918	-18.5469
473 - 773	50	-127.9489	208.0691	68.3318	- 5.1724
473 - 773	75	-116.4886	192.0615	60.3112	- 4.2749
473 - 773	100	- 94.3479	161.3909	44.4468	- 2.4351

The minimums at 50, 75, and 100 MPa occur at temperatures of 476, 486, and 500 K, respectively.

Some smoothed values of the Ostwald coefficient at selected temperatures are given in the Tables 12 and 13 below.

Table 12. Tentative values of the Ostwald coefficient between 273.15 and 393.15 K.

میں میں میں میں جو جو ہیں ہے۔ میں میں میں میں میں میں میں میں میں کی 199 م		من ها من من من من بن بن بي _{جو} بي هن من من من من من من من من من	
T/K	L	T/K	L
	Was line ton day day day		
273.15	16.98	319.9	1.000
278.15	11.21	323.15	0.971
283.15	7.65	333.15	0.608
288.15	5.37	343.15	0.446
293.15	3.879	353.15	0.342
298.15	2.871	363.15	0.272
303.15	2.175	373.15	0.222
308.15	1.683	383.15	0.186
313.15	1.328	393.15	0.159

Mercury in Water

Table 13.	Tentative total pres	values of Os ssures of 50,	twald coeffi 75 and 100 MP	cient from 4: a.	23 to	773	K at
		Ostwald coefficient at pressures of					
	17 K	50 MPa	75 MPa	100 MPa			
			دی سے سے مل خت مل جد ہے ہے جب ہے	بی افا ها ها هه هم موجو ها به			
	423	0.123	0.112	0.0912			
	473	0.106	0.0921	0.0687			
	476	0.106 min	-	-			
	486		0.0915 min	-			
	500	-	-	0.0665 min			
	523	0.114	0.0960	0.0678			
	573	0.137	0.113	0.0786			
	623	0.170	0.141	0.100			
	673	0.210	0.177	0.134			
	723	0.249	0.218	0.182			
	773	0.281	0.269	0.248			

Figure 7 shows the change of the experimental values of the Ostwald coefficient with pressure below (473, 573 K) and above (673, 773 K) the water critical temperature of 647 K. As noted with the Henry's constant there may be a difference in the pressure dependence of the Ostwald coefficient in the sub- and super-critical water regions. However, the case for the different pressure dependence is not as compelling for the Ostwald coefficient ficient as for Henry's constant. See Figures 6 and 7.

IV. Thermodynamic changes for the dissolution of mercury in water.

The parameters of the fitted equations can be used to calculate the Gibbs energy, enthalpy, entropy and heat capacity changes on dissolving mercury in water. Figure 8 shows these changes calculated from the parameters for the Ostwald coefficient. These values were chosen because they represent the simplest standard state change. They are for the transfer on one mole of mercury from the gas to the solution at the hypothetical concentrations of one mole per liter in each phase. The temperatures at which the Ostwald coefficients equals unity (equal equilibrium concentration in both phases), the temperature range at which the Ostwald coefficient goes through a minimum at the three total pressures, and the water critical temperature are marked on the figure. Table 14 gives the values as calculated from the Ostwald coefficient fit at 50 MPa total pressure.

Table 14. Standard thermodynamic changes for the transfer of one mole of mercury from the vapor to the solution at a hypothetical concentration of one mole per liter. Values calculated from the 50 MPa equation.

	، هذه بيند بين بين جي هنة هنا هن هن جي جي ج	، حد حد جد جد یہ جے حد حد حد ه	، سه هه دو دو دو مو مه مه مه مه مو دو مو م	ید او
T/K	Gibbs Energy kJ mol ⁻¹	Enthalpy Change kJ mol ⁻¹	Entropy Change J K ⁻¹ mol ⁻¹	Heat Capacity Change J K ⁻¹ mol ⁻¹
273	-6.27	-49.9	-160	333
323	+0.34	-34.3	-107	290
373	4.68	-20.9	- 68.5	247
423	7.36	- 9.59	- 40.1	204
473	8.82	- 0.46	- 19.6	161
523	9.43	+ 6.52	- 5.6	118
573	9.46	11.4	+ 3.3	75
623	9.17	14.0	7.8	32
673	8.74	14.6	8.7	- 11
723	8.36	13.0	6.4	- 54
773	8.15	9.2	1.3	- 97

At 273 K the equilibrium concentration of mercury is ten times larger in the water than the gas phase. This indicates a strong interaction between water and mercury which is reflected in the exothermic enthalpy change at

COMPONENTS :	EVALUATOR:
(1) Mercury; Hg; [7439-97-6] (2) Water; H ₂ O; [7732-18-5]	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA <u>1986</u> , July

the lower temperatures. At all temperatures above 320 K the Ostwald coefficient is less than unity. Thus the mercury equilibrium concentration is larger in the vapor phase than in the liquid water. This indicates a change from a dominate attractive interaction between mercury and water to a repulsion as the temperature increases. This is reflected in an endothermic enthalpy of solution at temperatures of 473 and above. Some further comments about the thermodynamic changes on dissolution follow below.

Standard Gibbs Energy change. Negative over the temperature interval of 273 to 320 K where the Ostwald coefficient is greater than one, positive at the higher temperatures where the Ostwald coefficient is less than one, and zero at the 320 K where the Ostwald coefficient equals unity.

Standard Heat Capacity change. The linear decrease in the heat capacity change follows from the four constant equation which on taking two temperature derivates gives an equation linear in temperature. The important point is the decrease from a large positive value to a negative value as the temperature increases. The heat capacities at 298 K of the pure components are liquid water 75.0 J K⁻¹ mol⁻¹ and mercury vapor 20.8 J K⁻¹ mol⁻¹. The heat capacity change in the room temperature range on dissolving the mercury indicates a loosening of the water structure when the mercury atom enters the solution and interacts with the water. The effect decreases with temperature of water. It is probably only a coincidence that the change in sign occurs near the water critical temperature.

Entropy change. The large negative entropy change at low temperature appears to be consistent with a loosening of the water structure indicated by the large positive heat capacity change. However, there appears to be a strong attractive interaction between the mercury and water in the 273 to 320 K range, thus the effect may be a large cooperative loosening of the water structure even though the mercury-water interaction is large with the effect in the water primarily an entropy effect. At the higher temperatures the mercury-water interaction changes to a net repulsion and order is restored in the water structure.

Enthalpy change. The large exothermic enthalpy change at 273 K is a measure of the strong interaction between mercury and water. The effect decreases rapidly with increasing temperature. Above about 480 K the change is endothermic which is consistent with a repulsion between the mercury and water dominating at the higher temperatures.

ADDED NOTE:

Dr. V. I. Sorokin, Institute of Experimental Mineralogy, Academy of Sciences, Moscow, USSR, has informed the IUPAC Solubility Commission that he has prepared a new critical evaluation of the Hg + H₂O system. The evaluation takes into account the partial molar volumes and pressure dependence of solubility up to 773 K and 152 MPa (1500 atm). The evaluation will be published in 1987.

Dr. G. Kolonin, Institute of Geology and Geophysics, Academy of Sciences (Siberian Branch), Novosibirsk-90, USSR, has informed the IUPAC Solubility Commission that he has new measurements in progress on the solubility of mercury in water by UV spectrophotometry over the 423 to 523 K temperature interval.















COMPONENTS :	EVALUATOR:		
(1) Mercury; Hg; [7439-97-6]	H. Lawrence Clever		
(2) Water; H ₂ O; [7732-18-5]	Emory University		
	Atlanta, Georgia 30322 USA		
	<u>1900</u> , 501y		
CRITICAL EVALUATION:			
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COMPONENTS :	EVALUATOR:
(1) Mercury; Hg; [7439-97-6]	Addendum I
(2) Water; H ₂ O; [7732-18-5]	Recommended solubility values at 298.15 K in several units.

Experimental values of the solubility of mercury in water at 298.15 K have been taken from eight papers. The experimental values were converted from the original unit to concentration, molal, mole fraction, Ostwald coefficient, and several forms of Henry's constant. There appear to be some minor inconsistencies because some values were converted on the basis of two significant digits and some on the basis of three digits. Other inconsistencies arise because the conversions are not necessarily made in the same order because the original unit varies from paper to paper. The values are arranged below along with the average value, the standard deviation, and the units. In general the standard deviation amounts to about 4 per cent of the average value.

Molality, mole fraction, and Ostwald coefficient.

Molal	Mole Fraction	Ostwald coefficient
10 ⁷ m ₁ /mol kg ⁻¹	10 ^{°x} 1	$L = c_1(liq)/c_1(gas)$
2.81 (ref. 8)	5.1 (ref. 8)	2.71 (ref. 8)
2.89 (ref. 18)	5.21 (ref. 18)	2.78 (ref. 18)
2.99 (ref. 9)	5.33 (ref. 5)	2.84 (ref. 5)
3.00 (ref. 16)	5.39 (ref. 9)	2.88 (ref. 9)
3.00 (ref. 5)	5.40 (ref. 16)	2.90 (ref. 16)
3.06 (ref. 11)	5.51 (ref. 11)	2.95 (ref. 11)
3.15 (ref. 6)	5.67 (ref. 6)	3.04 (ref. 6)
3.18 (ref. 12)	5.76 (ref. 12)	3.09 (ref. 12)
$(3.01 \pm 0.12) \times 10^{-7}$	(5.42 <u>+</u> 0.22) x 10 ⁻⁹	(2.90 <u>+</u> 0.13)
mol kg ⁻¹	mole fraction	Ostwald coef.

Henry's constants (several forms).

Pressure/Molal	Pressure/Mole Fraction	Pressure/Concentration K'' = p_1/c_1		
$K = p_1/m_1$	$K' = p_1 / x_1$			
813 (ref. 6)	45200 (ref. 6)	816 (ref. 6)		
837 (ref. 11)	46500 (ref. 11)	840 (ref. 11)		
846 (ref. 12)	47000 (ref. 12)	850 (ref. 12)		
850 (ref. 16)	47000 (ref. 16)	854 (ref. 16)		
858 (ref. 9)	47600 (ref. 9)	861 (ref. 9)		
860 (ref. 5)	48000 (ref. 5)	864 (ref. 5)		
887 (ref. 18)	49200 (ref. 16)	890 (ref. 16)		
920 (ref. 8)	50000 (ref. 8)	923 (ref. 8)		
(859 <u>+</u> 30)	(47600 <u>+</u> 1500)	(862 <u>+</u> 30)		
kPa kg mol ⁻¹	kPa	kPa dm ³ mol ⁻¹		

It is of some concern that when all of the experimental data are fitted by a linear regression as a function of temperature the smoothed 298.15 K solubility value does not reproduce the recommended value above. In this evaluation the smoothed values from the linear regression are classed as tentative values. The tentative 298.15 K solubility value is within one standard deviation of the recommended value above.

II
constant in pressure and ation.

Henry's constant, (K''/kPa dm³ mol⁻¹) = $(p_1/kPa)/(c_1/mol dm⁻³)$, is given here for comparison with the pressure/molal and pressure/mole fraction values given earlier in the evaluation. The pressure/concentration Henry's constant is larger than the pressure/molal constant by a percentage that reflect the difference in the mass of 1 kg and the mass of one dm³ of water in kg. At the lower temperatures this difference is negligible. For example at 298.15 K the recommended values are 862 kPa dm³ mol⁻¹ and 859 kPa kg mol⁻¹ which differ by 0.3 %. At the higher temperatures and especially in the water super critical region the differences are larger.

The feature that most distinguishes the pressure/concentration from the pressure/molal form of Henry's constant is the pressure dependence in the water supercritical region. The pressure/molal Henry's constant discussed earlier appears to be a continuous function of pressure through the water critical point and into the water super critical region (see Fig. 3, 6). In the super critical water region the pressure/concentration form of Henry's constant tends to be random with pressure. Average values of the constant are (31,100 \pm 4,500) and (28,200 \pm 3,800) kPa dm³ mol⁻¹ at 673 and 773 K, respectively.

The pressure/concentration Henry's constant has been fitted by linear regression to four equations of the type

 $\ln(K''/kPa \, dm^3 \, mol^{-1}) = A_1 + A_2/(T/100 \, K) + A_3 \, \ln(T/100 \, K) + A_4(T/100 \, K)$

for	0.	l MPa	anđ	273.15	to	393.	15	K,
	50	MPa	and	423	to	647	ĸ,	-
	100	MPa	anđ	423	to	647	K,	and
a	ill pres	sures	and	648	to	773	K.	

The regression parameters are given in the Table below.

Table 1. Linear regression parameters for the pressure/concentration form of Henry's constant.

Tempe	erature 7al, T/K	Total Pressure P _t /MPa	A1	A2	А ₃	А ₄
273.15	- 393.15	0.1	71.9562 <u>+</u> 3.3697	-120.1691 \pm 5.3714	-22.8021 <u>+</u> 1.4470	
423	- 647	50	137.3658 <u>+</u> 13.7699	-211.3420 <u>+</u> 19.7969	-69.9926 <u>+</u> 9.3807	5.6200 <u>+</u> 1.0528
423	- 647	100	63.3040 <u>+</u> 33.6868	-108.0239 <u>+</u> 47.3560	-16.3612 <u>+</u> 24.9924	-0.8248 <u>+</u> 3.1950
648	- 773	all	9.6153 <u>+</u> 0.5429	4.8348 <u>+</u> 3.8948	-	-

Table 2.	Tentat	ive values of	Henry's	constant	(pressure/concent	ration).		
		K/kPa dm³ m	ol -1	<i>T/K</i>	K/kPa dm³ mol ⁻¹			
	272 15	154		222 15	2000	·		
	2/3.15	207		222.15	4490			
	283.15	327		333.15	4480			
	293.15	633		343.15	6370			
				353.15	8660			
	298.15	856		363.15	11300			
				373.15	14200			
	303 15	1136		383.15	17400			
	212 15	1000		202 15	20600			
	212.12	1900		232.12	20000			
Table 3. Tentative values of Henry's constant (pressure/concentration).								
		Henry	's consta	nt, K/kPa	dm³ mol ⁻¹ , at			
	17	л <u>– – – – – – – – – – – – – – – – – – –</u>		100 MD-				
		50 MP	a	100 MPa	ATT			
			-		جي جن حد حد حد نحة نحة			
	42	27,80	0	3,600	-			
	44	3 32,20	0	55,000	-			
	46	3 35.30	0	64,900	-			
	48	3 37.30	ñ	72,300				
	50	2 20 20	0	76 900	_			
	50		0	70,000				
	52	3 30,30	0	78,200	_			
	54	3 3/,/0	U	76,800	-			
	56	3 36,80	D	73 , 000	-			
	58	3 35,60	0	67,600	-			
	60	3 34,40	0	61,000	-			
	62	3 33.30	D	53,900	-			
	64	3 32,20	n	46.800	-			
	66	3 52,20	-	407000	21 100			
	00		_	_	31,100			
	50	3	-	-	30,400			
	70	13	-	-	29,800			
	72	.3	_	-	29,300			
	74	3	-	-	28,700			
	76	3	-	-	28,200			
			حد حد مد مد مد حد حد	مه می بند به مه مه به به به	/			
The tentative values of Henry's constant in Tables 2 and 3 are generated from the linear regression parameters given in Table 1. The parameters for the 50 MPa total pressure equation will generate Henry's constant values within about 3 percent of the values above over the whole tempera- ture interval of 273 to 773 K. The two sets of values are probably well within experimental error of each other								
The stand	ard sta	te change for	the tran	sfer of o	one mole of mercur	y is		
	Hq (ac	, hyp 1 mol d	m - 3) =	Hq(q, 1 k	$(Pa) + H_{2}O(liq)$			
Summarized in Table 4 are values of the standard thermodynamic changes calculated from the regression parameters of the 50 MPa total pressure equation.								
Table 4. Standard thermodynamic changes in kJ mol ⁻¹ and J K ⁻¹ mol ⁻¹ for the standard state change defined by the equation above.								
T	7/K	Gibbs En	thalpy	Entropy	y . Heat Capacit	У		
		Energy C	hange	Change	Change			
-								
2	73	-11.4	51.6	231	-327			
1 5	98	-16.8	43 7	202	-303			
	72	-20.6		140	-202			
3	73	-29.0	23.0	143	-233			
4	/3	-41.3	5.0	98	-140			
5	73	-50.0 -	4.3	80	- 46			
6	73	-57.9 -	4.3	80	+ 47			
COMPONENTS :	ORIGINAL MEASUREMENTS:							
---	--							
(1) Mercury; Hg; [7439-97-6]	Christoff, A.							
(2) Water; H ₂ O; [7732-18-5]	Z. Phys. Chem. <u>1908</u> , 63, 346-54.							
L								
VARIABLES:	PREPARED BY:							
<i>T/K</i> = 281.15 - 3.15, 371.15 - 2.15	H. L. Clever M. Iwamoto							
EVAPDINGNAAT VALUES.								
Temperature	Mercury Concentration							
t/°C T/K 10	$c_1/\text{mg dm}^{-3}$ 10' $c_1/\text{mol dm}^{-3}$							
8 - 10 281.15 - 3.15	0.1 0.5							
98 - 99 371.15 - 2.15	0.93 4.6							
The above results are of his toff was probably the first mercury dissolves in water trolyte".	storical interest. Chris- to show quantitatively that and behaves as a "nonelec-							
Christoff also showed that detected in aqueous solutior of KOH [1310-58-3], and in zene, C ₆ H ₆ , [71-43-2], etha nitrobenzene, C ₆ H ₅ NO ₂ , [98-9	dissolved mercury could be as of H ₂ SO ₄ [7664-93-9] and the organic solvents ben- nol, C ₂ H ₆ O, [64-17-5], and 5-3].							
AUXILIARY	INFORMATION							
METHOD / APPARATUS / PROCEDURE :	SOURCE AND PURITY OF MATERIALS:							
A pyknometer was partially filled with mercury and weighed. A supply of water was connected to the pykno- meter and 10 liters of water slowly passed over the mercury surface. The pyknometer was dried and re- weighed to find the mercury lost to the water.	No information given.							
Obviously the time of contact be- tween water and mercury was not long enough to saturate the solution.	ESTIMATED EDDOD.							
However, the experiment did show that a measureable amount of mercury did dissolve in water.	DUIMALED ENNOR:							
	REFERENCES:							

	ODTOTIVAL NO LOUDING MAG
(1) MORGUNU: Water [7/39-97-6]	Poighardt II a Parhaaffar K F
(1) Mercury; ng ; $(1435-57-61)$	Reichardt, H.; Bonnoerier, K. F.
(2) Water; H ₂ O; 1//32-18-5)	2. Phys. <u>1931</u> , 67, 780 - 9.
VARIABLES:	PREPARED BY:
T/K = 313.15 - 336.15	M. Iwamoto
EXPERIMENTAL VALUES:	
Temperature Me	rcury Solubility
<i>t/°C T/K^a</i> <i>c₁/mg dm⁻³</i> 10 ⁵ <i>c₁/mo</i>	ation ^a Mole Fraction ^a Molality ^a 1 dm ⁻³ 10 ⁷ x ₁ · 10 ⁵ m ₁ /mol kg ⁻¹
120 393.15 1.0 \pm 0.2 0.5 \pm	0.1 1.0 \pm 0.2 0.5 ₃ \pm 0.1
^a Calculated by compilers.	
Water density taken as 0.945 g cm^{-3} .	
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Some of these results are mentioned in two earlier papers (ref. 1 and	(1) Mercury. No information given.
2), but the present paper discusses	(2) Water. No information given.
detail.	
The solution is analyzed by weighing a gold foil before and after amalga- mation with the mercury of the satu- rated solution. Ultraviolet absorp- tion at 257.15 nm is also used.	
	ESTIMATED ERROR:
	$\delta c_1/mg dm^{-3} = \pm (0.1 - 0.2)$
	REFERENCES ;
	 Bonhoeffer, K. F.; Reichardt, H. Naturwissenshaften 1929, 17, 933.
	2. Reichardt, H.; Bonhoeffer, K. F. 2. Electrochem. <u>1930</u> , 36, 753.

COMPON	ENTS:			ORIGINAL	MEASUREMENTS:	
(1)	Mercury;	Hg; [7439-97-6]		Stock	, A.; Cucuel, F	•; Gerstner,
(2)	Water; H		F.; Kohle, H.; Lux. H.		н.	
·		20,		Z. An 241 -	org. Allgem. Ch	em. <u>1934</u> , 217,
				<i>4</i> 71		
VARIAB	LES:			PREPAREI	RV.	
******				S. H.	Johnson	
T.	/K = 303	.15 - 373.15		M. IW H. L.	vamoto Clever	
EXPERI	MENTAL VA	LUES:				
Temp	erature		Mer	cury So	lubility	
			Concentr	ation ^a	Mole Fraction ⁶	^a Molality ^a
t/°C	<i>T/</i> K	10 ⁻¹ c ₁ /mg dm ⁻¹	10'c1/mo	1 dm-3	10°x ₁	10 ⁷ m ₁ /mol kg ⁻¹
30	303.15	0.002 - 0.003	1.0 -	1.5	2.3	1.3
85	358.15	0.03	15		28	15
100	373.15	0.06	30		56	31
^a Calo	culated	by compilers.				
ĺ						
1						
<u> </u>			AUVIITADV	TNEODWAT		
METHO			AUXILIAN	INFUNES.	AND DUDITY OF MATE	DT 41 C .
Flec	+rodenos	ition on a coppe	r wira.	(1) Me	AND PURITI OF MALE	KIALS:
ELCO	rrouepos	ition on a coppe	I WILC.	(1) No	ter Digbillo	
				(2) wa	cer. Distified	•
}				ESTIMAT	ED ERROR:	
				REFEREN	ICES:	

COMPONENTS :			ORIGINAL MEASUREMENTS:
(1) Mercury;	Hg; [743	9-97-6]	Pariaud, J.; Archinard, P.
(2) Water; H ₂ O; [7732-18-5]			Bull. Soc. Chim. France <u>1952</u> , 454 - 6.
			J. Chim. Phys. <u>1956</u> , 53, 765 - 9.
VARIABLES:			PREPARED BY:
T/K = 301	.15		S. H. Johnson M. Iwamoto H. L. Clever
EXPERIMENTAL VAL	UES:		
Temperature	Time of	Mercury in ^a	Mercury Solubility
t/°C T/K ^b	t/days	$10^{\circ}c_{1}/g dm^{-3}$	Concentration Mole ^b Molality ^b Fraction
			$10^{7}c_{1}/\text{mol dm}^{-3}$ $10^{9}x_{1}$ $10^{7}m_{1}/\text{mol kg}^{-1}$
25 298.15	1 3 10	0 10, 15, 15 25, 20, 25	
28 301.15	18 24	30, 28 32, 30, 25	
		30 <u>+</u> 10 ^C	1.5 ± 0.5 2.7 1.5
^b Calculated b ^C The solubil:	by compil ity and i	ers. ts uncertainty o	given in the author's second paper.
		AUXILIARY	INFORMATION
METHOD/APPARATUS	/PROCEDURE	:	SOURCE AND PURITY OF MATERIALS:
Colorimetric Mercury and sed water we to 24 days to The mercury cury(II) and zone. The m plex absorpt nm.	method triply d re equil o insure was oxi complex ercury d ion was n	with dithizone. istilled degas- ibrated for up saturation. dized to mer- ed with dithi- ithizonate com- neasured at 490	 Mercury. Electroanalytically pure. Water. Triply distilled and degassed.
			ESTIMATED ERROR:
			See uncertainty in table above.
			REFERENCES :

COMPONENTS:	ORIGINAL MEASUREMENTS:
<pre>(1) Mercury; Hg; [7439-97-6] Mercury-203; ***Hg; [13982-78-0]</pre>	Moser, H. C.; Voigt, A. F.
(2) Hypophosphorus acid; H ₃ PO ₂ ;	J. Am. Chem. Soc. <u>1957</u> , 79, 1837 - 9.
[6303-21-5] (3) Nitric acid; HNO_3 ; [7697-37-2] (4) Water: H_2O_3 ; [7732-18-5]	
VARIABLES:	PREPARED BY:
	S. H. Johnson
T/K = 298.15	M. Iwamoto H. L. Clever
EXPERIMENTAL VALUES:	
	Mercury Solubility
Temperature H ₃ PO ₂ HNO ₃	Concentration Wole ^a Wolelitua
$t/^{\circ}C T/K^{a} c_{2}/mol dm^{-3} c_{3}/mol dm^{-3}$	Fraction
	$0^{c_1/mol} dm^{-1} 10^{s_1} 10^{s_1} 10^{s_1/mol} kg^{-1}$
25.0 298.15 0.1 0	3.0 ± 0.3 5.4 3.0
0.01 0.01	2.9 <u>+</u> 0.1 5.2 2.9
0.001 0.01	3.0 ± 0.1 5.4 3.0
^a Calculated by compilers.	
The hypophosphorus acid, H_3PO_2 , an prevent oxidation of metallic mercu dilute that they do not effect the so ADDITIONAL DATA: The authors used their solubility va the disproportionation of mercurous i $Hg_1^{*}(ag) = Hg_2(1) + Hg_1^{**}(ag)$	d nitric acid, HNO_3 , were added to ary. The acids are assumed to be so lubility. alue along with literature values of on K = 0.0060 - 0.0120 (Literature)
<pre>to estimate the disproportionation co Hg3[*] (aq) = Hg(aq) + Hg^{2*} (aq) The authors' distribution study res (5.3 - 5.6) x 10⁻⁹. No evidence of t Hg3[*] (aq) = 2Hg[*](aq), was found. It co K is < 1 x 10⁻⁷.</pre>	R = 0.000 0.0120 (literature) start in aqueous solution of K = $(1.9 - 3.6) \times 10^{-9}$. ulted in a slightly larger value of he dissociation of mercurous dimer, an be inferred that the dissociation
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The solubility of mercury in dilute aqueous acid solution was determined by shaking them with a drop of mer- cury of known specific activity. The saturated solution was treated	 Mercury. Oak Ridge National Lab. Obtained as a high speci- fic activity solution of mer- curic nitrate containing isotope 203.
to obtain a precipitate of HgS which was deposited on a planchet and analyzed for mercury-203 with a thin window Geiger counter.	(2) Water. Distilled. Traces of hypophosphorus acid were added to prevent Hg oxidation by ra- diolysis.
It was found necessary to add a small amount of hypophosphorus acid to prevent oxidation of metallic mercury by radiolysis. More details may be found in (ref.	ESTIMATED ERROR: $\delta T/K = \pm 0.1$ $\delta c_1/c_1 = \pm 0.035$
· ·	REFERENCES: 1. Moser, H. C.; Voigt, A. F. USAEC Report <u>1957</u> , ISC-892.

COMPONENTS:		CRIGINAL MEASUREMENTS:				
(1) Mercury; Hg; [7439-97-6]		Choi, S. S.; Tuck, D. G.				
(2) Water; H ₂ O; [7732-18-5]		J. Chem. S	oc. <u>1962</u> ,	4080 - 8.		
VARIAB	LES:		-	PREPARED BY:		
T	/K = 298	.15 - 363.15		S. H. John M. Iwamoto H. L. Cleve	son er	
EXPERI	MENTAL VAL	UES:				
Temp	erature		Merc	ury Solubili	 ty	
-			Probable		Mole	
t/°C	<i>T/</i> K	10'w ₁ /g g ⁻¹	Error of Co Mean 10	ncentration ^a 'c ₁ /mol dm ⁻³	Fraction ^a 10 [°] x ₁	Molality ^a 10'm ₁ /mol kg ⁻¹
25	298.15	0.631	0.14	3.14	5.67	3.15
35	308.15	1.09	0.03	5.40	9.79	5.43
50	323.15	1.77	0.03	8.72	15.9	8.82
65	338.15	2.17	0.05	10.6	19.5	10.8
80	353.15	2.61	0.01	12.6	23.4	13.0
90	363.15	3.34	0.18	16.1	30.0	16.7
aCale	culated	by compilers	•			
The at 2	solubili 98.15 K)	ty values re with duplica	ported are m te samples t	ean values o aken in each	f two expo experimen	eriments (three t.
			AUXILIARY	INFORMATION		
METHOD)/APPARATU	S/PROCEDURE:		SOURCE AND PUR	ITY OF MATER	IALS:
A Ne used othe as H sele	utron a The r r reager 3 ^{PO} 2• T cted fo	activation nethod does nts in the so The isotopes r analysis v	method was not require plution such of mercury were ^{1 \$ 7} mHg	 (1) Mercury Co. Spe dium im (2) Water. 	y. Johnso ectroscopio purity l p Distille	on Matthey and cally pure, so- pm. d three times,
and Deox	¹ ⁹ ^{Hg} []	.3981-51-6]. water and m	nercury were	deoxyg system.	enated ir	n an air free
equilibrated 10 days without stir- ring to prevent suspended or colloi- dal Hg in the solution. Samples						
were in a	neutron	source. Cai	rier Hg was	ESTIMATED ERRO	DR:	
added, the Hg reacted and precipi- tated as HgS for counting in a crys- tal spectrometer. The method can detoget 2 × 10 ⁻¹ of W		See authors values in t	s probable able above	error on mean		
		y.		REFERENCES:		
		•				

COMPONENTS .	ORIGINAL MEASUREMENTS .
(1) Mercury; Hg; [7439-97-6]	Kuntz, R. R.; Mains, G. J.
(2) Water; H ₂ O; [7732-18-5]	J. Phys. Chem. <u>1964</u> , 68, 408 - 10.
-	
VARIABLES:	PREPARED BY:
T/K = 298.15	S. H. Johnson M. Iwamoto
	H. L. Clever
EXPERIMENTAL VALUES:	
Temperature Merc	ury Solubility
t/°C T/K ^a Concentration 10'c ₁ /mol dm ⁻³	Mole Fraction ^a Molality ^a 10 ^{°x} 1 10 ^{°m} 1/mol kg ⁻¹
25 298.15 1	1.8 1
^a Calculated by compilers.	
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Spectrophotometric method. It was	(1) Mercury. No information given.
assumed that the optical density at 2560 A is a reliable measure of the	(2) Water. No information given.
solubility. It was further assumed	
mercury was the same in all hydro-	
carbon solvents. The optical den- sity of a saturated solution of Hg	
in hexane was measured and, when	
sured by Moser and Voigt (ref. 1),	
gives an extinction coefficient $\epsilon_{2560} = 7.35 \times 10^3 \text{ dm}^3 \text{ mol}^{-1} \text{ cm}^{-1} \text{ at}$	ESTIMATED ERROR:
25°C. The value was used to calcu-	
solvents.	
The Hg and solvent were equilibrated	REFERENCES :
for 20 minutes and the optical den-	L Moser, H. C . Voigt, A. F.
Spectrophotometer.	USAEC Report <u>1957</u> , ISC-892,
The reliability of the results de-	es pp.
pends on the Moser and Voigt solu- bility value in hexane.	

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]; Mercury-203; *° Hg; [13982-78-0]	Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 464 - 470.
(2) Water; H ₂ O; [7732-18-5]	Spencer, J. N. <u>Dissertation</u> , Iowa State University, <u>1967</u> .
VARIABLES:	PREPARED BY:
<i>T</i> /K = 273.15 - 308.15	S. H. Johnson M. Iwamoto
EXPERIMENTAL VALUES:	H. L. Clever
Temperature Mer	cury Solubility
t/°C T/K ^a Concentration 10'c ₁ /mol dm ⁻ '	Mole Fraction ^a Molality ^a $10^{*}x_{1}$ $10^{7}m_{1}/mol kg^{-1}$
0 273.15 1.2 <u>+</u> 0.2	2.2 1.2
15.5 288.65 2.1 <u>+</u> 0.1	3.8 2.1
20 293.15 2.4 <u>+</u> 0.2	4.3 2.4
25 298.15 2.8 <u>+</u> 0.1	5.1 2.8
30 303.15 2.9 <u>+</u> 0.1	5.2 2.9
35 308.15 3.4 <u>+</u> 0.1	6.2 3.4
$\log x_1 = (8.600 \pm .)$ for the 273.15 to 308.15 temper	(T/K) - 29.597 ature interval.
AUXILIARY	INFORMATION
METHOD / APPARATUS / PROCEDURE :	SOURCE AND PURITY OF MATERIALS:
A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to metallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried. The mercury and solvent were shaken continuously in 25 ml glass stop- pered flasks in a thermostat for 24	 Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. Water. Doubly distilled from alkaline permanganate solution.
brated solution were counted by a conventional single channel scinti- lation counter. The window width was set to count only the photopeak at 279 kev. The solubility values were the average of at least six determinations over a three day period.	ESTIMATED ERROR: $\delta T/K = \pm 0.1$; See random error re- ported by authors with concentration values above. REFERENCES:

			loroury in trater		
COMPONEN	ITS:		ORIGINAL MEA	SUREMENTS:	
(1) Mercury; Hg; [7439-97-6]			Glew, D.	N.; Hames, D. A.	
(2) Wa	ter; H ₂ O	; [7732-18-5]	Can. J.	Chem. <u>1971</u> , 49,	3114 - 8.
EXPERIME	NTAL VALUES	5:		· · · · · · · · · · · · · · · · · · ·	· · · · · ·
Temper	cature	 Me	ercury Solubility	 Y	Reducing
t∕°C	T/K ^a	Concentration ^a 10 ⁷ c ₁ /mol dm ⁻³	Mole Fraction 10°x ₁	Molality ^a 10'm ₁ /mol kg ⁻¹	Agent ^b
4.30	277.45	2.33	4.19	2.33	iv
4.30	277.45	2.21	3.99	2.21	iv
11.41	284.56	2.37	4.28	2.38	ii
11.41	284.56	2.31	4.17	2.31	11
11.41	204.00	2.22	4.01	2.23	11
14.97	288.12	2.14	3.86	2.14	i
19.80	292.95	2.39	4.31	2.39	i
19.80	292.95	2.49	4.49	2.49	i
25.02	298.17	2.98	5.39	2.99	iv
30.02	303.17	3.58	6.47	3.59	iii
30.09	303.24	3.43	6.20	3.44	i
30.09	303.24	3.48	6.29	3.49	i
39.16	312.31	4.35	7.90	4.39	i
45.07	318.22	4.58	8.33	4.62	ii
45.07	318.22	4.40	8.01	4.45	ii
49.80	322.95	5.42	9.88	5.48	i
50.24	323.39	4.51	8.22	4.56	i
50.24	323.39	5.32	9.70	5.38	i
50.24	323.39	4.85	8.85	4.91	i
53.71	326.86	5.31	9.70	5.38	ii
59.98	333.13	6.77	12.4	6.88	i
59.98	333.13	6.06	11.1	6.16	i
62.28	335.43	7.25	13.3	7.38	ii
68.19	341.34	8.75	16.1	8.94	i
68.19	341.34	8.31	15.3	8.49	i
72.44	345.59	9.48	17.5	9.71	ii
	، الله جنة حنة حنة خنة حنة حنة .				

^aCalculated by compilers.

^bi sodium sulfite ii hydrazine hydrate iii sodium borohydrate

iv none

The authors fit the data above by the method of least squares to obtain the equation:

 $\log x_1 = -122.811 + 4475.3/(T/K) + 40.2205 \log(T/K).$

The estimated standard error on a single measurement is 7.5 percent.

COMPONENTS :	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]	Glew, D. N.; Hames, D. A.
(2) Water; H ₂ O; [7732-18-5]	Can. J. Chem. <u>1971</u> , 49, 3114 - 8.

ADDITIONAL INFORMATION:

Author's smoothed data: Solubility of mercury in water.

The experimental solubility values of Glew and Hames between 4° and 72° (preceeding page), the value of Bonhoeffer and Reichart (ref. 1) at 120°C, the value of Stock *et al.* (ref. 2) at 85°C, the value of Moser and Voigt (ref. 3) at 25°C, and the values of Choi and Tuck (ref. 4) at 25°, 80° and 90°C were combined to obtain the equation and the smoothed values below. The Henry's constant, $H/atm = (p_1/atm)/x_1$, were obtained from the same experimental solubility values and mercury vapor pressures from the equation of Douglas, Ball and Ginnings (ref. 5).

Temper	ature	Mole Fraction	Standard	Henry's Constant	Standard
	- /		Deviation		Deviation
t/°C	T/K	10°x1	σ	$H/atm = (p_1/atm)/x_1$	σ
0.0	2/3.2	3.73	0.14	70	3
5.0	2/8.2	3.91	0.11	109	3
10.0	283.2	4.15	0.10	165	4
15.0	288.2	4.46	0.08	242	5
20.0	293.2	4.83	0.08	346	6
25.0	298.2	5.28	0.08	482	7
30.0	303.2	5.83	0.08	658	10
35.0	308.2	6.48	0.10	878	13
40.0	313.2	7.27	0.11	1150	18
45.0	318.2	8.20	0.13	1470	23
50.0	323.2	9.31	0.15	1860	30
55.0	328.2	10.6	0.17	2300	38
60.0	333.2	12.2	0.20	2800	46
65.0	338.2	14.1	0.23	3370	56
70.0	343.2	16.4	0.28	3980	69
75.0	348.2	19.1	0.35	4640	85
80.0	353.2	22.4	0.44	5350	110
85.0	358.2	26.3	0.58	6080	140
90.0	363.2	31.0	0.78	6840	170
100.0	373.2	43.6	1.5	8360	280
110 0	383.2	62 1	2.7	9810	430
120.0	393.2	89 1	5 0	11100	630
120.0					

Linear regression resulted in the equations for 0° to 120°C:

 $\log x_1 = -128.089 + 4715.2/(T/K) + 42.0288 \log(T/K)$

and

 $\log(H/atm) = 135.636 - 8031.1/(T/K) - 42.8448 \log(T/K).$

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]	Glew, D. N.; Hames, D. A.
(2) Water; H ₂ O; [7732-18-5]	Can. J. Chem. <u>1971</u> , 49, 3114 - 8.
VARIABLES: T/K = 277.45 - 345.59 EXPERIMENTAL VALUES:	PREPARED BY: S. H. Johnson M. Iwamoto H. L. Clever
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE: About 300 cm ³ of water was distilled directly into a special solubility cell, then about 30 g of mercury was vacuum distilled into the cell. Atmospheric pressure was restored with helium. Reducing agent (see table) (0.001 M) was added to pre- vent oxidation of mercury by any residual oxygen. The cell contents were stirred continuously for up to a day and the temperature set to the operating level.	 SOURCE AND PURITY OF MATERIALS: (1) Mercury. Technical electrolytic grade, washed with 10% NaOH in an air stream, washed with 5% HNO₃, filtered through gold foil, rewashed with fresh 5% HNO₃ and distilled three times. (2) Water. Distilled, degassed and purged several times with nitrogen at atmospheric pressure. Distilled under vacuum directly into the solubility vessel.
The stirrer was stopped two hours before sampling. A helium pressure 15 mmHg above atmospheric pressure was used to express a $10 - 20$ g sample of saturated solution into a weighed flask containing 1 ml 4 percent KMnO ₄ and 1 ml 20 percent H ₂ SO ₄ . The flask was reweighed and the sample immediately analyzed for mercury by an atomic absorption method. Solubilities were ap- proached from both above and below saturation.	ESTIMATED ERROR: $\delta T/K = \pm 0.01$ $\delta x_1/x_1 = \pm 0.075$ Standared error of a single measurement (authors). REFERENCES:
	 Bonhoeffer, K. F.; Reichert, H. Z. Phys. <u>1931</u>, 67, 780. Stock, A.; Cucuel, F.; Gerstner, F.; Kohle, H.; Lux, H. Z. Anorg. Chem. <u>1934</u>, 217, 241.
Further details are in the paper and in the authors later paper on mer- cury + sodium chloride + water (ref. 6).	 Moser, H. C.; Voigt, A. F. J. Am. Chem. Soc. <u>1957</u>, 79, 1837. Choi, S. S.; Tuck, D. G.
	J. Chem. Soc. <u>1962</u> , 4080. 5. Douglas, T. B.; Ball, A. F.; Ginnings, D. C. J. Res. N. B. S. <u>1951</u> , 46, 334.
	6. Glew, D. N.; Hames, D. A. Can. J. Chem. <u>1972</u> , 50, 3124 - 8.

COMPONE	NTS:			ORIGINAL MEASUREMENTS:			
(1) M	lercury;	Hg; [7439-	97-6]	Sorokin, V. I.			
(2) W	later; H ₂	0; [7732-1	8-5]	Dolk. Akad 213(4), 8	d. Nauk SSSR 52 - 5.	<u>1973</u> ,	
				*Dok1. Ch <u>1973</u> , 213	em. (Engl. T: , 905 - 8.	ransl.)	
VARIABL	ES:			PREPARED BY:			
p/	$\frac{T/K}{MPa} = 40$	1.15 - 780 .5 - 100.3	.15	H. L. Clev M. Iwamoto	ver D		
EXPERIM	ENTAL VALU	VES:					
Tempe	erature	Pressure	Equilibration		Mercury Solu	ubility	
±/%	714	n/atm	Time		Molality ^a	Mole Fraction	
	-/ 1	27 acm	t/h	<i>m₁/g</i> kg ⁻¹	m ₁ /mol kg ⁻¹	10 ³ x ₁	
300	573.15	500	48	0.29	0.0014	0.0260	
300 298	573.15 571.15	640 900	72 138	U.24 0.19	0.0012 0.0009	0.0216 0.0171	
	(70 35				0.0360	0.300	
400	673.15	400 500	24 24	3.37 2.76	0.0138	0.248	
400	673.15	495	24	3.22	0.0161	0.289	
400	673.15	700	24 48	2.47		0.222	
398	671.15	920	24	2.23	0.0111	0.200	
401	0/4.15	910	48	2.13	0.0106	0.191	
500	773.15	500 ' 510	24 28	24.12	0.1202	2.16	
500	773.15	520	24	20.21	0.1008	1.81	
495	768.15	755 700	48 24	18.45 19.90	0.0920	1.65	
498	771.15	990	24	16.36	0.0816	1.47	
503	776.15	960	25 	13.41	0.0667	1.20	
^a Calc	ulated b	y compiler	•				
			AUXILIARY	INFORMATION			
METHOD	APPARATUS	/PROCEDURE:		SOURCE AND PU	IRITY OF MATERI	ALS:	
The 5	0 cm³ re sample co	action ves	sel and the 5 ere construc-	(1) Mercury. Doubly distilled.			
ted	of VT-8	titanium	alloy. The	(2) Water. Doubly distilled. Freed			
solut	tion was er. The	stirred b	y a magnetic was designed	of dissolved gases by boiling and subsequent purging with pure			
so th	at there	was no ch	ange in tem-	argon. The pH of the water was			
perat	ture or Neith	pressure er gas lib	during samp- eration from	6.50 be iment.	etore and aft	ter the exper-	
the	sample	nor the a	ppearance of				
oxidized Hg or titanium were ob- served in the course of the work.							
Three analytical methods were used			ESTIMATED ERI	ROR:			
with parallel samples:							
(i) amalgamation with a gold cap, (ii) colorimetric titration with							
dithizone, and			DEPENDENC				
(iii) volumetric titration with ammonium thiocyanate.				REFERENCES:			
The a	author d	oes not st	ate what gas				
was u was n	ised to p probably	ressure th argon.	e system. It				
		·· • • · · ·					

COMPONENTS:					ORIGINAL MEASUREMENTS:		
(1) M	lercury;	Hg; [743	9-97-6]		Onat, E.		
(2) Water; H ₂ O; [7732-18-5]					J. In 2029	org. Nucl. - 32.	Chem. <u>1974</u> , 36,
L	70						
VARIABL	ж = 298.	15 - 353	.25		PREPAREI H. L. M. IW) BY: Clever vamoto	
EXPERIM	ENTAL VALU	JES:					
Tempe	rature	No. of	Concentr	ation ^a	Avg.%	Mole Frac	ction ^b Molality ^b
t/°C	<i>т/</i> к	Detns.	10' <i>c</i> / mol	l dm - 3	from	10°x ₁	10'm ₁ /mol kg ⁻¹
25	298.15	5	3.05	3.09	3.3	5.5	3.06
40	313.15	4	5.12	5.19	1.9	9.30	5.16
50	323.15	3	7.43	7.47	4.0	13.5	7.52
60	333.15	3	10.78	10.87	3.0	19.8	11.0
70	343.15	4	13.33	13.37	3.0	24.6	13.6
80	353.15	4	16.37	16.40	0.6	30.3	16.8
average values to the left are from values to the right were calculat absorption of 2.8 x 10* (ref. 1). The mole fraction and molality soluk concentration in the left hand colur ^b Calculated by compilers.				lculat 1). y solub d colum	ed from	n Beer's l	aw using the molar
			A	UXILIARY	INFORMAT	ION	
METHOD	APPARATUS	/PROCEDURE	3:		SOURCE	AND PURITY O	F MATERIALS:
450 ml of water and 10 g of mercury were equilibrated with stirring for 24 hours in a thermostat. The sys- tem was oxygen free. Duplicate 100 ml samples were taken and transferred to flasks containing 5 ml 0.001 M Hg(ClO) ₄ and 0.837 g concentrated HClO ₄ . The flask con- tents were shaken continuously, made oxygen free by bubbling N ₂ , and brought to 25°C in a thermostat. The solution was left in the thermo-				(1) Me fi di su (2) Wa	ercury. R ed chemid stilled i re. ter. Trij	eagent grade. Puri- cally (ref. 2). Re- inder reduced pres- ply distilled.	
stat over night. The solution was analyzed for soluble Hg by measuring the absorbance of $Hg_2(ClO_4)_2$ at 2 nm				ESTIMAT $\delta T/K$ $\delta c_1/mc$	ED ERROR: No 1 dm ⁻³ Se	o information. ee % average devia-	
the absorbance of $Hg_2(ClO_4)_2$ at 2 nm intervals over the 212 to 256 nm interval in a 10 cm cell on a Beck- man DU spectrophotometer. The ab- sorbance was compared with a cali- bration curve to obtain the Hg_2^{*} concentration which was taken to be one-half the Hg concentration resul- ting from the reaction $Hg^{2*}(aq) + Hg(aq) = Hg_2^{*}(aq)$, which was complete under the analy- sis conditions.					REFEREN 1. Hig J. 2. Pal Exp C.	CES: ginson, W Chem. Soc. mer, W. G. erimental U. P., Cam	ion from mean above. C. E. <u>1951</u> , 1438. <i>Physical Chemistry</i> , bridge, 1949, p. 203.

COMPONENTS:				ORIGINAL MEASUREMENTS:		
(1) Me	rcury; Hg	; [7439-97-	6]	Sanemasa, I.		
(2) Water; H ₂ O; [7732-18-5]			1	Bull. Chem. Soc. Jp 1795 - 8.	n. <u>1975</u> , 48,	
VARIABLE	S :			PREPARED BY:		
<i>т/</i> к	= 278.15	- 333.15		S. H. Johnson H. L. Clever		
FYDERIME	NTAL VALUES	•		M. Iwamoto		
		• 				
Tempe	rature	Henry's constant		Mercury Solubilit	У	
t/°C	<i>T </i> K	K/atm	Concentrat 10 [°] c ₁ /g dm	ion Mole Fraction ^a -3 10 ⁹ x ₁	Molality ^a 10'm ₁ /mol kg ⁻¹	
5	278.15	233	19.2	1.72	0.957	
10	283.15	262	27.4	2.46	1.37	
20	293.15	391	45.0	4.04	2.25	
30	303.15	500	81.3	7.33	4.07	
40	313.15	650	137	12.4	6.88	
50	323.15	852	218	19.8	11.0	
60	333.15	1010	368	33.6	18.7	
aCalc	ulated by	compilers.		ین میں ایک ایس ایک ایپ		
Value	s in the	paper above	333.15K we	re extrapolated by th	e author.	
Henry	's consta	nt:				
		1n(K/atm) = In = -1	$(P_1/atm)/x_1)$ 0787(T/K) + 6.250		
The e	nthalpy o	f solution:	∆#/kcal mo	1-1 = 5.3		
			AUXILIARY	INFORMATION		
METHOD //	PPARATUS/PI	ROCEDURE:		SOURCE AND PURITY OF MAT	ERIALS:	
The close severa	solubil d system l flasks	ity appara which co connected	atus is a nsists of by tubing.	 Mercury. Metallic mercury puri- fied by distillation under re- duced pressure. 		
A 20 g portion of Hg is placed in one flask immersed in thermostat I, and up to 200 ml of water are placed in a second flask immersed in ther- mostat II. The Hg vapor pressure is controlled by the temperature of thermostat I. Nitrogen gas at atm pressure is circulated by the pump. The gas passes over the Hg and bub-			rmostat I, are placed d in ther- pressure is prature of gas at atm the pump. g and bub-	(2) Water. Redistil aerated and deo were used with r	led water. Both xygenated water no difference.	
bles through the water (or solu-				ESTIMATED ERROR:		
rates both the gas space and water. The Hg is determined by cold-vapor atomic absorption. The method is				$\delta T/K = \pm 0.05$		
based found	on a redu by Kimurz	ction-aerat a and Mille	ion method r (ref. 1).	REFERENCES :		
The p that	rocedure reported	used is s by Omang	imilar to (ref. 2).	l. Kimura, Y.; Mille Anal. Chim. Acta	er, V. L. <u>1962</u> , 27, 325.	
put t Analys Measur Hg pre	that reported by Omang (ref. 2). The sample and working standard are put through the same procedure. Analyses are done in triplicate. Measurements were made at up to six Hg pressures at each temperature.			2. Omang, S. H. Anal. Chim. Acta	<u>1971</u> , 53, 415.	

COMPONE	NTC .				ORIGINA	I MEASUREMENTS .	
(1) M	orcury.	Ha. [743	9-97-61		Sorokin, V. L.: Alekhin, Yu. V.:		
	ercury,				Dadze, T. P.		
(2) W	ater; H ₂	0; [7732	-18-51		Oche	rki FizKhim. P	etrol. <u>1978</u> ,
					8,1	33 - 49.	
VARIABL	ES:				PREPARE	D BY:	
D	T/K = 3	78.15 - 6 - 102	475.15		н т.	Clever	
ťť	/MFa - I	.0 - 102	• 5				
EXPERIM	ENTAL VALU	IES:					
Tempe	rature	Total P	ressure		 М	ercury Solubilit	у
t∕°C	T/K	P _t /atm	₽ _t /MPa	Weight	kg -1	Molality 10 ⁵ m ₁ /mol kg ⁻¹	Mole Fraction ^a
105	378.15	1000	101.3	0.04	60	0.229	0.402
200	473.15	16	1.6	5.17		25.8	46.5
200	473.15	530	53.7	2.44		12.2	22.0
202	475.15	1010	102.3	1.22		6.08	11.0
30.1.				an ar ar an mar ar an an ar			
	ulated D	A combin	61.				
1							
ł							
						<u></u>	
				AUXILIARY	INFORMA	TION	
METHOD	APPARATUS	PROCEDURE	:		SOURCE	AND PURITY OF MATE	RIALS:
These	are as	sumed to	be sim	ilar to			
that earli	descri er work	bed in (ref. 1)	the a	uthors			
ĺ							
					ESTIMA	TED ERROR:	
					REFERE	NCES:	······································
					1. So	rokin, V. I.	
					Do	kl. Akad. Nauk S	SSR <u>1973</u> ,
						U14/1 032 - 3.	
1							

COMPONENTS:		ORIGINAL MEASUREMENTS:		
(1) Mercu	ry; Hg; [7439-97-6]	Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.; Kawamoto, T.; Hikari, S.; Sogawa, K.; Maehara, S.		
(2) Water	; H ₂ O; [7732-18-5]			
		Shika Rikogaku Zasshi <u>1979</u> , 20, 137 - 41.		
VARIABLES:		PREPARED BY:		
	T/K = 310.15 pH = 7.2 <u>+</u> 0.1	H. L. Clever		
EXPERIMENTAL	L VALUES:			
Shaking		Mercury ^a		
Time		Concentration Mole Molality		
t/days	ppm ^D	Fraction $10^{7}c_{1}/mol dm^{-3} 10^{8}x_{1} 10^{7}m_{1}/mol kg^{-1}$		
	الله الله الله بالا الله الله الله الله			
1	$0.020 \leq 0.045 \leq 0.070$	2.2 <u>+</u> 1.0		
3	$0.025 \leq 0.060 \leq 0.096$	3.0 <u>+</u> 1.4		
5	0.078 <u><</u> 0.086 <u><</u> 0.090	4.2 <u>+</u> 0.2		
5	0.078 <u><</u> 0.087 <u><</u> 0.095	4.3 ± 0.3		
5	$0.070 \leq 0.095 \leq 0.120$	4.7 <u>+</u> 1.0		
		$4.4 \pm 0.7^{\circ}$ 8.0 4.4		
^a The comp equilibr	piler assumes that the fiv	e day shaking time represents solubility		
^b The com means gi	piler calculated the conc rams of mercury in 1 x 10°	entration of mercury assuming that ppm cm³ of solution.		
c _{The aver}	age is from the five days	of shaking time.		
	AUXILI	ARY INFORMATION		
METHOD/APPA	RATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:		
Metall: of water	ic mercury (0.3 g) and 25 g solution were placed in a	No information was given on the		
Erlenmeye	er flask. The rubber stop	source and purity of materials.		
in a the	rmostat at 37°C.			
The aq Acidified	ueous phase was sample (H ₂ SO4) potassium permai			
ganate s	solution was added. The			
reduced	by air and vaporized a			
describe The me	d in ref. l. ercurv was determined b			
flameless	s atomic absorption spectro	ESTIMATED ERROR:		
(JEOL AA	-HG 01) and an atomic al	$\frac{1}{2}$		
sorption JAA-7000)	spectrophotometer (JE($\delta T/K$ Not given.		
Three formed or	determinations were per h each sample.	REFERENCES:		
The so Much lar	lubility was pH dependen ger solubility values wer	L. l. Kimura, Y.; Miller, V. L.		
obtained	in the pH 2 - 3 and pH 10	Anal. Chim. Acta <u>1962</u> , 27, 325.		
values an	e for solutions at pH 7.2	-¥ ±		
0.1. The sion of c	re was no mention of exclu xygen from the samples.	1-		

COMPONENTS:			ORIGI	NAL MEASUREMENTS:	
(1) Mercury; Hg(2) Water; H₂O;	; [7439-9 [7732-18	7-6] -5]	Baltisberger, R. J.; Hildebrand, D.A.; Grieble, D.; Ballintine, T. A.		
				al. Chim. Acta L = 2.	<u>1979</u> , 111,
·····					
VARIABLES:			PREPA	RED BY:	
T/K = 303.15	5		н. М.	L. Clever Iwamoto	
EXPERIMENTAL VALUES	:			<u></u>	
Temperature		Merc	ury g	Solubility	
t/°С Т/К	ppb ^a	Concentration 10 ⁷ c ₁ /mol dm	on ^b M	Nole Fraction ^b	Molality ^b 10 ⁷ m ₁ /mol kg ⁻¹
30 303.15	63 <u>+</u> 2 ^C	$3.1_4 \pm 0.10$)	5.68	3.15
······································		AUXILIARY	INFOR	1ATION	
METHOD/APPARATUS/PF	ROCEDURE :		SOURC	E AND PURITY OF	MATERIALS:
The solutions nitrogen gas for of mercury was mixture sparge with nitrogen.	s were sp or 45 minu added, a d another Solution	arged with ites, a drop ind then the 30 minutes s were stir-	(1)	Mercury. Pretion from mer der a N ₂ atmo Water. Tripl	pared by distilla- cury(II) oxide un- shpere. e distilled.
vered for 24 hou vered stirrir solution were with a maintai prevent oxygen solutions.	ng bar. Ng bar. Withdrawn ned nitro n diffusio	a glass-co- Samples of by syringe gen flow to on into the			
An aliquot of tion was transf cing cell. The ted by nitroge lyzed by cold tion.	the satu ferred to mercury en spargin vapor ato	rated solu- a non-redu- was collec- ng and ana- mic absorp-	ESTIN See ity REFE	ATED ERROR: standard dev in water abo RENCES:	viation of solubil- ve.
The non-reduct that had never agents.	ing cell c contact	was a cell ed reducing			
Hg + H ₂ O was q tion. The pres the disproport:	uite pron ence of Cl ionation o	e to oxida- l prevented f any Hg(I).			

Mercury in Water

COMPONENTS :			ORIGINAL MEASUREMENTS:		
		20.07.61	Okouchi, S.; Sasaki, S.		
 Mercury Water; 	у нд; 174 Н ₂ 0; [773	2-18-5]	Bull. Chem. Soc. Jpn. <u>1981</u> , 54, 2513 – 4. Report of the College of Engineering of Hosei University <u>1983</u> , (No. 22), 55 – 106.		
VARIABLES:			PREPARED BY:	······	
T/K = 27	8.15 - 31	3.15	H. L. Clever M. Iwamoto		
EXPERIMENTAL V	ALUES:				
Tempe	rature	Merc	ury Solubility		
t/°C	<i>T/</i> K ^a	Concentration ^a 10 ⁷ c ₁ /mol dm ⁻³	Mole Fraction 10°x ₁	Molality ^a 10'm ₁ /mol kg ⁻¹	
5	278.15	2.2	3.9	2.2	
10	283.15	2.3	4.2	2.3	
20	293.15	2.7	4.8	2.7	
25	298.15	3.0	5.4	3.0	
30	303.15	3.2	5.8	3.2	
40	313.15	4.1	7.4	4.1	
a _{Calc}	ulated by	compilers.			
The a	log # ₁	.tted the data to = -147.56 + 5581.	the following (3/(T/K) + 48.723	equation: Blog(T/K)	
		AUXILIARY	INFORMATION		
METHOD/APPARAT	US/PROCEDUR	E:	SOURCE AND PURITY	OF MATERIALS:	
Solubility experiments were con- ducted by shaking the solvent with a drop of mercury for 24 hours in a thermostat. Separate experiments showed the mercury concentration remained constant after 24 hours of shaking. A 0.5 cm ³ sample of the equili- brated solution was analyzed by the cold-vapor atomic absorption method. Steps in the procedure included tin(II) chloride reduction, nitrogen bubbling and passage through magne- sium perchlorate to dry the Hg va- por. The mercury was determined from			 Mercury. Purified as did Glew and Hames (ref. 1). Water. Distilled, containing 0.001 mol/dm⁻³ of phosphinic acid to prevent mercury oxida- tion. ESTIMATED ERROR: δT/K = ±0.1 δT = (T = ±0.1) 		
por. The mercury was determined from the area under the atomic absorption peak at 253.7 nm compared to a cali- bration curve. In experiments with water, phos- phinic acid (0.001 mol) was added to prevent mercury oxidation. Water- hydrocarbon distribution constants of Hg were also directly determined.			REFERENCES: 1. Glew, D. N.; Can. J. Che	; Hames, D. A. m. <u>1971</u> , 49, 3114.	

COMPONENTS:		ORIGINAL MEASUREMENTS:		
(1) Mercury; Ho	; [7439-97-6]	Gjessing, E. T.; Rogne, A. K. G.		
(2) Water; H ₂ O;	[7732-18-5]	Vatten <u>1982</u> , 38, 4	06 - 8.	
VARIABLES:		PREPARED BY:		
T/K Not giv room te	en, assumed to be emperature.	H. L. Clever		
EXPERIMENTAL VALUES				
Temperature	Ме	rcury Solubility		
	Concentration	Mole Fraction	Molality	
	$10^{\circ}c_{1}/g \mathrm{dm}^{\circ 3} 10^{7}c_{1}/\mathrm{mol}$. dm ⁻³ 10 [°] x ₁	10' <i>m</i> 1/mol kg ⁻¹	
"Room"	7 0.35	0.63	0.35	
	9 0.4	0.81	0.4	
	13 ^b 0.6-	1 2	0.6-	
 In the left column. The authors fuberled the values in the left column as micrograms per liter. ^b The first two values were measured in distilled water. The third value was measured in an artificial "surface water" without organic material. It contained 5.62 mg dm⁻³ NaHCO₃, 1.18 mg dm⁻³ MgCO₃, 7.17 mg dm⁻³ CaSO₄, and 10.96 mg dm⁻³ CaCl₂. The total ionic strength is 6.3 s 10⁻³. These measurements appear to give solubility data that are too small. In addition the mercury solubility is greater in the electrolyte solution indicating salting in which is not normal behavior. 				
	AUXILIARY	INFORMATION		
METHOD/APPARATUS/P	ROCEDURE :	SOURCE AND PURITY OF MAT	ERIALS:	
The experiment adding five dr polarographic a sample of wate placed on a s hours. The sup analyzed for m tion spectropho 460).	at was performed by ops of mercury from a analyzer to a 500 cm ³ er. The samples were haking table for 19 pernatant liquid was ercury atomic absorp- tometry (Perkin Elmer	 (1) Mercury. Sou Stated to be pur (2) Water. Distille 	rce not given. ce mercury. d.	
		ESTIMATED ERROR:		
		REFERENCES:	······································	

COMPONENTS :	ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6] Mercury-203; ²⁰³ Hg; [13982-78-0]	Hursh, J. B.		
(2) Water; H ₂ O; [7732-18-5]	JAT, J. Appl. Toxicol. <u>1985</u> , 5, 327 - 32.		
VARIABLES:	PREPARED BY:		
<i>T/</i> K = 295, 298	H. L. Clever		
EXPERIMENTAL VALUES:			
Temperature Carrier Ostwald Gas Coefficient ^a	Mercury Solubility at Equilibrium Vapor, Pressure		
	$10^{\circ}c_1/mo1$ dm $32^{\circ}10^{\circ}x_1$ $10^{\circ}m_1/mo1$ kg 10°		
22 295.15 - (3.05) ^C	2.47 4.49 2.48		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.88 5.21 2.89		
^a The Ostwald coefficient is ((ng H above is the average <u>+</u> standard er	g/mL fluid)/(ng Hg/mL gas)). Given ror (number of determinations).		
^b The concentrations were calculated equilibrium with pure liquid mercu of Ambrose and Sprake (ref. 1). T concentration used at each temperat	by the compiler for mercury vapor in ry from the vapor pressure evaluation he mercury vapor pressure and vapor ure are:		
7/K	295 298 19 90 25 62		
$c_1^{p_1/Pa}$ $c_1^{p_1/Pa}$ (ng Hg/mL gas)	16.27 20.73		
^C The Ostwald coefficient in () is extrapolated value from measuremen water + hemoglobin system. See the wald coefficients estimated from da by the compiler are 3.22 and 2.75 f	not an experimental value. It is an hts of the mercury solubility in the at data sheet for more details. Ost- hta in the mercury + water evaluation or 295 and 298 K, respectively.		
AUXILIARY	INFORMATION		
METHOD /APPARATUS / PROCEDURE :	SQURCE AND PURITY OF MATERIALS.		
The equilibrium cell is a 50 mL syringe thermostated in a Dewar flask. A 10 mL liquid sample and a 40 mL carrier gas with Hg vapor sample are drawn into the cell. The cell is turned and rolled on the cylinder axis for 120 to 300 sec. Equilibrium is rapidly attained through the large contact area be- tween liquid and vapor phases. Both the liquid and vapor phases are sampled. The liquid phase is aer- ated and the Hg adsorbed on Hopcar	 (1) Mercury. Prepared by reduction of ²⁰ HgCl₂. The Hg vapor is swept into a leak-proof Saran bag. (2) Water. Deionized and double distilled. 		
lite. The Hg radioactivity is meas-	ESTIMATED EKKOK:		
ured on a liquid scintillation coun- ter. Corrections are applied for the counter efficiency, and for			
radioactive decay of the Hg.	REFERENCES:		
Nitrogen carrier gas was used to prevent oxidation of mercury during the experiment.	<pre>1. Ambrose, D.; Sprake, C. H. S. J. Chem. Thermodynam. <u>1972</u>, 4, 603.</pre>		

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]	Sanemasa, I.
(2) Sea water	Bull. Chem. Soc. Jpn. <u>1975</u> , 48, 1795 - 8.
VARIABLES:	PREPARED BY:
<i>T/</i> K = 278.15 - 303.15	S. H. Johnson H. L. Clever M. Iwamoto

EXPERIMENTAL VALUES:

Temper	rature	Mercury S	olubility
t/°C	<i>T/</i> K	Sea water 10° <i>c₁</i> /g dm ⁻³	Water 10°c ₁ /g dm ⁻¹
5	278.15	17.2	19.2
10	283.15	23.6	27.4
15	288.15	31.6	
20	293.15	40.6	45.0
25	298.15	54.9	63.9
30	303.15	69.7	81.3

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The solubility apparatus is a closed system which consists of several flasks connected by tubing. A 20 g portion of Hg is placed in one flask immersed in thermostat I, and up to 200 ml of water are placed in a second flask immersed in ther-The Hg vapor pressure is mostat II. controlled by the temperature of Nitrogen gas at atm thermostat I. pressure is circulated by the pump. The gas passes over the Hg and bubbles through the water (or solution). One hour circulation saturates both the gas space and water.

The Hg is determined by cold-vapor atomic absorption. The method is based on a reduction-aeration method found by Kimura and Miller (ref. 1). The procedure used is similar to that reported by Omang (ref. 2). The sample and working standard are put through the same procedure. Analyses are done in triplicate. Measurements were made at up to six Hg pressures at each temperature. SOURCE AND PURITY OF MATERIALS:

- Mercury. Metallic mercury purified by distillation under reduced pressure.
- (2) Sea water.

ESTIMATED ERROR: $\delta T/K = \pm 0.05$

 $\delta 10^* c_1 / g \, \mathrm{dm}^{-3} = \pm 0.1$

REFERENCES:

 Kimura, Y.; Miller, V. L. Anal. Chim. Acta <u>1962</u>, 27, 325.

 Omang, S. H. Anal. Chim. Acta <u>1971</u>, 53, 415.

COMPONENTS:	EVALUATOR:
(1) Mercury; Hg; [7439-97-6]	H. Lawrence Clever Chemistry Department
(2) Aqueous Electrolyte and Nonelectrolyte Solutions	Emory University Atlanta, Georgia 30322 USA
	<u>1986</u> , June

CRITICAL EVALUATION:

An Evlauation of the Solubility of Mercury in Aqueous Electrolyte and Nonelectrolyte Solutions.

The solubility of metallic mercury in aqueous elctrolyte solutions has been reported in seven papers. Not enough workers have measured the solubility of mercury in any one electrolyte system over common ranges of temperature and electrolyte concentration to recommend solubility values. Most of the available data are classed as tentative values. Some mercury nonelectrolyte + water systems are included in the section.

The solubility values have been converted to Sechenov salt effect parameters in order to have a common basis of comparison of the effect of the electrolyte on the mercury solubility. The notation used for the Sechenov salt effect parameter is discussed in detail in Solubility Series Volume 10, pp. xxix to xlii. Most of the mercury solubility data are given in one of two forms:

 $k_{scc}/dm^3 mol^{-1} = (1/(c_2/mol dm^{-3})) \log(c_{1,sat}^0)/(c_{1,sat})$

and

$$k_{gmm}/kg \mod^{-1} = (1/(m_2/mol kg^{-1})) \log(m_{1,gat}^2)/(m_{1,gat})$$

where subscripts 1 and 2 refer to mercury and electrolyte, respectively, and the superscript "o" refers to the mercury solubility in pure water.

The Sechenov salt effect parameters for the mercury containing systems are of a similar magnitude to the parameters for typical nonelectrolyte gas, liquid, and solid solutes. The mercury salt effect parameters are probably of a larger uncertainty than for other solutes because the mercury solubility values are of larger uncertainty. Some of the same electrolytes that salt-in typical solutes also salt in mercury. For example tetramethylammonium bromide, tetraethylammonium bromide and sodium thiocyanate. The change in the sign of the salt effect parameter with temperature observed for other solutes is also observed for mercury. The k smm value of sodium chloride changes sign at 324 K from salting-out to salting-in as the temperature increases.

Alpha amino acids and some of their hydrochlorides are included in this section. They appear to abnormally "salt-in" at very low concentrations. All of these data come from one paper, and it would be desirable to have these systems studied further.

Most of the salt effect data come from three papers. These three papers deserve some special comments. Glew and Hames (ref. 2) measured the solubility of mercury in water and in 6.1 mol kg⁻¹ NaCl solution from 278 to 343 K under oxygen free conditions in the presence of trace amounts of reducing agent. The study appears to be a carefully executed experiment and the results are considered to be reliable. The results are compatible with the results of Chviruk and Koneva (ref. 3) who measured the solubility of mercury at four temperatures in 3.42 mol dm⁻³ sodium chloride.

Sanemasa, Haraguchi, and Nagai (ref. 6) measured the solubility of mercury as a function of electrolyte concentration up to one mol dm⁻³ at 298.15 K. The data appears to be internally consistent and the salt effect parameters of the expected magnitude. The evaluator does have some doubts about the method used by the authors. The method does not exclude air, and it seems the times used to establish both liquid mercury liquid-vapor equilibrium and mercury aqueous solution equilibrium are very short. These problems were discussed in more detail in the mercury + water evaluation. However, the 293 - 303 K mercury solubility values in water agree well with the results of other studies. We believe the salt effect data at 298.15 K are reliable. Kawakara *et al.* (ref. 5) report the mercury solubility values in the alpha-amino acid and alpha amino acid hydrochloride solutions in water and in Hanks' balanced salt solutions (composition given on p. 87). For many of these systems the mercury solubility is four to seven times larger in the presence of only 0.0002 to 0.01 mol dm⁻⁷ amino acid or its hydrochloride than it is in pure water. It is not clear why there should be such a large enhancement of solubility in these solutions. It is not clear whether or not oxygen was rigously excluded, or if some chemical interaction might be involved. The results are classed as tentative, but the systems deserve further study.

The individual systems are discussed below. The systems are given in the order of the standard arrangement for inorganic compounds used by the US National Bureau of Standards publications. The number before each system is the standard order number for the cation. The amino acid, amino acid hydrochlorides, and nonelectrolyte systems are at the end.

1 Mercury + Hydrochloric acid [7647-01-0] + Water

Baltisberger *et al.* (ref. 4) report the only salt effect parameter for the system. The $k_{SCC} = 0.072$ at 296.15 K is classed tentative.

18(1) Mercury + Ammonium nitrate [6484-52-2] + Water

Tammann (ref. 1) reports no quantitative data.

18(2) Mercury + Tetramethylammonium bromide [64-20-0] + Water 18(3) Mercury + Tetraethylammonium bromide [71-91-0] + Water

Sanemasa *et al.* (ref. 6) measured the solubility of mercury in four solutions of different tetraalkylammonium bromide concentrations at 298.15 K. Mercury is salted in by both salts. The salt effect parameters below are classed tentative.

Electrolyte	^k scc	_kscx_
Tetramethylammonium bromide	-0.0779	-0.112
Tetraethylammonium bromide	-0.116	-0.176

35 Mercury + Mercury (II) sulfide [1344-48-5] + Water Mercury + Cinnabar [19122-79-3] + Water

Mukimova and Bykovskaya (ref. 11) experimentally determined the mercury solubility from mercury containing cinnabar in distilled and natural waters in contact with shales and carbonate rocks. This is not a real salt effect study, but a study of a natural system. According to the abstract the mercury dissolves in concentration of $(0.2 - 2) \times 10^{-6}$ g dm⁻³. The original paper was not available.

96 Mercury + Barium chloride [10361-37-2] + Water

Sanemasa *et al.* (ref. 6) measured the solubility of mercury in solutions of 0.250, 0.500, and 0.750 molar barium chloride at 298.15 K. The mercury is salted out. The salt effect parameters are:

 $k_{scc}/dm^3 mol^{-1} = 0.115$ $k_{scx}/dm^3 mol^{-1} = 0.121$

The values are smaller than expected for a 2-1 electrolyte. They are classed tentative, but should be used with caution.

99(1) Mercury + Sodium fluoride [7681-49-4] + Water

Sanemasa *et a1*. (ref. 6) measured the solubility of mercury in solutions of 0.250, 0.500, and 0.750 molar sodium fluoride at 298.15 K. The mercury is salted out. The salt effect parameters are:

Mercury in Aqueous Electrolyte and Nonelectrolyte Solutions

COMPONENTS:			EVALUATOR	:		
 Mercury Aqueous Noneleo 	7; Hg; [743 Electroly ctrolyte So	9-97-6] te and lutions	H. Law Chemis Emory Atlant	rence Clev try Depart University a, Georgia	er ment 30322	USA
			<u>1986</u> ,	June		
CRITICAL EVAL	JATION:					
		k _{scc} /dm³ k _{scx} /dm³	$mol^{-1} = 0.$ $mol^{-1} = 0.$	157 174		
The values	are classe	ed as tentative	•			
99(2) Merc	cury + Sodi	um chloride [7	647-14-5]	+ Water		
Glew and H (ref. 4), bility of	ames (ref. Sanemasa <i>e</i> mercury i	2), Chviruk an t al. (ref. 6) n aqueous sol	d Koneva , and Hurs utions of ers are gi	(ref. 3), B sh (ref. 7 sodium c ven in the	altisber) report hloride. followin	ger <i>et al</i> . the solu- The salt ng table.
effect par						_
effect par T/K		Salt eff	ect parame	ter, k _{scc}		k _{smm}
effect par	Chviruk,	Salt eff Baltisberger et al.	ect parame Sanemasa et al.	ter, k _{scc} Hursh	Glew and	k _{smm} Hames
effect par	Chviruk, Koneva (ref. 3)	Salt eff Baltisberger et al. (ref. 4)	sanemasa et al. (ref. 6)	ter, k _{scc} Hursh (ref. 7)	Glew and (ref. 2)	k _{smm} Hames
effect par 273.2 278.2 283.2 288.2 293.2 293.2 295.2	Chviruk, Koneva (ref. 3)	Salt eff Baltisberger et al. (ref. 4)	Sanemasa et al. (ref. 6)	ter, k _{scc} Hursh (ref. 7)	Glew and (ref. 2) (0.099)	k _{smm} Hames 0.112 0.095 0.080 0.065 0.053
effect par 273.2 278.2 283.2 288.2 293.2 295.2 295.2 296.2 298.2 303.2	Chviruk, Koneva (ref. 3)	Salt eff Baltisberger et al. (ref. 4) 0.70, 0.22	Sanemasa et al. (ref. 6)	ter, k _{scc} Hursh (ref. 7) 0.54	Glew and (ref. 2) (0.099)	k _{smm} Hames 0.112 0.095 0.080 0.065 0.053 - - 0.041 0.031
effect par T/K 273.2 278.2 283.2 288.2 293.2 295.2 295.2 296.2 298.2 303.2 308.2 313.2 318.2 323.2	Chviruk, Koneva (ref. 3) 0.119 0.051	Salt eff Baltisberger et al. (ref. 4) 0.70, 0.22	Sanemasa et al. (ref. 6)	ter, k _{scc} Hursh (ref. 7) 0.54	Glew and (ref. 2) (0.099) (0.056)	k _{smm} Hames 0.112 0.095 0.080 0.065 0.053 - - 0.041 0.031 0.022 0.014 0.007 0.001
effect par T/K 273.2 278.2 283.2 288.2 293.2 295.2 296.2 296.2 298.2 303.2 308.2 313.2 318.2 328.2 328.2 333.2 338.2	Chviruk, Koneva (ref. 3) 0.119 0.051 0.000	Salt eff Baltisberger et al. (ref. 4) 0.70, 0.22	Sanemasa et al. (ref. 6)	ter, k _{scc} Hursh (ref. 7) 0.54	Glew and (ref. 2) (0.099) (0.056) (0.027)	k _{smm} Hames 0.112 0.095 0.080 0.065 0.053 - - 0.041 0.031 0.022 0.014 0.007 0.001 -0.004 -0.009 -0.013

The $k_{\rm SMM}$ values of Glew and Hames are the authors' smoothed values. The values in () are $k_{\rm SCC}$ values calculated by the evaluator from the Glew and Hames results. The other values are calculated from the individual solubility values. The Baltisberger *et al.* and the Hursh values are for sodium chloride concentrations of 0.01, 0.1, and 0.155 mol dm⁻³, respectively. Salt effect parameters measured at these low electrolyte concentrations are seldom reliable, and these are classed as doubtful. Chviruk and Koneva did not measure the solubility of mercury in water. The evaluator calculated the salt effect parameters using evaluated mercury solubilities in water. The results agree well with the Glew and Hames results including agreement on a change from salting out to salting in by sodium chloride between 333 K and 343 K. The results of Chviruk and Koneva, Sanemasa *et al.*, and Glew and Hames are classed as tentative. We prefer the use of the Glew and Hames data as a self-consistent data set extending over a 70 degree temperature interval.

Wu and Qi (ref. 10) report a study titled "Solubility factors of elemental mercury, mercury oxides and mercury sulfides". They give data and discuss the effect of chloride ion concentration as well as humic acids and weathered coal fulvic acids on the solubility of Hg, HgO, and HgS. We were unable to obtain a reliable translation of their paper and no data sheet was prepared. 99(3) Mercury + Sodium bromide [7647-15-6] + water 99(4) Mercury + Sodium iodide [7681-82-5] + Water 99(5) Mercury + Sodium perchlorate [7601-89-0] + Water 99(6) Mercury + Sodium sulfate [7757-82-6] + Water 99(7) Mercury + Sodium nitrate [7631-99-4] + Water 99(8) Mercury + Sodium thiocyanate [540-72-7] + Water

Sanemasa, Haraguchi, and Nagai (ref. 6) reported the salt effect parameters for the above sodium salts. They measured the solubility of mercury at four electrolyte concentrations at 298.15 K. The salt effect parameter is taken as the slope of a plot of log (solubility) vs. electrolyte concentration. The plot was not forced through the origin. Sodium thiocyanate salts in which has been observed for some other nonelectrolyte solutes. Sodium perchlorate salts out more than the sodium halides which is not the usual trend with other solutes. No data were obtained for the sodium iodide. Use of the iodide ion gave abnormal results possibly due to some chemical reaction with the mercury. Although we have expressed some doubt about the authors' method we believe their data at 298 K are reliable and the values are classed tentative. The salt effect parameters are summarized below.

^k scc	^k scx
نحذ هبا هت هت ها دل	
0.017	0.023
0.117	0.114
0.308	0.319
0.062	0.065
-0.035	-0.034
	^k scc 0.017 0.117 0.308 0.062 -0.035

100 Mercury + Potassium chloride [7447-40-7] + Water

Sanemasa *et al.* (ref. 6) measured the solubility of mercury in four concentrations of potassium chloride between 0.250 and 1.000 mol dm⁻³ at 298 K. See section above for comments about method and reliabliity. The results are classed as tentative.

> $k_{scc}/dm^3 mol^{-1} = 0.070$ $k_{scx}/dm^3 mol^{-1} = 0.074$

Mercury + Alpha-amino acids and hydrochlorides + Water

Kawakara *et al.* (ref. 5) have measured the solubility of mercury in water and in Hanks' balanced salt solution in the presence of up to 0.01 mol dm⁻³ alpha-amino acids and some of their hydrochlorides. The solubility of mercury is greater in the presence of the alpha-amino acid component than in either pure water or Hanks' salt solution. Mercury is 2.35 times more soluble in Hanks' balanced salt solution than in water. When alphaamino acid or hydrochloride is added to either water or balanced salt solution the solubility is often increased by a factor of between four to seven. Salt effect parameters have not been calculated for these systems. The increase in mercuy solubilities are summarized below. The alpha-amino acids are identified by their Chemical Abstracts Registry Number, IUPAC abbreviation, and semiempirical formula.

Alpha-amino acid or Hydrochloride	Solvent	°2	°1/c ₁
[56-41-7] Ala CH ₃ CH(NH ₂)COOH	water	0.00056	5.9
[56-84-8] Азр нооссн (NH ₂) сн ₂ соон	water	0.00045	5.9
[72-19-5] Thr CH ₃ CHOHCH (NH ₂) COOH	water	0.00050	7.7
Table continued on next page.			

MPONENTS :	EVALUATOR:		
 Mercury; Hg; [7439-97-6] Aqueous Electrolyte and Nonelectrolyte Solutions 	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA 1986, June		
ITICAL EVALUATION:		<u></u>	
Alpha-amino acid or Hydrochloride	Solvent	°2	c ₁ /c ₁
[147-85-3] Pro CH ₂ -CH ₂ CH ₂ CHCOOH NH	water	0.00035	5.0
[56-85-9] Gln HOOCCH(NH ₂)CH ₂ CH ₂ CONH ₂	water	0.00068 0.01	12.4 10.6
[63-68-3] Met CH ₃ SCH ₂ CH ₂ CH(NH ₂)COOH	water Hanks'	0.00020 0.01 0.01	1.1 4.9 2.2
[61-90~5] Leu (CH ₃) ₂ CHCH ₂ CH(NH ₂)COOH	water	0.000915	4.2
[73-32-5] Ile СH ₃ CH ₂ CH (CH ₃) CH (NH ₂) СООН	water	0.00030	2.6
[63-91-2] Phe C ₆ H ₅ CH ₂ CH(NH ₂)COOH	water	0.0003	6.2
[60-18-4] Tyr p-HOC ₆ H ₄ CH ₂ CH (NH ₂) COOH	water	0.00022 0.01	5.9 3.1
[52-89-1] Cys.HCl HSCH ₂ CH(NH ₂)COOH.HCl	water Hanks'	0.00000063 0.01 0.01	19.4 908. 479.
[645-35-2] His.HCl N — CHCH ₂ CH(NH ₂)COOH.HCl CH CH NH	water Hanks'	0.01 0.01	10.8 17.3
[3184-13-2] Orn.HCl NH ₂ (CH ₂) ₃ CH (NH ₂)COOH.HCl	water	0.01	1.8
	Hanks'	0.01	4.7
[657-27-2] Lys.HCl NH ₂ (CH ₂) ₄ CH(NH ₂)COOH.HCl	water Hanks'	0.00038 0.01 0.01	1.8 1.6 5.8
[1119-34-2] Arg.HCl	water	0,00033	4.8
MI-COMP2/MICCI2/3CHONH2/COOH.HCJ	Hanks'	0.01	1.6

The solubility ratios for the amino acid containing systems in Hanks' balanced salt solution are referenced to the solubility of mercury in the Hanks' balanced salt solution. The superscript "o" in the c_1/c_1° ratio refers to the mercury solubility in either water or Hanks' balanced salt solution.

Several trends show in the data. Solutions containing 0.0002 to 0.0007 mol dm⁻³ amino acid enhance the mercury solubility 4 to 8 times over its solubility in water, but there is a decrease in the ratio when one increases the concentration to 0.01. However, solutions containing methionine, ornithine HCl, or lysine HCl are exceptions to the trend. A compound containing ~SH greatly enhances the mercury solubility, but one containing C-S-C does not. Mercury in the presence of alpha amino acid hydrochlorides is more soluble in the Hanks' balanced salt solutions than

in the corresponding water solutions. Arginine HCl is an exception.

The reliability of these data is impossible to judge. It is not clear whether or not oxygen was rigoursly excluded, nor is it clear whether or not a direct chemical interaction occurs in some of the systems. These data need confirmation by further experimental studies. For now they are classed as tentative.

Another paper from the same laboratory, Kawahara *et al.* (ref. 9), reports the solubility of mercury from high copper, conventional, and copper dental amalgams in a tissue culture medium (YLH). Data sheets containing the graphical results were prepared (pp. 100 - 1). The data are classed tentative.

Mercury + Humus + Water

Gjessing and Rogne (ref. 8) have measured the solubility of mercury in various natural humus containing waters. They conclude that the presence of humus enhances the solubility of mercury. From our knowledge of the behavior of other humus containing systems we suspect this is true. However, the present study is not conclusive because it reports a mercury solubility in water that is much too small. The data are classed doubtful.

Mercury + Blood and Various Blood Components

Hursh (ref. 7) has measured the solubility of mercury vapor in whole blood, plasma, and aqueous hemoglobin solutions. Care was taken to prevent the oxidation of mercury by the oxygen of the air. The results are consistent with the hemoglobin of whole blood binding up to one-half the mercury dissolved. The experiments appear to have been carefully done, and the results are classed tentative.

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COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]	Baltisberger, R. J.; Hildebrand,
<pre>(2) Hydrogen chloride; HCl; [7647-01-0]</pre>	D. A.; Grieble, D.; Ballintine, T. A.
(3) Water; H ₂ O; [7732-18-5]	Anal. Chim. Acta <u>1979</u> , 111, 111 - 2.
VARIABLES:	PREPARED BY:
<i>T</i> /K = 296.15, 303.15	H. L. Clever M. Iwamoto
EXPERIMENTAL VALUES:	
Temperature Hydrogen Merc	ury solubility Salt
chloride	Concentration ^C Parameter
$c_2/\text{mol dm}^{-3}$	$10^{7}c_{1}/mol dm^{-3}$ $k_{\rm SCC}/dm^{3} mol^{-1}$
30 303.15 0 63 <u>+</u> 2	^b $3.1_4 \pm 0.10$ -
23 296.15 0.1 59	2.9 ₄ 0.072
^a ppb = parts per billion.	
^b Standard deviation of ten analyses.	
Calculated by compilers. The molar	solubility was calculated assuming
grams of mercury per 1 x 10° cm³ of	solution.
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
nitrogen gas for 45 minutes, a drop of mercury was added, and then the mixture sparged another 30 minutes	(1) Mercury. Prepared by distilla- tion from mercury(II) oxide un- der a N ₂ atmosphere.
with nitrogen. Solutions were stir- red for 24 hours with a glass-co- vered stirring bar. Samples of so-	 Hydrogen chloride. From analy- tical grade reagent and solu- tion.
with a maintained nitrogen flow to prevent oxygen diffusion into the solutions.	(3) Water. Triple distilled.
An aliquot of the saturated solu-	ECTIMATED EDDOD.
tion was transferred to a non-redu- cing cell. The mercury was collec- ted by nitrogen sparging and ana- lyzed by cold vapor atomic absorp- tion.	See standard deviation of solubil- ity in water above.
The non-reducing cell was a cell that had never contacted reducing agents.	REFERENCES :
Hg + H_2O was quite prone to oxida- tion. The presence of Cl ⁻ prevented the disproportionation of any Hg(I).	

Mercury in Aqueous Electrolyte and Nonelectrolyte Solutions

COMPONENTS -	ADICINAL MEACUDENENDS .
(1) MORGURY: H_{0} , $[7/39-97-6]$	Mammann C
(1) Mercury; ng; (1439-97-01	
(2) Ammonium nitrate; NH ₄ NO ₃ ; [6484-52-2]	Z. Anorg. Allgem. Chem. <u>1922</u> , 121, 275 - 80.
(3) Water; H ₂ O; [7732-18-5]	
VARIABLES:	PREPARED BY:
Room temperature to solution boiling point.	H. L. Clever
EXPERIMENTAL VALUES:	
Tammann confirmed the repor	t of Hodgkinson and
Coot [Chem. News <u>1904</u> , 90, 1	42] that mercury was
insoluble in 50 % aqueous an	nmonium nitrate. The
report is of doubtful value	considering present
methods of measuring small an	mounts of mercury.
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
	ESTIMATED ERROR:
	REFERENCES :

COMPONENTS :		ORIGINAL MEASUREMENTS:				
(1) Mercury; Hg; [7439-97-6]		Sanemasa, I.; Haraguchi, K.; Nagai, H.				
(2) N, br br	N,N-Trime omide or omide; ()	ethylmethanam Tetramethyla CH ₃) ₄ NBr; [64	inium mmonium -20-0]	Bull. Chem. S 1040 - 3.	loc. Jpn .	<u>1981</u> , 54,
(3) Wa	ter; H ₂ O;	[7732-18-5]				
VARIABLE	ES :			PREPARED BY:		
c2/	T/K mol dm ⁻	= 298.15 = 0 - 1.00		S. H. Johnsor H. L. Clever M. Iwamoto	1	
EXPERIME	ENTAL VALUE	S:				
Temper	ature	Electrolyte	Solubilit Ratio	y log(c [§] /c ₁) at lim	Salt Effe	ct Parameter
t/°C	<i>T/</i> K	c ₂ /mol dm ⁻³	c1/c1	$c_2 \rightarrow 0$		^k scx
25	298.15	0.250	0.968		-0.056	
		0.500	0.923		-0.070	
		0.750	0.886		-0.070	
		1.00	0.845		-0.073	
				0.0051 ^a	-0.0779 ^a	-0.112
a _{Autho}	ors' valu	es which are	the interc	ept and slope of	of log(cg/c	1) vs. c ₂ .
The ot	cher k _{scc}	values were	calculated	by the compile	er from:	
The k.	value	k _{sc} s were calcul	$c = (1/c_2)$ ated by th	x log(c1/c1) e authors from	:	
where ¢/cm³	<pre></pre>	$k_{scx} = k_{e}$ apparent mol 114.28.	cc + (0.03 ar volume	$6 - \Phi \times 10^{-3})/2$ of the salt. I	2.30 For this sy	stem
The so deter	olubility mination	of mercury of 63.9 x 10	in water i ⁻ g dm ⁻³ .	s based on Sane	emasa's (rei	E. 3) earlier
Note:	k _{scc} /dm³	$mol^{-1} = (1/6)$	$c_2/mol dm^{-1}$	³))log(c ₁ /c ₁);	$k_{\rm scx} = (1/$	$(c_2) \log(x_1^9/x_1)$
			AUXILIARY	INFORMATION		
METHOD	APPARATUS /	PROCEDURE :		SOURCE AND PURTT	V OF MATERIAL	
The	solubi	lity appara	tus is a	(1) Mercury.	Source not	t given. Pur-
close	d system	which consis	ts of se-	ified by	distilla	ation under
	portion of	of Hg is plac	ed in one	Ieduceu F	ressure.	
flask	immersed	in thermost	at I, and	(2) Tetrameth	ylammonium	bromide.
a sec	ond flas	k immersed i	n thermo-	and weigh	ned.	grade. Dried
stat	II. The	Hg vapor pr	essure is	(3) Wator D	odiatillod	water Beth
therm	nostat I.	Nitrogen g	as at atm	aerated a	and deoxyq	enated water
press	ure is c	irculated by	the pump.	were used	l with no d	ifference.
bles	through	the water	(or solu-	ESTIMATED ERROR		
tion)	. One ho	ur circulat	ion satu-	δ7/	K = +0.05	
The	Hg is de	termined by	cold-vapor	10" 8c1/g dm-	$\frac{1}{2} = \frac{1}{2} 0.1$	
atomi	ic absorp	ption. The	method is	s(c1/c1	$) = \pm 0.005$	
found	by Kimu	ra and Miller	(ref. 1).	REFERENCES:		
The Inthe	procedure	e used is s d by Omang	imilar to	L. Kimura, Y.	; Miller, Mill	V. L.
The s	ample and	a working sta	andard are	2. Omang, S.	H.	<u>~~</u> ; .;; 525.
Analy	through vses are	the same p done in +r	rocedure.	Anal. Chim 3. Sanemasa.	. Acta <u>19</u> I.	<u>71, 53, 415.</u>
Measu	rements	were made at	up to six	Bull. Chem	. Soc. Jpn	. <u>1975</u> , 48,
нg pr	essures a	it each tempe	rature.	T T/22.		

Mercury in Aqueous Electrolyte and Nonelectrolyte Solutions

COMPONENTS:	ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6]	Sanemasa, I.; Haraguchi, K.; Nagai, H.		
(2) N,N,N-Triethylmethanaminium bromide or Tetraethylammonium bromide; (C ₂ H ₅) ₄ NBr; [71-91-0]	Bull. Chem. Soc. Jpn. <u>1981</u> , 54, 1040 - 3.		
(3) Water; H ₂ O; [7732-18-5]			
VARIABLES:	PREPARED BY:		
T/K = 298.15 $c_2/mol dm^{-3} = 0 - 0.995$	S. H. Johnson H. L. Clever M. Iwamoto		
EXPERIMENTAL VALUES:			
Temperature Electrolyte Solubilit Ratio	y $\log(c_1^{\circ}/c_1)$ Salt Effect Parameter at lim		
$t/^{\circ}C$ T/K $c_2/\text{mol dm}^{-3}$ c_1/c_1	$c_2 \rightarrow 0$ $k_{\rm scc}$ $k_{\rm scx}$		
25 298.15 0.250 0.933	-0.120		
0.500 0.870	-0.120		
0.746 0.812	-0.121		
0.995 0.766	-0.116		
	-0.0022 ^a -0.116 ^a -0.176		
^a Authors' values which are the interc	ept and slope of $log(c_1/c_1)$ vs. c_2 .		
The other k_{rec} values were calculated	by the compiler from:		
The k_{scc} values were calculated by th	x log(c ⁹ /c ₁) e authors from:		
$k_{\text{scx}} = k_{\text{scc}} + (0.03)$ where Φ is the apparent molar volume $\Phi/\text{cm}^3 \text{ mol}^{-1} = 173.83$.	$6 - \Phi \times 10^{-3})/2.30$ of the salt. For this system		
The solubility of mercury in water is determination of 63.9 x 10 ⁻⁴ g dm ⁻³ .	s based on Sanemasa's (ref. 3) earlier		
Note: $k_{\rm scc}/{\rm dm^3} {\rm mol^{-1}} = (1/(c_2/{\rm mol} {\rm dm^{-1}}))$	$(s_1) \log(c_1^0/c_1); k_{SCX} = (1/c_2) \log(x_1^0/x_1)$		
AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:		
The solubility apparatus is a closed system which consists of se- veral flasks connected by tubing. A	(1) Mercury. Source not given. Pur- ified by distillation under reduced pressure.		
20 g portion of Hg is placed in one flask immersed in thermostat I, and up to 200 ml of water are placed in	(2) Tetraethylammonium bromide. An-		
a second flask immersed in thermo- stat II. The Hg vapor pressure is	and weighed.		
controlled by the temperature of	(3) Water Pedistilled water Peth		
pressure is circulated by the pump.	aerated and deoxygenated water		
bles through the water (or solu-	ESTIMATED ERROR:		
rates both the gas space and water.	$\delta T/K = \pm 0.05$		
The Hg is determined by cold-Vapor atomic absorption. The method is	$\frac{10007}{5(c_1^0/c_1)} = \pm 0.005$		
based on a reduction-aeration method found by Kimura and Miller (ref. 1).	REFERENCES:		
The procedure used is similar to that reported by Omang (ref. 2).	1. Kimura, Y.; Miller, V. L. Anal. Chim. Acta <u>19</u> 62, 27, 325.		
The sample and working standard are	2. Omang, S. H. Anal. Chim. Acta 1971 53 A15		
Analyses are done in triplicate.	3. Sanemasa, I. Bull. Chem. Soc. Jnn. 1975 49		
Hg pressures at each temperature.	1795.		

COMPONENTS :	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]	Mukimova, D. S.; Bykovskaya, L. P.
(2) Cinnabar; HgS; [19122-79-3]	Vopr. Reg. Geol. Petrol. Sredn. Azii <u>1975</u> , 148 - 54. Chem. Abetr. <u>1977</u> , 87, 26346p.
VARIABLES:	PREPARED BY:
	H. L. Clever

EXPERIMENTAL VALUES:

The paper was not available. Part of the abstract is reproduced below.

"The experimental solubility of mercury was determined in cinnabar and rocks of the primary dispersion haloes, which had mercury content: shale 0.001, dolostone 0.015, volcanic rocks 0.0001, and effusive-sedimentary rocks 0.005 weight %, in distilled, natural (pH 6.5 and 5.5), and aggressive natural (pH 6.5 and 5.5) waters. The mercury was dissolved from the mercury containing minerals and rocks and subsequently absorbed with the shales absorbing more mercury than the carbonate rocks. The mercury in intrusive and effusive rocks dissolved in concentrations of (0.2 to 2) x 10^{-6} g dm⁻³; its concentration continually increased over a six month period. Zones with high and low content of mercury in water were observed during the dissolution because of dissolution and absorption of mercury in the rocks."

The paper may contain pertinent data but its usefulness can not be determined from the abstract. The paper is discussed in the salt effect evaluation, although it is not a salt effect study. It appears to be a study of a natural system of mercury containing minerals and rocks in contact with water.

AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS;		
	ESTIMATED ERROR: REFERENCES:		

COMPONENTS:			ORIGINAL MEASUREM	ENTS:	
(1) Mercury;	Hg; [7439-97-6	51	Sanemasa, I.; Nagai, H.	; Haraguchi,	K.;
(2) Barium ch. [10361-37·	loride; BaCl ₂ ; -2]	2	Bull. Chem. 1	Soc. Jpn. <u>1</u>	<u>.981, 54,</u>
(3) Water; H ₂ (D; [7732-18-5]		1040 - 3.		
VARIABLES:	····		PREPARED BY:		
T/I c ₂ /mol dm ⁻	x = 298.15 x = 0 - 0.750		S. H. Johnson H. L. Clever M. Iwamoto	n	
EXPERIMENTAL VALU	ES:		I		
Temperature	Electrolyte	Solubilit	y $\log(c_1^o/c_1)$	Salt Effec	t Parameter
t/°C T/K	c2/mol dm-3	c_1^2/c_1	$c_2 \rightarrow 0$	k _{scc}	kscx
25 298.15	0.250	1.080		0.134	
	0.500	1.148		0.120	
	0.750	1.233		0.121	
			0.0039 ^a	0.115 ^a	0.121
^a Authors' valu The other k_{sco}	es which are values were	the interc calculated $c = (1/c_2)$	ept and slope of by the compile x log(c%/c7)	of $\log(c_1^\circ/c_1$ er from:) vs. c ₂ .
The k _{scx} value	es were calcul	ated by th	e authors from:		
where Φ is the $\Phi/cm^3 \mod^{-1} =$	$k_{\text{scx}} = k_{\text{s}}$ e apparent mol 23.19.	cc + (0.03 ar volume	$6 - \Phi \times 10^{-3})/2$ of the salt. F	or this sys	tem
The solubility determination	y of mercury : h of 63.9 x 10	in water is 'g dm''.	s based on Sane	masa's (ref.	3) earlier
Note: k _{scc} /dm ¹	³ mol ⁻¹ = (1/(c ₂ /mol dm ⁻	³))log(c ₁ /c ₁);	$k_{\rm SCX} = (1/c$	$_{2}) \log(x_{1}^{o}/x_{1})$
		AUXILIARY	INFORMATION		
METHOD/APPARATUS/	PROCEDURE:	tue ie a	SOURCE AND PURITY	OF MATERIALS	; given Pur-
closed system veral flasks	which consist connected by	ts of se- tubing. A	ified by reduced p	distillat ressure.	ion under
20 g portion flask immerse up to 200 ml c a second flas	of Hg is plac d in thermost of water are] k immersed in	ed in one at I, and placed in h thermo-	(2) Barium c reagent weighed.	chloride. grade. I	Analytical Dried and
stat II. The controlled by thermostat I. pressure is c The gas passe	Hg vapor pre y the temper Nitrogen ga irculated by s over the Hg	ature is ature of as at atm the pump. and bub-	(3) Water. Re aerated a were used	edistilled w nd deoxygen with no dif	ater. Both ated water fference.
(bles through tion). One ho	the water (our circulati	or solu- on satu-	ESTIMATED ERROR:		
rates both the The Hg is de	gas space an termined by c	d water. old-vapor		$x = \pm 0.05$ $y = \pm 0.1$ $z = \pm 0.005$	
based on a red	uction-aerati	on method			
found by Kimur	ra and Miller	(ref. 1). milar to	L. Kimura. V.	Miller. V.	I.
that reporte	d by Omang	(ref. 2).	Anal. Chim.	Acta <u>1962</u>	, 27, 325.
The sample and put through	i working sta the same pr	ndard are ocedure.	2. Omang, S. H Anal. Chim.	Acta <u>19</u> 71	, 53, 415.
Analyses are	done in tra	iplicate.	3. Sanemasa, 1 Bull. Chem	Soc. Inm	1975. 48
Hg pressures a	it each temper	ature.	1795.	. The obut	<u>+2/3</u> , +0,

Components :			ORIGINAL MEASUREMENTS:			
(1) Mercury; Hg; [7439-97-6]			Sanemasa, I.; Haraguchi, K.; Nagai, H.			
<pre>(2) Sodium fluoride; NaF; [7681-49-4]</pre>			Bull. Chem.	Soc. Jpn.	<u>1981</u> , 54,	
(3) Water; H ₂ O; [7732-18-5]			1040 - 3.			
VARIABLES :			PREPARED BY.			
T/K = 298.15 $c_2/mol dm^{-3} = 0 - 0.750$			S. H. Johnso H. L. Clever M. Iwamoto	n		
EXPERIMENTAL VALU	JES:					
Temperature	Electrolvte	Solubilit	y log(c%/c1)	Salt Effe	ct Parameter	
t/°C T/K	c ₂ /mol dm ⁻³	Ratio c ₁ /c ₁	at lim $c_2 \rightarrow 0$		k _{scx}	
25 298.15	0.250	1.102		0.169		
	0.500	1.207		0.163		
	0.750	1.321		0.161		
	0.750	1.521		0.101		
			0.00294	0.1574	0.174	
The solubilit determinatio Note: k _{scc} /dm	y of mercury : n of 63.9 x 10 ³ mol ⁻¹ = (1/(in water is ^{-®} g dm ⁻³ . Ce ₂ /mol dm ⁻	<pre>s based on Sand 3))log(c¹/c₁);</pre>	emasa's (ref k _{scx} = (1/	<pre>5. 3) earlier 6. 2)log(x⁰/x₁)</pre>	
		AUXILIARY	INFORMATION			
METHOD/APPARATUS	/PROCEDURE:		SOURCE AND PURIT	Y OF MATERIAL	S;	
The solubility apparatus is a closed system which consists of se- veral flasks connected by tubing. A 20 g portion of Hg is placed in one flask immersed in thermostat I, and up to 200 ml of water are placed in a second flask immersed in thermo- stat II. The Hg vapor pressure is controlled by the temperature of thermostat I. Nitrogen gas at atm pressure is circulated by the pump. The gas passes over the Hg and bub-			(1) Mercury. Source not given. Pur- ified by distillation under reduced pressure.			
			 (2) Sodium f reagent weighed. (3) Water. R aerated a were used 	luoride. grade. edistilled and deoxyge with no di	Analytical Dried and water. Both enated water ifference.	
bles through tion). One h rates both th The Hg is d atomic absor based on a re found by Kimu The procedur that report The sample ar put through Analyses are	the water our circulation etermined by control ption. The production-aeration and Miller working station the same pro- e done in tr	(or solu- ion satu- nd water. cold-vapor method is on method (ref. 1). milar to (ref. 2). mdard are cocedure. iplicate.	ESTIMATED ERROR: $\delta T/$ $10^{\circ} \delta c_{1}/g dm^{-1}$ $\delta (c_{1}^{\circ}/c_{1})$ REFERENCES: 1. Kimura, Y. Anal. Chim 2. Omang, S. Anal. Chim 3. Sanemasa.	$K = \pm 0.05$ $i = \pm 0.1$ $j = \pm 0.005$; Miller, V . Acta <u>196</u> H. . Acta <u>197</u> I.	⁷ . L. <u>2</u> , 27, 325. <u>1</u> , 53, 415.	
Measurements were made at up to six Hg pressures at each temperature.			Bull. Chem 1795.	. Soc. Jpn.	<u>1975</u> , 48,	

OMPONENTS:			ORIGINAL MEASU	ORIGINAL MEASUREMENTS:			
(1) Mercury; Hg; [7439-97-6]			Glew, D. N	Glew, D. N.; Hames, D. A.			
<pre>(2) Sodium chloride; NaCl; [7647-14-5]</pre>			Can. J. Ch	em. <u>197</u>	<u>2</u> , 50, 3124 - 8.		
3) Water	; H ₂ 0; [7732-18-5]					
PERIMENTAL	VALUES:					-	
 Temperature		Sodium chloride	Mercury Solubility		Salt Effect		
t/°C	<i>T/</i> K	<i>m₂/</i> mol kg ⁻¹	10° <i>m</i> ₁ /mol kg ⁻¹	10°x ₁ ^a	Parameter k _{smm} /kg mol ^{-1a}		
5.24	278.37	0.0 6.10 6.10 6.10 6.10 6.10	21.8 5.05 5.25 5.65 6.35	3.93 0.746 0.775 0.775 0.938	0.104 0.101 0.096 0.096 0.088		
5.35	278.48	0.0 6.10	21.8 5.89	3.93 0.870	0.093		
10.17	283.32	0.0 6.10 6.10 6.10	23.1 7.40 7.44 7.61	4.16 1.093 1.106 1.124	0.081 0.080 0.079		
15.01	288.16	0.0 6.12 6.12	24.7 10.8 11.2	4.45 1.594 1.653	0.059 0.056		
19.92	293.07	0.0 6.13 6.13 6.13 6.13 6.13	26.8 12.1 13.7 15.1 15.2	4.83 1.93 2.02 2.23 2.24	0.051 0.048 0.041 0.040		
25.02	298.17	0.0 6.14 6.14 6.14 6.14 6.14	29.3 15.6 15.6 16.7 16.9	5.28 2.30 2.30 2.46 2.49	- 0.045 0.045 0.040 0.039		
30.27	303.42	0.0 6.09 6.09 6.09 6.09 6.09	32.5 18.7 19.6 20.4 20.4	5.85 2.76 2.90 3.01 3.01	0.039 0.036 0.033 0.033		
34.96	308.11	0.0 6.18 6.18 6.18 6.18 6.18	36.0 25.1 26.3 27.5 27.6	6.49 3.70 3.88 4.05 4.07	0.025 0.022 0.019 0.019		
40.02	313.17	0.0 6.21 6.21	40.3 31.3 32.9	7.26 4.61 4.84	0.0177 0.0143		
44.86	318.01	0.0 6.18 6.18 6.18	45.4 37.1 38.8 41.2	8.18 5.47 5.72 6.07	0.0142 0.0110 0.0068		
50.07	323.22	0.0 6.09 6.09	51.8 46.5 49.8	9.33 6.87 7.36	0.0077 0.0028		

^aCalculated by compiler.

Continued on the next page.

COMPONENTS :	ORIGINAL MEASUREMENTS:									
(1) Mercury; Hg; [7439-97-6]	Glew, D. N.; Hames, D. A.									
<pre>(2) Sodium chloride; NaCl; [7647-14-5]</pre>	Can. J. Chem. <u>1972</u> , 50, 3124 - 8.									
(3) Water; H ₂ O; [7732-18-5]										
VARIABLES:	PREPARED BY:									
T/K = 278.39 - 342.92 $m_2/mol kg^{-1} = 6.09 - 6.29$	H. L. Clever									
EXPERIMENTAL VALUES:										
Temperature Sodium chloride	ercury Solubility Salt Effect									
t/°C T/K m ₂ /mol kg ⁻¹ 1	$0^{\circ}m_1/\text{mol kg}^{-1}$ $10^{\circ}x_1^{a}$ $k_{\text{smm}}/\text{kg mol}^{-1a}$									
54.99 328.14 0.0	59.1 10.65 -									
6.29	58.9 8.65 0.0002									
6.29	61.9 9.09 -0.0032									
6.29	67.4 9.90 -0.0091									
6.29	68.7 10.09 -0.0104									
6.29	68.9 10.12 -0.0106									
60.12 333.27 0.0	68.1 12.27 -									
6.18										
0.18	/6.0 11.20 -0.00//									
65 28 229 42 0.0	791 14.25 -									
6 18	96.8 14.25 -0.0142									
6.18	97.5 14.37 -0.0147									
0.10	5/15 1405/ 01014/									
69.77 342.92 0.0	90.4 16.29 -									
6.18	112 16.5 -0.0151									
6.18	119 17.5 -0.0193									
رهم هم جن جن هم رود هم هو رود هم هو رود هم هم هو رود وي وي بري بي وي وي وي الا اللا اللا اللا الله عن هم هم هم	ی چو بی ما ما ما ما ما ما ما ما ما مو بو بی به به به به به به به به به ما به بو بو به ب									
AUXILIARY	INFORMATION									
METHOD APPARATUS / PROCEDURE .										
The colubility coll and torners-	SOURCE AND PURITY OF MATERIALS:									
turo recoording equipment were	arade, purified as follows, agin									
dongribod oprior (rof 1 and 2)	tated with air and wached with									
mbo water and mercury were dir-	108 NaOW distilled water, 59									
tilled into the events of colubility	HNO. filtered through Au foil									
Coll Sufficient NaCl was added	rewashed with 5% HNO, and dis-									
under He to make the solution about	tilled water, distilled three									
6.1 molal. About 0.001 molal bydra-	times.									
zine hydrate was added to ensure no										
Hg was oxidized by residual air. The solubility cell was contin-	(2) Sodium chloride. Fischer Scien- tific Co.: ASC Grade.									
uously stirred and Hg solubilities										
were determined at preselected tem-	(3) Water. Distilled.									
peratures starting from both above										
and below saturation.	ESTIMATED ERROR:									
The stirrer was stopped 2 hours	5 7 / 7 - 10 03									
plag of colution were superced date	$5\pi_{2}/\pi_{1} = \pm 0.077$ Standard error on a									
la tared flack containing 1 ml 20	$\int \frac{1}{2} $									
KeCron and 1 ml 200 H CO mbo	$\delta k/mol kg^{-1} = \pm 0.0054$ Standard error									
flask was reweighed and heated to	on a single determination (au-									
boiling to oxidize the Hg.	thors).									
The sample was cooled and trans-										
ferred quantitatively to a wash	REFERENCES									
bottle in the train for the atomic	NEFERENCES:									
absorption spectrophotometer. The	1. Glew, D. N.; Hames, D. A.									
Hg ** was reduced to Hg by SnCl ₂ .	Can. J. Chem. <u>1969</u> , 47, 4651.									
The mercury was vaporized into the										
quartz cell of the spectrophotome-	2. Glew, D. N.; Hames, D. A.									
ter. The spectrophotometer was cal-	Can. J. Chem. <u>1971</u> , 49, 3114.									
Ibrated by a standard Hg solution										
prepared from HgCl ₂ .										
			<u> </u>							
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COMPON	ENTS:				ORIGINAL	MEASUREMENTS:				
(1) M	(1) Mercury; Hg; [7439-97-6]					Glew, D. N.; Hames, D. A.				
(2) g	<pre>(2) Sodium chloride; NaCl; [7647-14-5]</pre>					I. Chem. <u>1972</u> , 8	50, 3124 - 8.			
(3) P	Nater	; H ₂ O;	[7732-18-5]							
ADDIT	ADDITIONAL INFORMATION:									
Au ag	Authors' smoothed data. Solubility of mercury in 6.10 mol/kg ¹ aqueous sodium chloride.									
Те	empera	ature	Molality	Sta	ndard	Salt Effect	Standard			
t/	°C	<i>T/</i> K	10* <i>m</i> 1/mol k	g-1	d	k _{smm} /kg mol-1a	g			
	0.0	273.2	4.31	0	.10	0.1120	0.0028			
	5.0	278.2	5.75	0	.12	0.0950	0.0020			
l 1	.0.0	283.2	7.58	0	.14	0.0795	0.0014			
1	.5.0	288.2	9.91	0	.16	0.0654	0.0011			
2	20.0	293.2	12.8	0	.17	0.0528	0.0011			
2	25.0	298.2	16.5	0	.20	0.0413	0.0012			
3	80.0	303.2	21.0	0	.24	0.0311	0.0012			
3	85.0	308.2	26.5	0	.30	0.0220	0.0012			
4	10.0	313.2	33.2	0	.39	0.0140	0.0011			
4	15.0	318.2	41.3	0	.54	0.0069	0.0011			
5	50.0	323.2	51.1	0	.74	0.0008	0.0011			
5	5.0	328.2	62.8	1	.0	-0.0044	0.0012			
6	50.0	333.2	76.7	1	.4	-0.0089	0.0015			
6	55.0	338.2	93.1	1	.9	-0.0125	0.0019			
7	0.0	343.2	112.	2	.5	-0.0153	0.0024			

 $a_{k_{gmm}/kg mol^{-1}} = (1/(m_2/mol kg^{-1}))\log((m_1^o/mol kg^{-1})/(m_1/mol kg^{-1}))$

The authors' smoothing equations were $\log(m_1/mol \ kg^{-1}) = -6.043 - 1639.8/(T/K) + 1.9230 \ \log(T/K)$ with a standard error on a single determination of 7.7%, and $k_{gmm} = -20.373 + 1072.2/(T/K) + 6.7966 \ \log(T/K)$ with a standard error on a single determination of 0.0054.

The salting out constant changes sign at 50.8 \pm 1.0 °C (324.0 K).

· ·	· · · · · ·				
COMPONENTS :	C	ORIGINAL MEASUREMENTS:			
(1) Mercury; Hg; [7439-97-6]		Chviruk, A. P.; Koneva, N. V.			
<pre>(2) Sodium chloride; NaCl; [7647-14-5]</pre>		Urk. Khim. Zh. <u>1975</u> , 41, 1162 - 4.			
(3) Water; H ₂ O; [7732-18-5]		* <i>So</i> t <u>197</u> :	5. Prog. 5, 41(1)	. Chem 1), 39	. (Engl. Transl.) - 41.
VARIABLES:		PREPAR	ED BY:		
T/K = 293.15 - 353.1 $p_1/kPa = 0 - 0.0112$ $c_2/mol dm^{-3} = 3.42$	5	H. 1 M. 1	L. Cleve Wamoto	er	
EXPERIMENTAL VALUES:					
Temperature Pressure ^a Sod	H	Henry's Constant ^c Mercury Solubility ^d			
$t/^{\circ}C T/K p_1/mmHg c_2/mmHg$	oride ^D g dm ⁻³	1	o1/c1		c ₁ /mg dm ⁻³
20 293.15 1.1 x 10 ⁻³ 40 313.15 5.7 x 10 ⁻³ 60 333.15 24 x 10 ⁻³ 80 353.15 84 x 10 ⁻³	200		0.63 1.0 1.45 2.1		0.0192 0.0591 0.158 0.377
^a Calculated by compilers from	literatı	ure e	quation	(ref.	1) given in paper,
$\log p_1 = 10.55 - 0.84 \log T$	- (3348/ T	"), P;	1/mmHg a	and T/	κ.
CHenry's constant defined as a equation for K is log K = 0.	$K = (p_1/n_34 + 0.28)$	ng dm 3 log	-3)/(cj.	/mg dn n ⁻³).	a"). The authors'
dCalculated by the compiler f - 1.325 log(T/K) - 2411/(T/K	rom auth	ors'	equatio	n log(c₁/mg dm⁻³)= 9.781
The authors also measured the dm ⁻³ of sodium hydroxide at system, but they say that the	e solubil 20°C. T results	ity c They agre	of mercu give no e with	ry in nume the aq	a solution of 600 g rical data for the ueous NaCl data.
Systems undersaturated, satu studied. The authors show a solutions obey Henry's law, a with mercury vapor at its equ	irated sn fiqure v nd the su ilibrium	nd suj which ipersa pres	persatu shows aturate sure.	rated that solut	with mercury were the undersaturated ions are in contact
	AUXILIARY	INFORM	ATION		. <u></u>
METHOD/APPARATUS/PROCEDURE:		SOURC	E AND PUR	ITY OF	MATERIALS:
		(1)	Mercury. oy redu (15 g di	Form Ction m ⁻³) a	med in the solution of HgCl ₂ by SnCl ₂ t pH 2.
		(2)	Sodium "cp".	chlor	ide. Specified as
		(3)	Water.	Disti	lled.
		ESTIM	ATED ERRO	DR:	
1		REFER	ENCES:		
		1. M(<i>P)</i> t:	oelwyn hysical ranslata	- Hugh Chemi ion, I	es, E. A. stry, Russian L Press, Moscow.

COMPONENT	S:			ORIGINAL MEASUREMENTS:		
(l) Mer	cury; Hg;	[7439-97-6]		Baltisberger, R. J.; Hildebrand,		
(2) Sod [76	lium chlo: 547-14-5]	ide; NaCl;		T. A.		
(3) Water; H ₂ O; [7732-18-5]				Anal. Chim. Acta <u>1979</u> , 111, 111 - 2.		
VARIABLES	:			PREPARED BY:	······································	
I	'/K = 296.	.15, 303.15		H. L. Clever M. Iwamoto		
EXPERIMEN	TAL VALUES	;		L		
Temperature Sodium Mercu		ury solubility Salt				
t∕°C	T/K	$c_2/mol dm^{-3}$	ppb ^a	Concentration ^C 10 ⁷ c ₁ /mol dm ⁻³	Parameter k _{scc} /dm ³ mol ⁻¹	
30	303.15	0	63 <u>+</u> 2	$3.1_4 \pm 0.10$	-	
23	296.15	0.01	59	2.94	0.70	
		0.1	57	2.84	0.22	
annh	narte n	r billion				
betand	- parts pe	tion of ton an				
Gazza		cion di cen an	aryses.			
gram	s of merc	ury per 1 x 10°	cm ³ of	solution.	culated assuming	
	· · · ·					
		A	UXILIARY	INFORMATION		
METHOD/AL	PPARATUS/PR	OCEDURE:	with	SOURCE AND PURITY OF M	ATERIALS:	
nitrog of mer mixtur	en gas fo cury was e sparged	r 45 minutes, added, and th another 30 m	a drop en the inutes	(1) Mercury. Prep tion from merc der a N ₂ atmos	ared by distilla- cury(II) oxide un- phere.	
with ni red fo	itrogen. r 24 hou: stirring	Solutions were rs with a glas bar. Samples	stir- ss-co-	(2) Sodium chlorid cal grade reag	e. From analyti- ent and solution.	
lution with a	were wi	thdrawn by synchrony f	yringe	(3) Water. Triple	distilled.	
preven solutio	t oxygen	diffusion in	to the			
An alie	quot of as transf	the saturated erred to a non	solu- -redu-	ESTIMATED ERROR:		
cing ce ted by lyzed l	all. The nitroge by cold v	mercury was c n sparging and apor atomic al	ollec- d ana- bsorp-	See standard devi ity in water abov	ation of solubil- e.	
tion.	_		_	REFERENCES:		
The no that h agents.	n-reduci ad never	ng cell was a contacted red	a cell ducing			
Hg + H tion. the dis	20 was qu The prese sproportic	nite prone to e ence of Cl pre pnation of any	oxida- vented Hg(I).			

COMPONEN	NTS:			ORIGINAL MEASUREMENTS:		
(1) M	ercury; H	g; [7439-97-6	1	Sanemasa, I.; Haraguchi, K.;		
(2) S	odium chl 7647-14-5	oride; NaCl;]		Bull. Chem. Soc. Jpn <u>1981</u> , 54,		
(3) W	ater; H ₂ O	; [7732-18-5]				
VARIABL	ES:			PREPARED BY:		
T/K = 298.15				S. H. Johnson H. L. Clever		
· · · 2				M. Iwamoto		
EXPERIMENTAL VALUES:						
Temperature Electrolyte Solubilit			Solubilit Ratio	y $\log(c_1^o/c_1)$ Salt Effect Parameter		
t/°C	<i>T</i> /K	c ₂ /mol dm ⁻³	c ₁ /c ₁	$c_2 \rightarrow 0$ $k_{\rm scc}$ $k_{\rm scx}$		
25	298.15	0.250	1.050	0.0848		
		0.501	1.105	0.0866		
		0.752	1.154	0.0827		
		1.00	1.204	0.0806		
				0.0025 ^a 0.0788 ^a 0.0872		
a _{Auth}	ors' valu	es which are	the interc	ept and slope of $log(c_1/c_1)$ vs. c_2 .		
The o	ther keeg	values were	calculated	by the compiler from:		
The k	value	k _{sc}	$c = (1/c_2)$	$x \log(c_1^0/c_1)$		
where	• • is the	$k_{\rm scx} = k_{\rm scx}$ apparent mol	cc + (0.03 ar volume	$6 - \Phi \times 10^{-3})/2.30$ of the salt. For this system		
₽/cm³	mol ⁻¹ =	16.62.				
deter	mination	of mercury 1 of 63.9×10^{-1}	n water 19 ' [*] g dm ⁻³ .	s based on Sanemasa's (ref. 3) earlier		
Note:	k _{scc} /dm ³	$mol^{-1} = (1/(1))$	c ₂ /mol dm ⁻	³)) $\log(c_1^0/c_1)$; $k_{\text{SCX}} = (1/c_2) \log(x_1^0/x_1)$		
			AUXILIARY	INFORMATION		
METHOD/	APPARATUS/P	ROCEDURE :		SOURCE AND PURITY OF MATERIALS:		
The	e solubil d system flasks o	lity apparat which consist	us is a s of se-	(1) Mercury. Source not given. Pur- ified by distillation under reduced pressure.		
20 g j	portion o	f Hg is place	ed in one			
up to	immersed 200 ml o	f water are p	at I, and blaced in	(2) Sodium chloride. Analytical reagent grade. Dried and		
a sec	ond flask	immersed in Hg vapor pre	ssure is	weighed.		
contr	olled by	the temper	ature of	(3) Water. Redistilled water. Both		
press	ure is ci	rculated by f	the pump.	were used with no difference.		
The g	The gas passes over the Hg and bub- bles through the water (or solu-			ESTIMATED FREOR.		
tion)	. One how	ur circulati gas space an	on satu- d water.	$\delta T/K = \pm 0.05$		
The	The Hg is determined by cold-vapor			$ \begin{array}{rcl} 10^{\circ}\delta c_{7}/g & \mathrm{dm}^{-3} = \pm 0.1 \\ \delta (c_{7}^{\circ}/c_{7}) = +0.005 \end{array} $		
based	on a redu	iction-aeratic	on method	REFERENCES.		
The p	by Kimur procedure	a and Miller used is si	(ref. 1). milar to	1. Kimura, Y.; Miller, V. L.		
that The s	reported	by Omang (working star	ref. 2).	Anal. Chim. Acta <u>1962</u> , 27, 325. 2. Omang, S. H.		
put t	through	the same pr	ocedure.	Anal. Chim. Acta <u>1971</u> , 53, 415.		
Measu	rements w	ere made at	up to six	Bull. Chem. Soc. Jpn. <u>1975</u> , 48,		
Hg pr	essures a	t each temper	ature.	1795.		

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COMPONENTS:	ORIGINAL MEASUREMENTS:					
(1) Mercury; Hg; [7439-97-6] Mercury-203; ²⁰³ Hg; [13982-78-0]	Hursh, J. B. <i>JAT</i> , <i>J. Appl. Toxicol.</i> <u>1985</u> , <i>5</i> , 327 - 32.					
<pre>(2) Sodium chloride; NaCl; [7647-14-5]</pre>						
(3) Water; H ₂ O; [7732-18-5]						
VARIABLES:	PREPARED BY:					
T/K = 295	H. L. Clever					
EXPERIMENTAL VALUES:						
Temperature NaCl Carrier	Ostwald Concentration ^b					
t/°C T/K c ₂ /mol dm ⁻³	Coefficient ^a Av. <u>+</u> SE (no.) 10 ⁷ c ₁ /mol dm ⁻³					
22 295.15 0 -	(3.22) 2.61					
0.155 Air	2.65 <u>+</u> 0.07(5) 2.15					
^a The Ostwald coefficient is ((Given above is the average <u>+</u> s minations).	ng Hg/mL fluid)/(ng Hg/mL air)). tandard error (number of deter-					
 ^b The concentrations were calculated by the compiler for mercury vapor in equilibrium with pure liquid mercury from the vapor pressure evaluation of Ambrose and Sprake (ref. 1). The mercury vapor pressure and vapor concentration at 295.15 K are 19.90 Pa and 16.27 ng Hg/mL air, respectively. The author describes the solution as 0.9 wt. % NaCl. The compiler calculated the concentration as 0.155 mol dm⁻³ NaCl. The water values in () were added by the compiler for comparison. They were calculated from data in the mercury + water evaluation. 						
AUXILIARY	INFORMATION					
	CONDER AND DIDITY OF MATEDIALS.					
The equilibrium cell is a 50 mL syringe thermostated in a Dewar flask. A 10 mL liquid sample and a 40 mL carrier gas with Hg vapor sample are drawn into the cell. The cell is turned and rolled on the cylinder axis for 120 to 300 sec. Equilibrium is rapidly attained through the large contact area be- tween liquid and vapor phases. Both the liquid and vapor phases are	 Mercury. Prepared by reduction of ²⁰³HgCl₂. The Hg vapor is swept into a leak-proof Saran bag. Sodium chloride. No information given. Solution specific gravi- ty Handbook value of 1.0064. Water. Deionized and doubly distilled. 					
sampled. The liquid phase is aer- ated and the Hg adsorbed on Hopca-	ESTIMATED ERROR:					
lite. The Hg radioactivity is meas- ured on a liquid scintillation coun-						
ter. Corrections are applied for the counter efficiency, and for						
radioactive decay of the Hg.	REFERENCES:					
	 Ambrose, D.; Sprake, C. H. S. J. Chem. Thermodynam. <u>1972</u>, 4, 603. 					

Mercury in Aqueous Electrolyte and Nonelectrolyte Solutions

COMPONENTS:			ORIGINAL MEASUREMENTS:			
(l) Mercury; H	g; [7439-97-6	1	Sanemasa, I.; Haraguchi, K.; Nagai, H.			
(2) Sodium bro [7647-15-6	<pre>(2) Sodium bromide; NaBr; [7647-15-6]</pre>			Bull. Chem. Soc. Jpn. <u>1981</u> , 54,		
(3) Water; H ₂ O	(3) Water; H ₂ O; [7732-18-5]					
VARIABLES:			PREPARED BY:			
<i>T/K</i> c ₂ /mol dm ⁻³	= 298.15 = 0 - 1.01		S. H. Johnson H. L. Clever M. Iwamoto	1		
EXPERIMENTAL VALUE	S:					
Temperature	Electrolyte	Solubilit Ratio	y log(c½/c1) at lim	Salt Effec	t Parameter	
t/°C T/K	$c_2/mol dm^{-3}$	c1/c1	$c_2 \rightarrow 0$	k _{scc}	k _{scx}	
25 298.15	0.253	1.023		0.039		
	0.506	1.038		0.032		
	0.750	1.046		0.026		
	1.01	1.055		0.023		
			0.0063 ^a	0.0173 ^a	0.0227	
^a Authors' valu	es which are	the interc	ept and slope o	f log(c ₁ /c ₁) vs. c ₂ .	
The other k_{scc}	values were	calculated	by the compile	r from:		
The k _{scx} value	s were calcul	ated by th	$\begin{array}{c} x & \log(c_1/c_1) \\ e & \operatorname{authors} from: \\ 6 & - & - & - & 10^{-3} \\ \end{array}$	30		
where Φ is the $\Phi/cm^3 \mod^{-1} =$	apparent mol 23.50.	ar volume	of the salt. F	or this sys	tem	
The solubility determination	of mercury i of 63.9 x 10	in water is "g dm-".	s based on Sane	masa's (ref.	3) earlier	
Note: k _{scc} /dm³	$mol^{-1} = (1/($	c ₂ /mol dm ⁻	<pre>\$))log(c₁/c₁);</pre>	$k_{\rm scx} = (1/c)$	(x_1^{o}/x_1)	
		AUXILIARY	INFORMATION			
METHOD/APPARATUS/P	ROCEDURE:		SOURCE AND PURITY	OF MATERIALS	;	
The solubi closed system veral flasks o	lity apparate which consist connected by	tus is a ts of se- tubing. A	(1) Mercury. Source not given. Pur- ified by distillation under reduced pressure.			
20 g portion o flask immersed up to 200 ml o	f Hg 15 place l in thermost f water are p	at I, and placed in	(2) Sodium bro gent grade	omide. Anal . Dried ar	ytical rea- nd weighed.	
stat II. The controlled by	limmersed in Hg vapor pre the temper	ssure is ature of	(3) Water. Re aerated a	distilled w nd deoxyger	vater. Both nated water	
thermostat I. pressure is ci	Nitrogen ga rculated by	as at atm the pump.	were used	with no dif	fference.	
The gas passes bles through	s over the Hg the water (or solu-	ESTIMATED FREOR.			
tion). One ho	ur circulati	on satu-	δ <i>T</i> /K	= +0.05		
The Hg is determined by cold-vapor atomic absorption. The method is			$\frac{10^{\circ} \delta c_{1}/g \ dm^{-3}}{\delta (c_{1}^{\circ}/c_{1})}$	$= \pm 0.1$ = ± 0.005		
based on a redu	uction-aerati	on method	REFERENCES:			
The procedure	used is si	milar to	l. Kimura, Y.;	Miller, V.	L.	
The sample and	a by Omang working sta	(ref. 2). ndard are	2. Omang, S. H	Аста <u>1962</u> !•	<i>27, 32</i> 5.	
put through	the same pr	ocedure.	Anal. Chim.	Acta <u>1971</u>	<u>,</u> 53, 415.	
Measurements w	vere made at	up to six	Bull. Chem.	Soc. Jpn.	<u>1975</u> , 48,	
FLODULOD a	- cren cember		L			

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COMPONENTS:			ORIGINAL MEASUREMENTS:		
(1) Mercury; H	Ig; [7439-97-6	11	Sanemasa, I.; Haraguchi, K.; Nagai, H.		
(2) Sodium per [7601-89-0	chlorate; NaC]]	:104;	Bull. Chem. Soc. Jpn. <u>1981</u> , 54,		
(3) Water; H ₂ C); [7732-18-5]		1040 - 3.		
$c_2/mol dm^{-3}$	2 = 298.15 = 0 - 1.00		PREPARED BY: S. H. Johnson H. L. Clever M. Twamoto		
EXPERIMENTAL VALU	ES:				
Temperature	Electrolyte	Solubilit	y $\log(c_1^{o}/c_1)$ Salt Effect Parameter		
t/°C T/K	c_2 /mol dm ⁻³	Ratio c ₁ /c ₁	at $\lim_{c_2 \to 0} \frac{1}{k_{\text{scc}}} + \frac{1}{k_{\text{scx}}}$		
25 298.15	0.250	1.093	0.154		
[0.500	1.172	0.138		
	0.750	1.252	0.130		
	1.00	1.338	0.126		
			0.0098 ^a 0.117 ^a 0.114		
aAuthors' valu	es which are	the interc	ept and slope of $log(c_1/c_1)$ vs. c_2 .		
The other k _{scc}	values were	calculated	by the compiler from:		
The k _{scx} value	s were calcul	$c = (1/c_2)$ ated by th	x log(c1/c1) e authors from:		
where Φ is the $\Phi/cm^3 \mod^{-1} =$	$k_{\text{scx}} = k_{\text{s}}$ apparent mol 42.91.	cc + (0.03 ar volume	$6 - \Phi \times 10^{-1}/2.30$ of the salt. For this system		
The solubility determination	of mercury i of 63.9 x 10	in water is ''g dm''.	s based on Sanemasa's (ref. 3) earlier		
Note: k _{scc} /dm³	$mol^{-1} = (1/($	c2/mol dm ⁻	$(c_1^2/c_1); k_{SCX} = (1/c_2)\log(x_1^2/x_1)$		
		AUXILIARY	INFORMATION		
METHOD/APPARATUS/I	PROCEDURE :	n	SOURCE AND PURITY OF MATERIALS:		
The solubi	lity apparat	tus is a	(1) Mercury. Source not given. Pur-		
closed system	which consist	s of se-	ified by distillation under		
20 q portion c	of Hg is place	ed in one	reduced pressure.		
flask immersed	in thermosta	at I, and	(2) Sodium perchlorate. Analytical		
up to 200 mi o a second flas	f water are _b c immersed in	thermo-	reagent grade. Dried and weighed.		
stat II. The	Hg vapor pre	ssure is			
controlled by	the temper Nitrogen ga	ature of as at atm	(3) Water. Redistilled water. Both aerated and deoxygenated water		
pressure is ci	rculated by t	the pump.	were used with no difference.		
The gas passes	s over the Hg the water (or solu-	ECTIMATED EDDAD.		
tion). One ho	ur circulati	on satu-	$\frac{8\pi}{v} = \pm 0.05$		
rates both the The Hg is de	gas space an termined by co	d water. old-vapor	$10^{\circ} \delta c_{1}/g dm^{-3} = \pm 0.1$ $\delta (c_{1}/c_{1}) = \pm 0.005$		
based on a red	action-aeratic	on method			
found by Kimur	a and Miller	(ref. 1).	REFERENCES: 1 Vimura V • Miller V I		
that reported	d by Omang (ref. 2).	Anal. Chim. Acta <u>1962</u> , 27, 325.		
The sample and	working star	ndard are	2. Omang, S. H.		
put through Analyses are	done in tri	plicate.	3. Sanemasa, I.		
Measurements w	vere made at u	up to six ature.	Bull. Chem. Soc. Jpn. <u>1975</u> , 48, 1795.		
ny pressures a	c each compor				

COMPONENTS:			ORIGINAL MEASUREMENTS:		
(1) Mercury; I	lg; [7439-97-6]	Sanemasa, I.; Haraguchi, K.; Nagai, H.		
(2) Sodium su [7757-82-6	lfate; Na ₂ SO ₄ ; 5]		Bull. Chem. Soc. Jpn. <u>1981</u> , 54,		
(3) Water; H ₂ (; [7732-18-5]		1040 5.		
VARIABLES:			PREPARED BY:		
T/H c ₂ /mol dm ⁻¹	<pre>x = 298.15 y = 0 - 0.501</pre>		S. H. Johnson H. L. Clever M. Iwamoto	1	
EXPERIMENTAL VALU	2S:		L <u></u>		
Temperature	Electrolyte	Solubilit Ratio	y log(c ₁ /c ₁)	Salt Effect Parameter	
t/°C T/K	c ₂ /mol dm ⁻³	c ₁ /c ₁	$c_2 \rightarrow 0$	kscc kscx	
25 298.15	0.125	1.104		0.344	
	0.250	1.216		0.340	
	0.375	1.314		0.316	
	0.501	1.447		0.320	
			0.0053 ^a	0.308 ^a 0.319	
^a Authors' valu	les which are	the interc	ept and slope o	$f \log(c_1^2/c_1) vs. c_2.$	
The other kee	, values were	calculated	by the compile	r from:	
The k_{scr} value	k _{sc} s were calcul	$c = (1/c_2)$ ated by th	x log(c ₁ /c ₁) le authors from:		
where Φ is the Φ/cm^3 mol ⁻¹ =	$k_{scx} = k_{s}$ apparent mol 11.56.	cc + (0.03 ar volume	$6 - \Phi \times 10^{-3})/2$ of the salt. F	.30 or this system	
The solubility determination	y of mercury in of 63.9 x 10	in water i: • g dm**.	s based on Sane	masa's (ref. 3) earlier	
Note: k _{scc} /dm	mol ⁻¹ = (1/(c2/mol dm-	''))log(c1/c1);	$k_{\rm SCX} = (1/c_2) \log(x_1^0/x_1)$	
		AUXILIARY	INFORMATION		
METHOD/APPARATUS/	PROCEDURE:		SOURCE AND PURITY	OF MATERIALS:	
The solubi closed system veral flasks 20 g portion	lity apparate which consist connected by	tus is a ts of se- tubing. A ed in one	(1) Mercury. Source not given. Pur- ified by distillation under reduced pressure.		
flask immerse up to 200 ml (a second flas	d in thermost of water are j k immersed in	at I, and placed in h thermo-	(2) Sodium sulfate. Analytical rea- gent grade. Dried and weighed.		
stat II. The Hg vapor pressure is controlled by the temperature of thermostat I. Nitrogen gas at atm pressure is circulated by the pump.			(3) Water. Re aerated a were used	distilled water. Both nd deoxygenated water with no difference.	
bles through	the water (or solu-	ESTIMATED ERROR:		
tion). One hour circulation satu- rates both the gas space and water.			δτ/κ	: = <u>+</u> 0.05	
The Hg is determined by cold-vapor atomic absorption. The method is			10 ^{*δ} c ₁ /g dm ⁻³ δ(c ₁ /c ₁)	= <u>+</u> 0.1 = <u>+</u> 0.005	
based on a reduction-aeration method found by Kimura and Miller (ref. 1).			REFERENCES :		
The procedure that reporte	e used is si	milar to (ref. 2)	1. Kimura, Y.; Anal. Chim.	Miller, V. L. <i>Acta</i> 1962, 27, 325.	
The sample and	d working sta	ndard are	2. Omang, S. H Angl. Chim	Acta 1971. 53. 415.	
Analyses are	done in tr	iplicate.	3. Sanemasa, I Bull Cham	Soc. Jnn. 1975 - 48	
Hg pressures a	at each temper	ature.	1795.	200. 0 Pro 10101 +01	

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COMPONENTS:			ORIGINAL MEASUREMENTS:			
(1) Mercury; H	ig; [7439-97-6	, 1	Sanemasa, I.; Haraguchi, K.; Nagai, H.			
(2) Sodium nit [7631-99-4	:rate; NaNO ₃ ; 4]		Bull. Chem. Soc. Jpn. <u>1981</u> , 54,			
(3) Water; H ₂ (); [7732-18-5]					
VARIABLES:			PREPARED BY:			
<i>T/</i> F <i>c</i> ₂ /mol dm ⁻¹	$\zeta = 298.15$ $\gamma = 0 - 1.00$		S. H. Johnson H. L. Clever M. Iwamoto			
EXPERIMENTAL VALU	ES:					
Temperature	Electrolyte	Solubilit Ratio	y $\log(c_1^{\circ}/c_1)$ at lim	Salt Effec	t Parameter	
t/°C T/K	$c_2/mol dm^{-3}$	c ⁹ /c ₁	$c_2 \rightarrow 0$	^k scc	kscx	
25 298.15	0.250	1.037		0.063		
	0.500	1.074		0.062		
	0.753	1.106		0.058		
	1.00	1.156		0.063		
			-0.0002 ^a	0.0616 ^a	0.0652	
The other k_{scc} The k_{scx} value where Φ is the $\Phi/cm^3 mol^{-1} =$ The solubility determination Note: k_{scc}/dm^3	^a Authors' values which are the intercept and slope of $\log(c_1^{\circ}/c_1)$ vs. c_2 . The other k_{SCC} values were calculated by the compiler from: $k_{\text{SCC}} = (1/c_2) \times \log(c_1^{\circ}/c_1)$ The k_{SCX} values were calculated by the authors from: $k_{\text{SCX}} = k_{\text{SCC}} + (0.036 - \Phi \times 10^{-3})/2.30$ where Φ is the apparent molar volume of the salt. For this system $\Phi/\text{cm}^3 \mod^{-1} = 27.79$. The solubility of mercury in water is based on Sanemasa's (ref. 3) earlier determination of 63.9 x 10 ⁻⁴ g dm ⁻³ . Note: $k_{\text{SCC}}/\text{dm}^3 \mod^{-1} = (1/(c_2/\text{mol dm}^{-3}))\log(c_1^{\circ}/c_1); k_{\text{SCX}} = (1/c_2)\log(x_1^{\circ}/x_1)$					
METHOD /APPARATUS /	PPOCEDURE		COURCE AND PURTTY	OF MATERIALS.		
The solubi. Closed system veral flasks of 20 g portion of flask immersed up to 200 ml of a second flash stat II. The controlled by thermostat I. pressure is controlled bles through tion). One ho rates both the The Hg is de atomic absorp	lity apparat which consist connected by of Hg is place i in thermosta f water are p c immersed in Hg vapor pre y the temper Nitrogen ga irculated by f s over the Hg the water (ur circulati gas space an termined by c otion. The m	us is a s of se- tubing. A d in one at I, and laced in thermo- ssure is ature of at at at the pump. and bub- or solu- on satu- d water. old-vapor ethod is protocol	 (1) Mercury. Source not given. Purified by distillation under reduced pressure. (2) Sodium nitrate. Analytical reagent grade. Dried and weighed. (3) Water. Redistilled water. Both aerated and deoxygenated water were used with no difference. ESTIMATED ERROR: & δT/K = ±0.05 10⁶ δc₁/g dm⁻³ = ±0.1 & (c⁰/₂/c₁) = ±0.005 			
based on a red found by Kimur The procedure	action-aeration a and Miller used is sind by Omang ((ref. 1). milar to ref. 2).	REFERENCES: 1. Kimura, Y.; Miller, V. L. Anal. Chim. Acta <u>1962</u> , 27, 325.			

2. Omang, S. H. Anal. Chim. Acta <u>1971</u>, 53, 415.

1975, 48,

Bull. Chem. Soc. Jpn.

3. Sanemasa, I.

1795.

that reported by Omang (ref. 2). The sample and working standard are put through the same procedure. Analyses are done in triplicate. Measurements were made at up to six Hg pressures at each temperature.

Mercury in Aqueous Electrolyte and Nonelectrolyte Solutions

COMPONENTS:	ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6]	Sanemasa, I.; Haraguchi, K.;		
<pre>(2) Sodium thiocyanate; NaSCN; [540-72-7]</pre>	Bull. Chem. Soc. Jpn. <u>1981</u> , 54,		
(3) Water; H ₂ O; [7732-18-5]	1040 - 3.		
VARIABLES:	PREPARED BY:		
T/K = 298.15 $c_2/mol dm^{-3} = 0 - 1.062$	S. H. Johnson H. L. Clever M. Iwamoto		
EXPERIMENTAL VALUES:			
Temperature Electrolyte Solubil Ratio	ity log(c ^o /c ₁) Salt Effect Parameter at lim		
$t/^{\circ}C$ T/K $c_2/\text{mol dm}^{-3}$ c_1°/c_1	$c_2 \rightarrow 0$ $k_{\rm scc}$ $k_{\rm scx}$		
25 298.15 0.266 0.977	-0.038		
0.531 0.964	-0.030		
0.797 0.944	-0.031		
1.062 0.917	-0.035		
	0.0008 ^a -0.0345 ^a -0.0338		
^a Authors' values which are the inte	rcept and slope of $\log(c_1^o/c_1)$ vs. c_2 .		
The other k_{SCC} values were calculat	ed by the compiler from:		
The k_{scx} values were calculated by	2) X log(c <u>i/ci)</u> Ehe authors from: Disc. — M x loci/(ci)		
where Φ is the apparent molar volum $\Phi/\text{cm}^3 \text{ mol}^{-1} = 34.49$.	$0.50 - \Psi \times 10^{-7/2.30}$ e of the salt. For this system		
The solubility of mercury in water determination of 63.9 x 10 ⁻⁶ g dm ⁻³	is based on Sanemasa's (ref. 3) earlier •		
Note: $k_{scc}/dm^3 mol^{-1} = (1/(c_2/mol d$	m^{-3}))log(c_1°/c_1); $k_{SCX} = (1/c_2)log(x_1^{\circ}/x_1)$		
AUXILIA	RY INFORMATION		
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:		
The solubility apparatus is closed system which consists of se veral flasks connected by tubing. 20 g portion of Hg is placed in on	 A (1) Mercury. Source not given. Pur- ified by distillation under reduced pressure. 		
flask immersed in thermostat I, an up to 200 ml of water are placed i a second flask immersed in thermo stat II. The Hg vapor pressure i	d (2) Sodium thiocyanate. Analytical n reagent grade. Dried and weighed.		
controlled by the temperature o thermostat I. Nitrogen gas at at: pressure is circulated by the pump The gas passes over the Hg and bub	(3) Water. Redistilled water. Both aerated and deoxygenated water were used with no difference.		
bles through the water (or solu tion). One hour circulation satu	ESTIMATED ERROR:		
rates both the gas space and water. The Hg is determined by cold-vapo atomic absorption. The method i	$\begin{cases} \delta T/K = \pm 0.05 \\ 10^{6} \delta c_{1}/g \ dm^{-3} = \pm 0.1 \\ \delta (c_{1}^{6}/c_{1}) = \pm 0.005 \end{cases}$		
based on a reduction-aeration metho	REFERENCES :		
The procedure used is similar t	1. Kimura, Y.; Miller, V. L.		
that reported by Omang (ref. 2) The sample and working standard ar	Anal. Chim. Acta <u>1962</u> , 27, 325. 2. Omang, S. H.		
put through the same procedure	Anal. Chim. Acta <u>1971</u> , 53, 415.		
Measurements were made at up to si Hg pressures at each temperature.	Bull. Chem. Soc. Jpn. <u>1975</u> , 48, 1795.		

COMPONENTS:			ORIGINAL MEASUREMENTS:		
(1) Mercury; H	lg; [7439-97-6	51	Sanemasa, I.; Haraguchi, K.; Nagai, H.		
(2) Potassium [7447-40-7	chloride; KCl /]	.;	Bull. Chem. Soc. Jpn. <u>1981</u> , 54,		
(3) Water; H ₂ (); [7732-18-5]		1040 - 3.		
VARIABLES:			PREPARED BY:		
T/K = 298.15 $c_2/mol dm^{-3} = 0 - 1.00$			S. H. Johnson H. L. Clever M. Iwamoto		
EXPERIMENTAL VALU	ES:				
Temperature	Electrolyte	Solubilit	y log(c%/c1) Salt Effect Parameter		
t/°C T/K	$c_2/mol dm^{-3}$	Ratio c¶/c ₁	at $\lim_{c_2 \to 0} \frac{1}{k_{\text{SCC}}} = \frac{1}{k_{\text{SCC}}}$		
25 298.15	0.250	- <u>-</u> 1.046	0.078		
	0.500	1.095	0.079		
	0.750	1.120	0.066		
	1.00	1.188	0.075		
			0.0018 ^a 0.0703 ^a 0.0743		
^a Authors' valu	es which are	the interc	ept and slope of $log(c_1^2/c_1)$ vs. c_2 .		
The other $k_{\rm scc}$, values were	calculated	by the compiler from:		
The k _{scx} value	s were calcul	$c = (1/c_2)$ ated by the	x log(c%/c1) e authors from:		
where Φ is the $\Phi/cm^3 \mod^{-1} =$	$k_{\rm scx} = k_{\rm s}$ apparent mol 26.85.	cc + (0.03) ar volume ($6 - \Phi \times 10^{-3})/2.30$ of the salt. For this system		
The solubility determination	of mercury i of 63.9 x 10	in water is ''g dm''.	based on Sanemasa's (ref. 3) earlier		
Note: k _{scc} /dm ³	$mol^{-1} = (1/($	c ₂ /mol dm ⁻	$(1/c_2)\log(c_1^2/c_1); k_{scx} = (1/c_2)\log(x_1^2/x_1)$		
		AUXILIARY	INFORMATION		
METHOD/APPARATUS/	PROCEDURE :		SOURCE AND PURITY OF MATERIALS:		
The solubi	lity apparat	us is a	(1) Mercury. Source not given. Pur-		
closed system veral flasks o	which consist connected by	tubing. A	ified by distillation under reduced pressure.		
20 g portion of flask immersed	of Hg is place i in thermosta	ed in one	(2) Potassium chloride, Analytical		
up to 200 ml o	f water are p	laced in	reagent grade. Dried and		
a second flass	(immersed in Ha vapor pre	ssure is	weighed.		
controlled by	the temper	ature of	(3) Water. Redistilled water. Both		
thermostat I.	Nitrogen ga	is at arm the pump.	aerated and deoxygenated water were used with no difference.		
The gas passes	over the Hg	and bub-			
bles through tion). One ho	the water (ur circulati	or solu- on satu-	ESTIMATED ERROR:		
rates both the	gas space an	d water.	$\delta T/K = \pm 0.05$ 10 ^{\$} Se ₁ /g dm ⁻³ = ±0.1		
atomic absorp	tion. The m	ethod is	$\delta(c_1^{\circ}/c_1) = \pm 0.005$		
based on a redu	uction-aeratic	on method (ref. 1).	REFERENCES :		
The procedure	used is si	milar to	1. Kimura, Y.; Miller, V. L.		
that reported	d by Omang (working star	ref. 2). ndard are	Anal. Unim. Acta <u>1962</u> , 27, 325. 2. Omang, S. H.		
put through	the same pr	ocedure.	Anal. Chim. Acta <u>1971</u> , 53, 415.		
Analyses are Measurements W	done in tri vere made at 1	plicate. up to six	<i>Bull. Chem. Soc. Jpn.</i> <u>1975</u> , 48,		
Hg pressures a	t each temper	ature.	1795.		

COMPONENTS:			ORIGINAL MEASUREMENTS:			
(1) Mercur	y; Hg; [743	9-97-6]	Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.;			
(2) L-Alar	nine; C ₃ H ₇ NO	2; [56-41-7]	Kawamoto, T.; Hikari, S.; Sogawa, K.; Maehara, S.			
(3) Water;	н ₂ 0; 17732	-18-5]	Shika Rikogaku Zass 137 - 41.	hi <u>1979</u> , 20,		
VARIABLES:		<u></u>	PREPARED BY:			
c₂∕mol	T/K = 310. $dm^{-3} = 0$ to pH = 7.2	15 5.6 x 10 ⁻ <u>+</u> 0.1	Hiroshi Miyamoto			
EXPERIMENTAL	VALUES:					
Shaking	L-Al	anine	Mercury ^a			
t/days	$c_2/\text{mg} \text{ dm}^{-3}$	c ₂ /mol dm ^{-3C} (compiler)	ppm ^b	10'c1/mol dm-3C (compiler)		
1	0	0		2.2		
- -	0	0	$0.025 \le 0.045 \le 0.070$	2.2		
5	0	0	$0.023 \leq 0.000 \leq 0.090$	3.0		
5	0	0	$0.078 \le 0.088 \le 0.090$	4.3		
5	U	0	$0.078 \le 0.087 \le 0.095$	4.3		
5	U	0	$0.070 \le 0.095 \le 0.120$	4.7		
5	50	5.6 x 10-*	$0.525 \leq 0.525 \leq 0.525$	26.2		
^a The compi ity equil ^b The comp: means gra ^C This valu	 ^aThe compiler assumes that the five day shaking time represents solubil- ity equilibrium. ^bThe compiler calculated the concentration of mercury assuming that ppm means grams of mercury in 1 x 10° cm³ of solution. ^cThis value calculated from the middle value of the three numbers. 					
		AUXILIARY	INFORMATION			
METHOD/APPARA	ATUS / PROCEDURE		SOURCE AND PURITY OF MAT	ERIALS:		
Metallic of amino a in an Erle stoppered days in a The aqu Acidified ganate so sample was reduced h described The mer	c mercury (0 acid soluti enmeyer flas flask was thermostat eous phase (H ₂ SO ₄) pot olution wa s wet ashed by air and in ref. 1.	.3 g) and 25 ml on were placed sk. The rubber rotated 1 to 5 at 37°C. was sampled. assium perman- s added. The and the mercury vaporized as determined by	No information wa source and purity o	as given on the of materials.		
flameless photometry (JEOL AA- sorption JAA-7000). Three d formed on The solu Much large obtained i 11 ranges. values are 0.1. There sion of ox	atomic abso y using a me HG 01) and spectrophot eterminatic each sample ibility was er solubili n the pH 2 - All repor for soluti e was no mer ygen from t	rption spectro- ercury analyzer an atomic ab- cometer (JEOL ons were per- pH dependent. ty values were - 3 and pH 10 - ted solubility ons at pH 7.2 <u>+</u> ntion of exclu- he samples.	ESTIMATED ERROR: &c ₁ /ppm See ranges in table above. &T/K Not given. REFERENCES: 1. Kimura, Y.; Miller, V. L. Anal. Chim. Acta <u>1962</u> , 27, 325.			

COMPONENTS :			ORIGINAL MEASUREMENTS:		
(l) Mercury; Hg; [7439-97-6]		Kawakara, H.; Nakan Ishizaki, N.; Yamad	Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.;		
$\begin{bmatrix} (2) & L-Aspartic acid; & C_4H_7NO_4; \\ & [56-84-8] \end{bmatrix}$		Kawamoto, T.; Hikar Sogawa, K.; Maehara	:i, S.; 1, S.		
(3) Water;	H ₂ O; [7732	-18-5]	Shika Rikogaku Zass 137 - 41.	hi <u>1979</u> , 20,	
VARIABLES:			PREPARED BY:		
c ₂ /mol d	T/K = 310. $dm^{-3} = 0$ to pH = 7.2	15 4.5 x 10 ⁻⁴ <u>+</u> 0.1	Hiroshi Miyamoto		
EXPERIMENTAL V	ALUES:				
Shaking	L-Aspar	tic acid	Mercury ^a		
Time - t/days d	2/mg dm-3	c ₂ /mol dm ^{-3C} (compiler)	ppm ^b	10'c1/mol dm-3C (compiler)	
1	0	0	0.020 <u><</u> 0.045 <u><</u> 0.070	2.2	
3	0	0	0.025 <u><</u> 0.060 <u><</u> 0.096	3.0	
5	0	0	0.078 <u><</u> 0.086 <u><</u> 0.090	4.3	
5	0	0	0.078 <u><</u> 0.087 <u><</u> 0.095	4.3	
5	0	0	0.070 <u><</u> 0.095 <u><</u> 0.120	4.7	
5	60	4.5 x 10 ⁻⁴	0.483 <u><</u> 0.520 <u><</u> 0.552	25.9	
ity equili ^b The compil means gran ^C This value	^b The compiler calculated the concentration of mercury assuming that ppm means grams of mercury in 1 x 10° cm³ of solution. ^c This value calculated from the middle value of the three numbers.				
		AUXILIARY	INFORMATION		
METHOD/APPARAT	US/PROCEDURE:		SOURCE AND PURITY OF MATE	CRIALS:	
Metallic mercury (0.3 g) and 25 ml of amino acid solution were placed in an Erlenmeyer flask. The rubber stoppered flask was rotated 1 to 5 days in a thermostat at 37°C. The aqueous phase was sampled. Acidified (H ₂ SO ₄) potassium perman- ganate solution was added. The sample was wet ashed and the mercury reduced by air and vaporized as described in ref. 1. The mercury was determined by					
photometry using a mercury analyzer			ESTIMATED ERROR:		
(JEOL AA-HG 01) and an atomic ab- sorption spectrophotometer (JEOL JAA-7000).			$\delta c_1/\text{ppm}$ See ranges $\delta T/K$ Not given.	in table above.	
Three de	terminatic	ons were per-	REFERENCES:		
formed on e The solut Much larger obtained in 11 ranges. values are 0.1. There	ach sample bility was r solubilit the pH 2 - All repor for solutio was no men gen from the	pH dependent. ty values were 3 and pH 10 - ted solubility ons at pH 7.2 + tion of exclu-	l. Kimura, Y.; Mille Anal. Chim. Acta	r, V. L. <u>1962</u> , 27, 325.	

COMPONENTS :			ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6] (2) L-Threonine; C ₄ H ₉ NO ₃ ; [72-19-5]			Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.; Kawamoto, T.; Hikari, S.; Soqawa, K.; Maehara, S.		
(3) Water; H ₂ O; [7732-18-5]			Shika Rikogaku Zass 137 - 41.	hi <u>1979</u> , 20,	
VARIABLES:			PREPARED BY:		
c₂∕mol	T/K = 310.1 dm ⁻³ = 0 to pH = 7.2	15 5.0 x 10-4 <u>+</u> 0.1	Hiroshi Miyamoto		
EXPERIMENTAL	VALUES:				
Shaking	L-Thre	eonine	Mercury ^a		
t/days	c ₂ /mg dm ⁻³	c ₂ /mol dm ^{-3C} (compiler)	ppm ^b	10'c ₁ /mol dm-;c (compiler)	
1	0	0	0.020 <u><</u> 0.045 <u><</u> 0.070	2.2	
3	0	0	0.025 <u><</u> 0.060 <u><</u> 0.096	3.0	
5	0	0	0.078 <u><</u> 0.086 <u><</u> 0.090	4.3	
5	0	0	0.078 <u><</u> 0.087 <u><</u> 0.095	4.3	
5	0	0	$0.070 \le 0.095 \le 0.120$	4.7	
5	60	5.0 x 10-*	$0.659 \leq 0.685 \leq 0.712$	34.1	
ity equil ^b The comp: meansgra ^C This valu	^b The compiler calculated the concentration of mercury assuming that ppm means grams of mercury in 1 x 10° cm ³ of solution.				
		AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE: Metallic mercury (0.3 g) and 25 ml of amino acid solution were placed in an Erlenmeyer flask. The rubber stoppered flask was rotated 1 to 5 days in a thermostat at 37°C. The aqueous phase was sampled. Acidified (H ₂ SO ₄) potassium perman- ganate solution was added. The sample was wet ashed and the mercury reduced by air and vaporized as described in ref. 1. The mercury was determined by					
photometry (JEOL AA- sorption JAA-7000). Three d formed on The sol Much larg obtained i 11 ranges. values are 0.1. There sion of ox	y using a me HG 01) and spectrophot each sample ubility was er solubili n the pH 2 - All repor for soluti e was no men sygen from t	preury analyzer an atomic ab- cometer (JEOL ons were per- pH dependent. ty values were - 3 and pH 10 - ted solubility ons at pH 7.2 <u>+</u> ntion of exclu- he samples.	<pre>ESTIMATED ERROR: δc₁/ppm See ranges δT/K Not given. REFERENCES: 1. Kimura, Y.; Mille Anal. Chim. Acta</pre>	in table above. r, V. L. <u>1962</u> , 27, 325.	

COMPONENTS :			ORIGINAL MEASUREMENTS:	
(1) Mercu	ry; Hg; [743	9-97-6]	Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.;	
(2) L-Pro	Line; C5H9NO	27 [147-05-5]	Sogawa, K.; Maehara	1, 5.; , S.
(3) Water	; H ₂ O; [7732	-18-5]	Shika Rikogaku Zass 137 - 41.	hi <u>1979</u> , 20,
VARIABLES:		<u></u>	PREPARED BY:	
c2/mol	T/K = 310. dm ⁻³ = 0 to pH = 7.2	15 3.5 x 10 ^{-*} <u>+</u> 0.1	Hiroshi Miyamoto	
EXPERIMENTAL	VALUES:			
Shaking	L-Pr	oline	Mercury ^a	
Time t/days	c ₂ /mg dm ⁻³	c ₂ /mol dm ^{-3C} (compiler)	ppm ^b	10'c1/mol dm-3C (compiler)
1	0	0	0.020 <u><</u> 0.045 <u><</u> 0.070	2.2
3	0	0	$0.025 \le 0.060 \le 0.096$	3.0
5	0	0	0.078 <u><</u> 0.086 <u><</u> 0.090	4.3
5	0	0	0.078 <u><</u> 0.087 <u><</u> 0.095	4.3
5	0	0	$0.070 \le 0.095 \le 0.120$	4.7
5	40	3.5 x 10-4	0.415 <u><</u> 0.445 <u><</u> 0.493	22.2
		الله من الله من من من مع مو جو من من مع		
^a The comp ity equi	iler assumes librium.	that the five	day shaking time repr	esents solubil-
^b The comp means gr	iler calcula ams of mercu	ted the concentry in 1 x 10° c	tration of mercury ass m³ of solution.	suming that ppm
^C This valu	ie calculated	d from the midd	le value of the three	numbers.
	· · · · · · · · · · · · · · · · · · ·	AUXILIARY	INFORMATION	
METHOD /APPAR	ATUS /PROCEDURE	<u></u>	SOURCE AND PURITY OF MATE	CDIALS.
Metallic mercury (0.3 g) and 25 ml of amino acid solution were placed in an Erlenmeyer flask. The rubber stoppered flask was rotated 1 to 5 days in a thermostat at 37°C. The aqueous phase was sampled. Acidified (H ₂ SO ₄) potassium perman- ganate solution was added. The				s given on the f materials.
reduced by air and vaporized as described in ref. 1.				
flameless atomic absorption spectro-			ESTIMATED ERROR:	
photometry using a mercury analyzer (JEOL AA-HG 01) and an atomic ab-			δ_{c_1}/ppm See ranges	in table above.
sorption spectrophotometer (JEOL JAA-7000).			$\delta T^{2}K$ Not given.	
Three determinations were per- formed on each sample.			REFERENCES:	
The sol Much larg obtained i 11 ranges. values are 0.1. Ther sion of or	ubility was er solubili n the pH 2 - All repor for soluti e was no men	pH dependent. ty values were - 3 and pH 10 - ted solubility ons at pH 7.2 <u>+</u> ntion of exclu- he samples.	l. Kimura, Y.; Mille Anal. Chim. Acta	r, V. L. <u>1962</u> , 27, 325.
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ORIGINAL MEASUREMENTS:				
Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.;				
Kawamoto, T.; Hikari, S.; Sogawa, K.; Maehara, S.				
Shika Rikogaku Zaeshi <u>1979</u> , 20, 137 - 41.				
PREPARED BY:				
Hiroshi Miyamoto				
Mercury ^a				
-3C ppm ^b 10 ⁷ c ₁ /mol dm ^{-3C}) (compiler)				
$0.020 \leq 0.045 \leq 0.070$ 2.2				
$0.078 \le 0.086 \le 0.090$ 4.3				
$0.078 \le 0.087 \le 0.095$ 4.3				
$0.070 \leq 0.095 \leq 0.120$ 4.7				
0.588 < 0.650 < 0.712 32.4				
$0.618 \le 0.680 \le 0.742$ 33.9				
$0.790 \le 0.945 \le 1.101$ 47.1				
$1.075 \le 1.105 \le 1.132$ 55.1				
^c The compiler assumes that the five day shaking time represents solubil- ity equilibrium. ^b The compiler calculated the concentration of mercury assuming that ppm means grams of mercury in 1 x 10° cm³ of solution. ^c This value calculated from the middle value of the three numbers.				
KILIARY INFORMATION				
SOURCE AND PURTTY OF MATERIALS.				
25 ml No information was siven on the				
Metallic mercury (0.3 g) and 25 ml of amino acid solution were placed in an Erlenmeyer flask. The rubber stoppered flask was rotated 1 to 5 days in a thermostat at 37°C. The aqueous phase was sampled. Acidified (H ₂ SO ₄) potassium perman- ganate solution was added. The sample was wet ashed and the mercury reduced by air and vaporized as described in ref. 1. The mercury was determined by				
lvzer				
c^{ab-}_{JEOL} $\delta c_{1}/ppm$ See ranges in table above. (JEOL $\delta T/K$ Not given.				
REFERENCES:				
dent. were 10 - ility 7.2 <u>+</u> xclu-				

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COMPONENTS:			ORIGINAL MEASUREMENTS:	ORIGINAL MEASUREMENTS:	
(1) Mercury; Hg; [7439-97-6]		Kawakara, H.; Nakar Ishizaki, N.; Yamad	Kawakara, H.; Nakamura, M.; Isbizaki, N.: Yamada, T.:		
(2) L-Methionine; C ₅ H ₁₁ NO ₂ S; [63-68-3]		Kawamoto, T.; Hikari, S.; Sogawa, K.; Maehara, S.			
(3) Water;	; H ₂ 0; [7732	-18-5]	Shika Rikogaku Zasu 137 - 41.	shi <u>1979</u> , 20,	
VARIABLES:			PREPARED BY:		
	T/K = 310.	15			
c₂/mol	$dm^{-3} = 0$ to pH = 7.2	0.01 <u>+</u> 0.1	Hiroshi Miyamoto		
EXPERIMENTAL	VALUES:			· · · · · · · · · · · · · · ·	
Shaking	L-Meth	ionine	Mercury ⁴	1	
Time t/days			b	$107a_{\rm r}/mo1 dm^{-3}C$	
"Udys	e 27 mg um	(compiler)	ppm	(compiler)	
1	0	0	$0.020 \leq 0.045 \leq 0.070$	2.2	
3	0	0	$0.025 \leq 0.060 \leq 0.096$	3.0	
5	0	0	$0.078 \le 0.086 \le 0.090$	4.3	
5	0	0	$0.078 \le 0.087 \le 0.095$	4.3 A 7	
	U	U		-1 • /	
1	-	0.01	0.079 < 0.086 < 0.091	4.3	
3	-	0.01	$0.133 \le 0.168 \le 0.204$	8.38	
5	-	0.01	$0.237 \leq 0.262 \leq 0.287$	13.1	
5	-		$0.433 \leq 0.433 \leq 0.433$	21.6	
2	30	2.0 X 10-4	$0.097 \le 0.097 \le 0.097$	4.8	
^b The comp means gr ^C This valu	iler calcula ams of mercu ue calculate	ated the concen bry in 1 x 10° c d from the midd	tration of mercury as m³ of solution. lle value of the three	suming that ppm numbers.	
				·····	
		AUXILIARY	INFORMATION		
METHOD/APPAR	ATUS/PROCEDURE:		SOURCE AND PURITY OF MAT	ERIALS;	
Metallio of amino in an Erlo stoppered	c mercury (0 acid soluti enmeyer fla: flask was	63 g) and 25 ml on were placed sk. The rubber rotated l to 5	No information was source and purity of	as given on the of materials.	
days in a	thermostat	at 37°C.]		
The aqu	ieous phase	was sampled.			
Acidified	(H_2SO_4) pot	assium perman-			
ganate s	olution wa	s added. The			
reduced	by air and	vanorized as			
described	l in ref. 1.				
The mercury was determined by					
flameless atomic absorption spectro-			ESTIMATED ERROR:		
photometry using a mercury analyzer					
(JEOL AA-HG 01) and an atomic ab- sorption spectrophotometer (JEOL JAA-7000).			$\delta c_1/\text{ppm}$ See ranges $\delta T/K$ Not given.	in table above.	
Three of formed on	determinati each sample	ons were per-	REFERENCES:		
The sol	ubility was	pH dependent.	l. Kimura, Y.; Mille	er, V. L.	
Much larg	er solubili	ty values Were	Anal. Chim. Acta	<u>1962</u> , 27, 325.	
11 ranges	All report	- 5 and ph 10 - rted solubili+v			
values ar	e for soluti	ons at pH 7.2 +			
0.1. Ther	e was no me	ntion of exclu-			
sion of or	xygen from t	he samples.			

COMPONENTS:			ORIGINAL MEASUREMENTS:		
(1) Mercur	y; Hg; [743	9-97-6]	Kawakara, H.; Nakam Ishizaki, N.; Yamad	Kawakara, H.; Nakamura, M.; Tshizaki, N.; Yamada, T.;	
(2) L-Leucine; C ₆ H ₁₃ NO ₂ ; [61-90-5]		Kawamoto, T.; Hikari, S.; Sogawa, K.; Maehara, S.			
(3) Water;	H ₂ O; [7732-	-18-5]	Shika Rikogaku Zass 137 - 41.	hi <u>1979</u> , 20,	
VARIABLES:			PREPARED BY:		
c ₂ /mol	T/K = 310.3 dm ⁻³ = 0 to pH = 7.2	15 9.15 x 10 ⁻⁺ <u>+</u> 0.1	Hiroshi Miyamoto		
EXPERIMENTAL	VALUES:				
Shaking	L-Lei	ucine	Mercury ^a		
t/days	c ₂ /mg dm ⁻³	c ₂ /mol dm ^{-3C} (compiler)	ppm ^b .	10'c ₁ /mol dm-*C (compiler)	
1	0	0	0.020 <u><</u> 0.045 <u><</u> 0.070	2.2	
3	0	0	0.025 <u>≤</u> 0.060 <u>≤</u> 0.096	3.0	
5	0	0	0.078 <u><</u> 0.086 <u><</u> 0.090	4.3	
5	0	0	0.078 <u><</u> 0.087 <u><</u> 0.095	4.3	
5	0	0	$0.070 \leq 0.095 \leq 0.120$	4.7	
5	120	9.15 x 10-*	$0.330 \leq 0.375 \leq 0.382$	18.7	
ity equilibrium. ^b The compiler calculated the concentration of mercury assuming that ppm means grams of mercury in 1 x 10° cm³ of solution. ^C This value calculated from the middle value of the three numbers.					
		AUXILIARY	INFORMATION		
METHOD/APPARA	TUS/PROCEDURE :		SOURCE AND PURITY OF MATH	ERIALS:	
Metallic mercury (0.3 g) and 25 ml of amino acid solution were placed in an Erlenmeyer flask. The rubber stoppered flask was rotated 1 to 5 days in a thermostat at 37°C. The aqueous phase was sampled. Acidified (H ₂ SO ₄) potassium perman- ganate solution was added. The sample was wet ashed and the mercury reduced by air and vaporized as described in ref. 1. The mercury was determined by					
photometry using a mercury analyzer			ESTIMATED ERROR:		
(JEOL AA-HG 01) and an atomic ab- sorption spectrophotometer (JEOL JAA-7000).			$\delta c_1/\text{ppm}$ See ranges $\delta T/K$ Not given.	in table above.	
formed on	each sample	ons were per-	REFERENCES:		
The sol Much larg obtained i 11 ranges, values are 0.1. Ther sion of ox	ubility was er solubili .n the pH 2 . All report for soluti e was no men xygen from t	pH dependent. ty values were - 3 and pH 10 - cted solubility ons at pH 7.2 \pm ntion of exclu- he samples.	 Kimura, Y.; Mille Anal. Chim. Acta 	er, V. L. <u>1962</u> , 27, 325.	

COMPONENTS :			ORIGINAL MEASUREMENTS:		
(1) Mercu	ry; Hg; [743	9-97-6]	Kawakara, H.; Nakamura, M.;		
(2) L-Isoleucine; C ₆ H ₁₃ NO ₂ ; [73-32-5]		Kawamoto, T.; Hikari, S.; Sogawa, K.; Maehara, S.			
(3) Water	; H ₂ O; [7732	-18-5]	Shika Rikogaku Zase 137 - 41.	hi <u>1979</u> , 20,	
VARIABLES:			PREPARED BY:		
c ₂ /mol	T/K = 310. $dm^{-3} = 0$ to pH = 7.2	15 3.0 x 10 ^{-*} <u>+</u> 0.1	Hiroshi Miyamoto		
EXPERIMENTAL	VALUES:				
Shaking	L-Isol	eucine	Mercury ^a		
Time t/days	c ₂ /mg dm ⁻³	c ₂ /mol dm ^{-3C} (compiler)	ppm ^b	10'c1/mol dm-3C (compiler)	
1	0	0	$0.020 \leq 0.045 \leq 0.070$	2.2	
3	0	0	0.025 <u><</u> 0.060 <u><</u> 0.096	3.0	
5	0	0	0.078 <u><</u> 0.086 <u><</u> 0.090	4.3	
5	0	0	0.078 <u><</u> 0.087 <u><</u> 0.095	4.3	
5	0	0	$0.070 \leq 0.095 \leq 0.120$	4.7	
5	40	3.0 x 10 ⁻⁴	0.205 <u><</u> 0.227 <u><</u> 0.252	11.3	
ity equi ^b The comp means gr ^C This valu	ity equilibrium. ^b The compiler calculated the concentration of mercury assuming that ppm means grams of mercury in 1 x 10° cm³ of solution. ^C This value calculated from the middle value of the three numbers.				
		AUXILIARI			
METHOD/APPAR	ATUS/PROCEDURE		SOURCE AND PURITY OF MAT	ERIALS:	
Metallic mercury (0.3 g) and 25 ml of amino acid solution were placed in an Erlenmeyer flask. The rubber stoppered flask was rotated 1 to 5 days in a thermostat at 37°C. The aqueous phase was sampled. Acidified (H ₂ SO ₄) potassium perman- ganate solution was added. The sample was wet ashed and the mercury reduced by air and vaporized as described in ref. 1. The mercury was determined by					
photometry using a mercury analyzer			ESTIMATED ERROR:		
(JEOL AA-HG 01) and an atomic ab- sorption spectrophotometer (JEOL JAA-7000).			$\delta c_1/\text{ppm}$ See ranges $\delta T/K$ Not given.	in table above.	
formed on	each sample	ons were per-	REFERENCES:		
The sol Much larg obtained 11 ranges values ar 0.1. Ther sion of of	ubility was per solubili in the pH 2 . All repo e for soluti ce was no me	pH dependent. ty values were - 3 and pH 10 - rted solubility ons at pH 7.2 <u>+</u> ntion of exclu-	l. Kimura, Y.; Mille Anal. Chim. Acta	er, V. L. <u>1962</u> , 27, 325.	

COMPONENTS:		<u></u>	ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; $[7439-97-6]$			Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.; Kawamata, T.;		
[63-91	2]	-911	Sogawa, K.; Maehara	, S.	
(3) Water;	H ₂ O; [7732-	-18-5]	Shika Rikogaku Zass 137 - 41.	hi <u>1979</u> , 20,	
VARIABLES:			PREPARED BY:		
c₂/mol	T/K = 310.1 dm ⁻³ = 0 to pH = 7.2	15 3.0 x 10 ⁻⁴ <u>+</u> 0.1	Hiroshi Miyamoto		
EXPERIMENTAL	VALUES:				
Shaking	L-Pheny	lalanine	Mercury ^a		
t/days	c ₂ /mg dm ⁻³	c ₂ /mol dm ^{-3C} (compiler)	ppm ^b .	10'c1/mol dm-3C (compiler)	
1	0	0	0.020 <u><</u> 0.045 <u><</u> 0.070	2.2	
3	0	0	0.025 <u><</u> 0.060 <u><</u> 0.096	3.0	
5	0	0	0.078 <u><</u> 0.086 <u><</u> 0.090	4.3	
5	0	0	0.078 <u><</u> 0.087 <u><</u> 0.095	4.3	
5	0	0	$0.070 \leq 0.095 \leq 0.120$	4.7	
5	50	3.0 x 10-4	0.525 <u><</u> 0.552 <u><</u> 0.578	27.5	
^a The compi ity equil ^b The comp: means gra ^C This valu	 ^aThe compiler assumes that the five day shaking time represents solubil- ity equilibrium. ^bThe compiler calculated the concentration of mercury assuming that ppm means grams of mercury in 1 x 10[°] cm³ of solution. ^cThis value calculated from the middle value of the three numbers. 				
		AUXILIARY	INFORMATION		
METHOD/APPAR/	TUS/PROCEDURE:	:	SOURCE AND PURITY OF MATERIALS:		
Metallic mercury (0.3 g) and 25 ml of amino acid solution were placed in an Erlenmeyer flask. The rubber stoppered flask was rotated 1 to 5 days in a thermostat at 37°C. The aqueous phase was sampled. Acidified (H ₂ SO ₄) potassium perman- ganate solution was added. The sample was wet ashed and the mercury reduced by air and vaporized as described in ref. 1. The mercury was determined by					
photometry using a mercury analyzer			ESTIMATED ERROR:		
(JEOL AA-HG 01) and an atomic ab- sorption spectrophotometer (JEOL JAA-7000).			$\delta c_1/ppm$ See ranges $\delta T/K$ Not given.	in table above.	
formed on	eterminatio each sample	• • • • • • • • • • • • • • • • • • •	REFERENCES:		
The solution Much large obtained i ll ranges. values are 0.1. There	er solubili er solubili n the pH 2 - All repor for soluti e was no mer	pH dependent. ty values were - 3 and pH 10 - ted solubility ons at pH 7.2 <u>+</u> ntion of exclu-	l. Kimura, Y.; Mille Anal. Chim. Acta	r, V. L. <u>1962</u> , 27, 325.	
I SION OF OX	ygen rrom t	ne sampies.	1		

Components :			ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6] (2) L-Tyrosine; C ₉ H ₁₁ NO ₃ ; [60-18-4]			Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.; Kawamoto, T.; Hikari, S.; Sogawa K : Mashara S		
(3) Water; H ₂ O; [7732-18-5]			Shika Rikogaku Zass 137 - 41.	Soyawa, r.; maenara, S. Shika Rikogaku Zaeshi <u>1979</u> , 20, 137 - 41.	
VARIABLES:	· · · · · · · · · · · · · · · · · · ·		PREPARED BY:		
c₂/mol	T/K = 310. $dm^{-3} = 0$ to pH = 7.2	15 0.01 <u>+</u> 0.1	Hiroshi Miyamoto		
EXPERIMENTAL	VALUES:				
Shaking	L-Tyr	osine	Mercury ^a		
t/days	c ₂ /mg dm ⁻³	c ₂ /mol dm ^{-1C} (compiler)	ppm ^b	10'c ₁ /mol dm-3C (compiler)	
1 3 5 5 5 1 3 5 5 ^a The comp ity equi ^b The comp means gr ^C This valu	0 0 0 0 - - 40 iler assumes librium. iler calcula ams of mercu	0 0 0 0 0.01 0.01 0.01 2.2 \times 10 ⁻⁺ 5 that the five ated the concent ary in 1 \times 10 [*] cr d from the midd	$0.020 \le 0.045 \le 0.070$ $0.025 \le 0.060 \le 0.096$ $0.078 \le 0.086 \le 0.090$ $0.078 \le 0.087 \le 0.095$ $0.070 \le 0.095 \le 0.120$ $0.183 \le 0.251 \le 0.281$ $0.247 \le 0.251 \le 0.287$ $0.274 \le 0.293 \le 0.303$ day shaking time repr tration of mercury assonation. le value of the three	2.2 3.0 4.3 4.3 4.7 12.5 12.5 13.5 14.6 	
		AUXILIARY	INFORMATION		
METHOD/APPAR. Metalli of amino in an Erl stoppered days in a The aqu Acidified ganate s sample wa reduced described The me	ATUS/PROCEDURE: c mercury (C acid soluti enmeyer fla i flask was thermostat leous phase (H ₂ SO ₄) pot olution wa s wet ashed by air and i n ref. 1. rcury was		SOURCE AND PURITY OF MATE No information wa source and purity c	RIALS: as given on the f materials.	
The mercury was determined by flameless atomic absorption spectro- photometry using a mercury analyzer (JEOL AA-HG 01) and an atomic ab- sorption spectrophotometer (JEOL JAA-7000). Three determinations were per- formed on each sample. The solubility was pH dependent. Much larger solubility values were obtained in the pH 2 - 3 and pH 10 - 11 ranges. All reported solubility values are for solutions at pH 7.2 <u>+</u> 0.1. There was no mention of exclu- sion of oxygen from the samples.			ESTIMATED ERROR: & c1/ppm See ranges & T/K Not given. REFERENCES: 1. Kimura, Y.; Mille Anal. Chim. Acta	in table above. r, V. L. <u>1962</u> , 27, 325.	

COMPONENTS :			ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6]		Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.;			
(2) L-Cyst C ₃ H ₇ NC	28.HCl; [52	hloride; -89-1]	Kawamoto, T Sogawa, K.;	.; Hikar Maehara	1, S.; , S.
(3) Water; H ₂ O; [7732-18-5]			Shika Rikog 137 - 41.	аки Zавв	hi <u>1979</u> , 20,
VARIABLES:			PREPARED BY:		
c2/mol	T/K = 310. dm ⁻³ = 0 to pH = 7.2	15 0.01 ± 0.1	Hiroshi Miy	amoto	
EXPERIMENTAL	VALUES:		· · · · · · · · · · · · · · · · · · ·		
Shaking	L-Cyste	ine HCl		Mercury ^a	
t/days	c ₂ /mg dm ⁻³	c ₂ /mol dm ^{-3C} (compiler)	ppmb		10'c ₁ /mol dm-:C (compiler)
	0	0 0	$0.020 \leq 0.045$	≤ 0.070	2.2
5 5	0		$1.025 \le 0.060$	≤ 0.096	3.0
5	ŏ	õ c	.078 < 0.087	< 0.095	4.3
5	0	0 0	0.070 ≤ 0.095	≤ 0.120	4.7
,	-	0 01 3/	825 239 000	<a3 18a<="" td=""><td>1944 3</td></a3>	1944 3
3	-	0.01 37	.926 <40.000	<42.074	1994.1
5	-	0.01 37	.852 <u><</u> 42.000	<u><</u> 46.185	2093.8
5	-	0.01 79	•.290 <u><</u> 80.670	<u><82.050</u>	4021.6
5	0.1	0.3 X TO . 1	095 < 1.725	<u><</u> 1.740	05.90
^a The comp ity equi	iler assumes librium.	s that the five	day shaking t	ime repr	esents solubil-
^b The comp means gr	iler calcula ams of mercu	ated the concent ary in 1 x 10° cm	ration of mer ³ of solution	cury ass 1.	suming that ppm
c _{This} valu	ue calculate	d from the midd	le value of th	ne three	numbers.
· - · · ·		AUXILIARY	INFORMATION		
METHOD /APPAR	TUS /PROCEDURE	•	SOURCE AND PURT	TY OF MATE	PTAIS
Metalli	c mercury ((1.3 a) and 25 ml	SOURCE AND TURI		AIRLO,
of amino	acid soluti	on were placed	No informa	ition wa	s given on the
in an Erle	enmeyer fla	sk. The rubber	source and	purity o	r materiais.
stoppered	flask was	rotated 1 to 5			
days in a	thermostat	at 37°C. wag gampled			
Acidified	(Hoso) pot	assium perman-	1		
ganate s	olution wa	s added. The			
sample wa	s wet ashed	and the mercury			
described	l in ref. l.	vaporized as			
The men	rcury was	determined by	1		
flameless atomic absorption spectro-			ESTIMATED ERROR	:	
photometry using a mercury analyzer (JEOL AA-HG 01) and an atomic ab-					
sorption spectrophotometer (JEOL			δc ₁ /ppm See	ranges	in table above.
JAA-7000)				9470110	
formed on	leterminati	ons were per-	REFERENCES :		
The sol	ubility was	5 pH dependent.	1. Kimura V	. • Will-	r. V I.
Much larg	er solubili	ty values were	Anal. Chi	m. Acta	1962, 27, 325.
obtained i	in the pH 2	- 3 and pH 10 -			
values ar	• All repo	ons at pH 7.2 +			
0.1. Ther	e was no me	ntion of exclu-	1		
sion of oxygen from the samples.					

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COMPONENTS:		<u> </u>	ORIGINAL MEASUREMENTS:		
(1) Mercur	y; Hg; [743	9-97-6]	Kawakara, H.; Nakam	Kawakara, H.; Nakamura, M.;	
<pre>(2) L-Histidine monochloride; C₅H₁₂N₂O₃.HCl; [645-35-2]</pre>		Kawamoto, T.; Hikari, S.; Sogawa, K.; Maehara, S.			
(3) Water;	; H ₂ 0; [7732	-18-5]	Shika Rikogaku Zass 137 - 41.	hi <u>1979</u> , 20,	
VARIABLES:	· · · · · · · · · · · · · · · · · · ·		PREPARED BY:		
c2/mol	T/K = 310. dm ⁻³ = 0 to pH = 7.2	15 0.01 <u>+</u> 0.1	Hiroshi Miyamoto		
EXPERIMENTAL	VALUES:				
Shaking	L-Histi	dine HCl	Mercury ^a		
Time t/days	c ₂ /mg dm ⁻³	c ₂ /mol dm ^{-3C} (compiler)	ppm ^b	10'c1/mol dm-3C (compiler)	
1	0	0	0 020 < 0 045 < 0 070	2 2	
-	õ	0	0.025 < 0.060 < 0.096	3.0	
5	0	0	$0.023 \le 0.000 \le 0.000$	1.2	
5	0	0	$0.078 \leq 0.088 \leq 0.090$	4.3	
5	0	0	$0.078 \le 0.087 \le 0.095$	4.3	
5	U	0	$0.070 \le 0.095 \le 0.120$	4.7	
5	-	0.01	$0.919 \leq 0.960 \leq 1.001$	47.9	
^a The comp ity equi ^b The comp means gr ^C This valu	 ^aThe compiler assumes that the five day shaking time represents solubil- ity equilibrium. ^bThe compiler calculated the concentration of mercury assuming that ppm means grams of mercury in 1 x 10⁴ cm³ of solution. ^CThis value calculated from the middle value of the three numbers. 				
		AUXILIARY	INFORMATION		
METHOD/APPARA	TUS/PROCEDURE :		SOURCE AND PURITY OF MATE	RIALS:	
Metallic mercury (0.3 g) and 25 ml of amino acid solution were placed in an Erlenmeyer flask. The rubber stoppered flask was rotated 1 to 5 days in a thermostat at 37°C. The aqueous phase was sampled. Acidified (H ₂ SO ₄) potassium perman- ganate solution was added. The sample was wet ashed and the mercury reduced by air and vaporized as described in ref. 1.					
The mercury was determined by flameless atomic absorption spectro-			FSTIMATED EPDOD.		
photometry using a mercury analyzer (JEOL AA-HG 01) and an atomic ab- sorption spectrophotometer (JEOL JAA-7000). Three determinations were per-			$\delta c_1/\text{ppm}$ See ranges $\delta T/K$ Not given.	in table above.	
formed on The sol Much larg obtained i 11 ranges values are 0.1. Ther sion of or	each sample ubility was er solubili in the pH 2 All report for soluti e was no men sygen from t	 pH dependent. ty values were 3 and pH 10 - cted solubility ons at pH 7.2 + ntion of exclu- he samples. 	REFERENCES: 1. Kimura, Y.; Mille Anal. Chim. Acta	r, V. L. <u>1962</u> , 27, 325.	

COMPONENTS:			ORIGINAL MEASUREMENTS:		
(l) Mercur	(Y; Hg; [743	9-97-6]	Kawakara, H.; Nakar Ishizaki, N.; Yamad	Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.;	
<pre>(2) L-Ornithine monochloride; C₅H₁₂N₂O₂.HCl; [3184-13-2]</pre>		Kawamoto, T.; Hikari, S.; Sogawa, K.; Maehara, S.			
(3) Water;	н ₂ 0; [7732-	-18-5]	Shika Rikogaku Zase 137 - 41.	nhi <u>1979</u> , 20,	
VARIABLES:	·····		PREPARED BY:		
c₂∕mol	T/K = 310.3 dm ⁻³ = 0 to pH = 7.2	15 0.01 <u>+</u> 0.1	Hiroshi Miyamoto		
EXPERIMENTAL	VALUES:				
Shaking	L-Ornit	hine HCl	Mercury ²		
t/days	c ₂ /mg dm ⁻³	c ₂ /mol dm-3C (compiler)	ppm ^b	10'c ₁ /mol dm-*C (compiler)	
1	0	0	0.020 <u><</u> 0.045 <u><</u> 0.070	2.2	
3	0	0	0.025 <u><</u> 0.060 <u><</u> 0.096	3.0	
5	0	0	$0.078 \le 0.086 \le 0.090$	4.3	
5	0	0	0.078 <u><</u> 0.087 <u><</u> 0.095	4.3	
5	0	0	$0.070 \leq 0.095 \leq 0.120$	4.7	
5	-	0.01	$0.158 \le 0.158 \le 0.158$	7.88	
^b The compiler calculated the concentration of mercury assuming that ppm means grams of mercury in 1 x 10° cm ³ of solution. ^c This value calculated from the middle value of the three numbers.					
		AUXILIARY	INFORMATION		
METHOD/APPAR	ATUS/PROCEDURE:		SOURCE AND PURITY OF MAT	ERIALS:	
Metallic mercury (0.3 g) and 25 ml of amino acid solution were placed in an Erlenmeyer flask. The rubber stoppered flask was rotated 1 to 5 days in a thermostat at 37°C. The aqueous phase was sampled. Acidified (H ₂ SO ₄) potassium perman- ganate solution was added. The sample was wet ashed and the mercury reduced by air and vaporized as described in ref. 1.					
flameless atomic absorption spectro-			ESTIMATED ERROR:		
pnotometry using a mercury analyzer (JEOL AA-HG 01) and an atomic ab- sorption spectrophotometer (JEOL JAA-7000).			$\delta c_1/\text{ppm}$ See ranges $\delta T/K$ Not given.	in table above.	
formed on	eterminationetic	ons were per-	REFERENCES:		
The solution Much larg obtained i 11 ranges. values are 0.1. Ther sion of ox	ubility was er solubili .n the pH 2 - . All repor e for soluti e was no mer	pH dependent. ty values were - 3 and pH 10 - ted solubility ons at pH 7.2 <u>+</u> ntion of exclu- he samples.	l. Kimura, Y.; Mille Anal. Chim. Acta	er, V. L. <u>1962</u> , 27, 325.	

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COMPONENTS :			ORIGINAL MEASUREMENTS:	
(1) Mercun (2) L-Lysi	ry; Hg; [743 ine monohydr	9-97-6] ochloride;	Kawakara, H.; Nakam Ishizaki, N.; Yamad Kawamoto, T.; Hikar	ura, M.; a, T.; i, S.;
C ₆ H ₁₄ N	N202.HCl; [6	57-27-2]	Sogawa, K.; Maehara	, S.
(3) Water; H ₂ O; [7732-18-5]		Shika Rikogaku Zass 137 - 41.	hi <u>1979</u> , 20,	
VARIABLES:			PREPARED BY:	
c₂∕mol	T/K = 310. dm ⁻³ = 0 to pH = 7.2	15 0.01 <u>+</u> 0.1	Hiroshi Miyamoto	
EXPERIMENTAL	VALUES:			
Shaking	L-Lysi	ne HCl	Mercury ^a	
Time t/days	c ₂ /mg dm ⁻³	c ₂ /mol dm ^{-3C} (compiler)	ppm ^b	10'c1/mol dm-3C (compiler)
1	0	0	0.020 < 0.045 < 0.070	2.2
3	0	0	0.025 < 0.060 < 0.096	3.0
5	0	0	0.078 < 0.086 < 0.090	4.3
5	0	0	0.078 < 0.087 < 0.095	4.3
5	0	0	$0.070 \leq 0.095 \leq 0.120$	4.7
5	70	3.8 x 10-*	$0.124 \leq 0.162 \leq 0.195$	8.08
5	-	0.01	0.138 <u><</u> 0.146 <u><</u> 0.154	7.28
^a The comp ity equi ^b The comp means gr ^C This valu	iler assumes librium. iler calcula ams of mercu le calculate	s that the five ated the concen ary in 1 x 10 ⁶ c d from the midd	day shaking time repr tration of mercury as m³ of solution. He value of the three	esents solubil- suming that ppm numbers.
		AUXILIARY	INFORMATION	
METHOD/APPARA Metallic of amino in an Erle stoppered days in a The aqu Acidified ganate so sample was reduced described The men	ATUS/PROCEDURE c mercury (O acid soluti enmeyer flas flask was thermostat leous phase (H ₂ SO ₄) pot olution wa s wet ashed by air and in ref. 1.	.3 g) and 25 ml on were placed sk. The rubber rotated 1 to 5 at 37°C. was sampled. cassium perman- s added. The and the mercury vaporized as determined by	SOURCE AND PURITY OF MATE No information wa source and purity o	RIALS: as given on the f materials.
flameless photometry (JEOL AA- sorption JAA-7000). Three of formed on The sol Much larg obtained i 11 ranges, values are 0.1. Ther sion of ox	atomic abso y using a mu HG 01) and spectropho determinati each sample ubility was er solubili in the pH 2 All repose for soluti e was no me sygen from t	rption spectro- ercury analyzer an atomic ab- tometer (JEOL ons were per- s pH dependent. ty values were - 3 and pH 10 - rted solubility ons at pH 7.2 <u>+</u> ntion of exclu- he samples.	ESTIMATED ERROR: δc ₁ /ppm See ranges δT/K Not given. REFERENCES: 1. Kimura, Y.; Mille Anal. Chim. Acta	in table above. r, V. L. <u>1962</u> , 27, 325.

COMPONENTS:		·····	ORIGINAL MEASUREMENTS:	
 (1) Mercury; Hg; [7439-97-6] (2) L-Arginine monohydrochloride; C₆H₁₄N₄O₂.HCl; [1119-34-2] 		Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.; Kawamoto, T.; Hikari, S.; Sogawa, K.; Maehara, S.		
(3) Water; H ₂ O; [7732-18-5]			Shika Rikogaku Zass 137 - 41.	hi <u>1979</u> , 20,
VARIABLES:			PREPARED BY:	
r c ₂ /mol dm	/K = 310.1 -3 = 0 to pH = 7.2	15 0.01 <u>+</u> 0.1	Hiroshi Miyamoto	
EXPERIMENTAL VAL	UES:			
Shaking	L-Argin:	ine HCl	Mercury ^a	
t/days c ₂	/mg dm - 3	c ₂ /mol dm ^{-3C} (compiler)	ppm ^b .	10 ⁷ c ₁ /mol dm ^{-3C} (compiler)
1	0	0	$0.020 \leq 0.045 \leq 0.070$	2.2
3	0	0	0.025 <u><</u> 0.060 <u><</u> 0.096	3.0
5	0	0	0.078 <u><</u> 0.086 <u><</u> 0.090	4.3
5	0	0	$0.078 \leq 0.087 \leq 0.095$	4.3
5	0	0	$0.070 \leq 0.095 \leq 0.120$	4.7
5	70	3.3 x 10 ⁻⁴	$0.332 \leq 0.425 \leq 0.510$	21.2
5	-	0.01	$0.320 \leq 0.320 \leq 0.320$	16.0
^a The compile ity equilib ^b The compile means grams	r assumes rium. r calcula s of mercu	that the five ted the concent ry in 1 x 10° c	day shaking time repr ration of mercury as: m³ of solution.	esents solubil-
^C This value	calculated	d from the midd	le value of the three	numbers.
		AUXILIARY	INFORMATION	
Metallic m of amino aci in an Erlenm stoppered f: days in a th The aqueo Acidified (H ganate solu sample was w reduced by described in The mercu flameless at photometry U (JEOL AA-HG sorption sp JAA-7000). Three det formed on ea The solub: Much larger obtained in l1 ranges.	ercury (0 d solution eyer flass lask was ermostat us phase 2SO4) pot ition was et ashed air and aref. 1. ery was (omic abso sing a me 01) and ectrophot erminatic ch sample ility was solubili the pH 2 - All repor	.3 g) and 25 ml on were placed sk. The rubber rotated 1 to 5 at 37°C. was sampled. assium perman- s added. The and the mercury vaporized as determined by rption spectro- ercury analyzer an atomic ab- tometer (JEOL ons were per- pH dependent. ty values were - 3 and pH 10 - cted solubility	No information was source and purity of ESTIMATED ERROR: $\delta c_1/ppm$ See ranges $\delta T/K$ Not given. REFERENCES: 1. Kimura, Y.; Mille Anal. Chim. Acta	in table above.
values are f 0.1. There we sion of oxyg	or soluti vas no mer en from t	ons at pH 7.2 <u>+</u> ntion of exclu- he samples.		

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COMPONENTS :	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]	Kawahara, H.; Nakamura, M.; Isbizaki, N.; Yamada, T.
(2) See following seven data sheets.	Kawamoto, T.; Hikari, S.; Sogawa, K.; Maehara, S.
(3) Hanks' balanced salt solution; see formulation below.	Shika Rikogaku Zasshi <u>1979</u> , 20, 137 - 41.

COMMENTS AND/OR ADDITIONAL DATA:

Paul (ref. 1) says that balanced salt solutions are media in which cell growth of tissues from warm-blooded vertebrates is maintained in either an air or special carbon dioxide atmosphere. The function of the balanced salt solution is to maintain the pH and osmotic pressure and to provide an adequate concentration of essential inorganic ions without allowing calcium deposition.

In preparing a balanced salt solution, it is essential that calcium and phosphate ions should not meet until the solution is quite dilute, and that the solution should not be made basic until the last minute. Thus, the calcium chloride is sometimes dissolved separately and slowly added to the solution of other components. Also, the sodium bicarbonate solution is prepared separately and added at the end to adjust pH.

Hanks (ref. 2 and 3) has described the solution. According to Paul (ref. 1), the solution is for use with an air atmosphere, but it has also been used with special carbon dioxide atmospheres. The solution used in the present work had the composition below.

Component	Registry Number	$c/mg dm^{-3}$	c/mol dm ⁻³
NaCl	[7647-14-5]	8000	0.137
KCl	[7447-40-7]	400	0.00536
CaCl	[10043-52-4]	140	0.00126
Maso .7HoO	[7487-88-9]	200	0.00021
NaoHPOA· 2HoO	[10028-24-7]	48	0.00031
KH2PO	[7778-77-0]	60	0.00044
D-Glucose	[50-99-7]	1000	0.00555
Kanamycin	[8063-07-8]	60	-
(Kanamycin A)	[59-01-8]		
Phenol Red	[143-74-8]	6	-
NaHCO3	[144-55-8]	350	0.0042

The balanced salt solution is prepared in several steps:

- (1) Solution 1 is prepared by dissolving the first eight components listed above in a little less than one liter of distilled water.
- (2) Solution 2 is prepared by dissolving one gram of phenol red in 100 cm³ of one molar dm⁻³ NaOH solution.
 (3) An 0.6 cm³ volume of solution 2 is added to solution 1 and the
- solution is sterilized under high pressure.
 (4) Solution 3 is prepared to be 6 wt % NaHCO3. It is sterilized by filtration and then 3 cm³ is added to the sterilized solution 1. The total solution is brought to one liter.

Note that sterilization by heat when the NaHCO₃ is present converts the bicarbonate to carbonate with evolution of CO₂. The reverse reaction occurs at room temperature, $2NaHCO_3(aq) = Na_2CO_3(aq) + CO_2(aq)$.

REFERENCES:

- 1. Paul, J. Cell and Tissure Culture, 4th Ed., Williams and Wilkins, Baltimore, 1970, Chapter VI.
- 2. Hanks, J. H. J. Cell Comp. Physiol. 1948, 31, 235.
- 3. Hanks, J. H.; Wallace, R. E. Proc. Soc. exp. Biol. NY <u>1949</u>, 71, 196.

COMPONENTS :		ORIGINAL MEASUREMENTS:
(1) Mercur	y; Hg; [7439-97-6]	Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.;
(2) Hanks'	Balanced Salt Solution	Kawamoto, T.; Hikari, S.; Sogawa, K.; Maehara, S.
(3) Water;	H ₂ O; [7732-18-5]	Shika Rikogaku Zasshi <u>1979</u> , 20, 137 - 41.
VARIABLES:		PREPARED BY:
	T/K = 310.15	
Gammad	$pH = 7.2 \pm 0.1$	H. L. Clever
Composi	tion: refer to page 8/ .	1
EXPERIMENTAL	VALUES:	
Shaking		Mercury ^a
Time	. Co	ncentration Mole Molality
	ppm ^D	Fraction
t/days	10	$r_{c_1/mol dm^{-3}} 10^{s_{x_1}} 10^{r_{m_1/mol kg^{-1}}}$
Water		
5	0.078 ≤ 0.086 ≤ 0.090	4.2 <u>+</u> 0.2
5	0.078 <u><</u> 0.087 <u><</u> 0.095	4.3 ± 0.3
5	$0.070 \leq 0.095 \leq 0.120$	4.7 <u>+</u> 1.0
		$4.4 \pm 0.7^{\circ}$ 8.0 4.4
Hanks' Bal	anced Salt Solution	
5	$0.173 \leq 0.208 \leq 0.243$ 1	0.4 ± 1.7 10.4
^a The compi ity equil	ler assumes that the five .ibrium.	day shaking time represents solubil-
b _{The compi}	ler calculated the concer	tration of mercury assuming that ppm
means gra	ms of mercury in i x 10° C	
^C The avera	ge for water is from the t	he five days of shaking time.
	AUXILIAR	Y INFORMATION
METHOD/APPAR	ATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Metallic	mercury (0.3 g) and 25 ml	No information was given on the
of amino a	cid solution were placed	source and purity of materials.
stoppered	flask was rotated 1 to 5	
days in a	thermostat at 37°C.	
Acidified	(H_SO_) notassium perman-	
ganate so	olution was added. The	
sample was	wet ashed and the mercury	
described	in ref. 1.	
The mer	cury was determined by	
flameless	atomic absorption spectro-	ESTIMATED ERROR:
(JEOL AA-	HG 01) and an atomic ab-	Se (non coo ranges in table above
sorption JAA-7000).	spectrophotometer (JEOL	δτ/K Not given.
Three d formed on	eterminations were per- each sample.	REFERENCES :
The solu	ubility was pH dependent.	1. Kimura, Y.; Miller, V. L.
Much large	er solubility values were	Anal. Unim. Acta <u>1962</u> , 27, 325.
11 ranges.	All reported solubility	
values are	e for solutions at pH 7.2 \pm	
sion of ox	ygen from the samples.	

COMPONENTS :			ORIGINAL MEASUREMENT	ïS:
(1) Mercury;	Hg; [7439-97-6]		Kawakara, H.; N Tshizaki, N.: Y	Jakamura, M.; Jamada, T.:
(2) L-Methion [63-68-3]	ine; C ₅ H ₁₁ NO ₂ S;		Kawamoto, T.; H Sogawa, K.; Mae	likari, S.; hara, S.
(3) Hanks' balanced salt solution			Shika Rikogaku 137 - 41.	Zasshi <u>1979</u> , 20,
VARIABLES: T/	K = 310.15		PREPARED BY:	
p compositio	<pre>H = 7.2 ± 0.1 n = See descriptio</pre>	n	Hiroshi Miyamot	o
EXPERIMENTAL VALU	JES:			
Shaking Time	L-Methionine		Mercury	a
t/days	c ₂ /mg dm ⁻³		ppm ^b	10' <i>c₁/</i> mol dm ^{-3C} (compiler)
5	0	0.173	<u><</u> 0.208 <u><</u> 0.243	10.4
5	0.01	0.374	<u>< 0.456 < 0.556</u>	22.7
^a The comp solubili	>iler assumes that ty equilibrium.	t the f	ive day shaking	time represents
b _{The comp that ppm}	piler calculated f	the com	ncentration of m in 1 x 10° cm³ of	ercury assuming solution.
Cml to un l				
This val	ue calculated from	n the m	liddle value of th	he three numbers.
	AU	XILIARY	INFORMATION	
METHOD/APPARATUS	/PROCEDURE:		SOURCE AND PURITY OF	F MATERIALS:
Metallic me	ercury (0.3 g) and	25 ml	No information	n who given on the
of amino acio	i solution were player flask. The r	laced	source and puri	ty of materials.
stoppered fla	ask was rotated 1	to 5	_	-
days in a the	rmostat at 37°C. s phase was sam	pled.		
Acidified (H2	SO ₄) potassium pe	rman-		
ganate solu	tion was added.	The		
reduced by	air and vaporize	ed as		
described in	ref. 1.	d hu		
flameless ato	mic absorption spe	ctro-	ESTIMATED ERROR.	
photometry us	ing a mercury ana	lyzer	DOTTINITED ERROR.	
JAA-7000).	ctrophotometer	(JEOL	δ <i>c</i> ₁ /ppm See ran δ <i>T</i> 7K Not giv	ges in table above. en.
Three dete	rminations were	per-	REFERENCES :	
The solubi	lity was pH depen	dent.	1. Kimura. V. M	liller, V. L.
Much larger	solubility values	were	Anal. Chim. A	cta <u>1962</u> , 27, 325.
11 ranges. R	All reported solub	ility		
values are fo	r solutions at pH	7.2 ±		
sion of oxyge	n from the samples	5.		

COMPO	NENTS:			ORIGINAL MEASUREMENTS:	
(1) (2)	Mercury; H L-Histidin C ₆ H ₉ N ₃ O ₂ .H	ig; [7439-97-6] ie monohydrochlorid IC1; [645-35-2]	de;	Kawakara, H.; Na Ishizaki, N.; Ya Kawamoto, T.; Hi Sogawa, K.; Maeh	kamura, M.; mada, T.; kari, S.; ara, S.
(3) Hanks' balanced salt solution			Shika Rikogaku Z 137 - 41.	asshi <u>1979</u> , 20,	
VARIA	BLES: T/K	= 310.15		PREPARED BY:	
	pH composition	<pre>1 = 7.2 ± 0.1 1 = See description on page 87.</pre>	n	Hiroshi Miyamoto	
EXPER	IMENTAL VALUE	:5:			
1	Shaking	L-Histidine HCl		Mercury ^a	
	Time t/days	c ₂ /mg dm ⁻³		ppm ^b	10'c1/mol dm ^{-3C} (compiler)
	5	0	0.173	<u>< 0.208 < 0.243</u>	10.4
	5	0.01	3.244	<u>< 3.600 < 3.956</u>	179.5
	^a The comp solubilit	iler assumes that y equilibrium.	the f	tive day shaking t	ime represents
	^b The comp that ppm	iler calculated t means grams of me	he co rcurv	ncentration of me in 1 x 10° cm³ of s	rcury assuming
	C _{whis valu}	e calculated from	the T	niddle value of the	three numbers
Į	11110 1010	e ourourubeu rrom	C 11 C 11	addie value of ene	. enree numbers.
	· +				
		AUX	ILIARY	INFORMATION	
METHO	DD/APPARATUS/I	ROCEDURE:		SOURCE AND PURITY OF	MATERIALS:
M of a sto days T Acio gan sam red des	etallic meanino acid an Erlenme ppered fla s in a ther he aqueous dified (H2S ate solut ple was we uced by a cribed in p	ccury (0.3 g) and 2 solution were pl yer flask. The ru sk was rotated 1 mostat at 37°C. phase was samp O4 potassium per ion was added. ashed and the men ir and vaporize ref. 1. y was determine	25 ml aced bber to 5 oled. The rcury d as d by	No information source and purit	was given on the y of materials.
phot	heress atom tometry us:	ing a mercury anal	lyzer	ESTIMATED ERROR:	
(JE) sor JAA	OL AA-HG 0 ption spec -7000).	1) and an atomic trophotometer (ab− JEOL	$\delta c_1/\text{ppm}$ See rang $\delta T/K$ Not give	es in table above. n.
for	nree deter med on each	minations were sample.	per-	REFERENCES:	
TI Muc obta 11 valu 0.1. sion	he solubil h larger s: ained in th ranges. A ues are for There wa n of oxygen	ity was pH depend olubility values e pH 2 - 3 and pH ll reported solubits solutions at pH s no mention of ex from the samples	lent. were 10 - ility 7.2 <u>+</u> clu-	l. Kimura, Y.; Mi Anal. Chim. Ac	ller, V. L. <i>ta <u>1962</u>, 27,</i> 325.

COMPONENTS:	ORIGINAL MEASUREMENTS:
 (1) Mercury; Hg; [7439-97-6] (2) L-Cysteine hydrochloride; CoHonos, HC1: [52-89-1] 	Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.; Kawamoto, T.; Hikari, S.; Sogawa, K.; Maehara, S.
(3) Hanks' balanced salt solution	Shika RikogakuZasshi <u>1979</u> , 20, 137 - 41.
VARIABLES:	
$\begin{array}{rcl} P/K = 310.15 \\ pH = 7.2 \pm 0.1 \\ composition = See description \\ on page 87 \end{array}$	Hiroshi Miyamoto
EXPERIMENTAL VALUES:	
Shaking L-Cysteine HCl	Mercury ^a
Time t/days c ₂ /mg dm ⁻ ³	ppm ^b 10'c ₁ /mol dm ^{-;c} (compiler)
	· · · · · · · · · · · · · · · · · · ·
5 0 0.173	\leq 0.208 \leq 0.243 10.4
5 0.01 89.310	\leq 100.000 \leq 110.700 4985
^a The compiler assumes that the fiv bility equilibrium.	e day shaking time represents solu-
^b The compiler calculated the concen means grams of mercury in 1 x 10 ⁵	tration of mercury assuming that ppm
Curbic value calculated from the mid	dle value of the three numbers
This value calculated from the mit	die value of the three humbers.
AUXILIAR	INFORMATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
of amino acid solution were placed in an Erlenmeyer flask. The rubber stoppered flask was rotated 1 to 5 days in a thermostat at 37°C. The aqueous phase was sampled. Acidified (H ₂ SO ₄) potassium perman- ganate solution was added. The sample was wet ashed and the mercury reduced by air and vaporized as	No information was given on the source and purity of materials.
described in ref. 1. The mercury was determined by	
flameless atomic absorption spectro- photometry using a mercury analyzer (JEOL AA-HG 01) and an atomic ab- sorption spectrophotometer (JEOL JAA-7000).	ESTIMATED ERROR: $\delta c_{7}/\text{ppm}$ See ranges in table above. $\delta T/K$ Not given.
formed on each sample. The solubility was pH dependent. Much larger solubility values were obtained in the pH 2 - 3 and pH 10 - 11 ranges. All reported solubility values are for solutions at pH 7.2 <u>+</u> 0.1. There was no mention of exclu- sion of oxygen from the samples.	REFERENCES: 1. Kimura, Y.; Miller, V. L. Anal. Chim. Acta <u>1962</u> , 27, 325.

		· · · · · · · · · · · · · · · · · · ·		-	
COMPONE	NTS:			ORIGINAL MEASUREMENTS	:
(1) M	Mercury; Hg;	[7439-97-6]	_	Kawakara, H.; N Ishizaki, N.; Ya	akamura, M.; amada, T.;
(2) L C	,-Ornithine 6 ^H 12 ^N 2 ^O 2• ^{HC}	monohydrochlorid 1; [3184-13-2]	de;	Kawamoto, T.; H Sogawa, K.; Mael	ikari, S.; hara, S.
(3) H	Ianks' balan	ced salt solution	on	Shika Rikogaku 137 - 41.	Zaeshi <u>1979</u> , 20,
VARIABL	LES: T/K =	310.15		PREPARED BY:	
co	pH = pmposition =	7.2 \pm 0.1 See description on page 87.	n	Hiroshi Miyamoto	D
EXPERIM	MENTAL VALUES:			Lu =	
s	Shaking L-	Ornithine HCl		Mercury	a
t	Time days	c ₂ /mg dm ⁻ ³		ppm ^b	l0 ⁷ c ₁ /mol dm ^{-3C} (compiler)
-	5	0	0.173	< 0.208 < 0.243	10.4
	-			<u>.</u>	
	5	0.01	0.952	<u><</u> 0.988 <u><</u> 1.023	49.3
a	The compile solubility	er assumes that equilibrium.	the f	ive day shaking t	time represents
c	This value	calculated from	the m	hiddle value of th	e three numbers.
		AUX	ILIARY	INFORMATION	
METHOD	APPARATUS/PROC	CEDURE:		SOURCE AND PURITY OF	MATERIALS;
Met of an in an stopp days The Acidi gana sampl redu descr The	callic mercu nino acid so Erlenmeyer pered flask in a thermo aqueous p fied (H ₂ SO4 te solutio le was wet a ced by air ribed in red	ry (0.3 g) and 2 olution were pl r flask. The ru was rotated l ostat at 37°C. phase was sam) potassium per	25 ml laced ibber to 5 pled.	No information source and puri	was given on the ty of materials.
і гташе	e mercury	n was added. shed and the me and vaporize f. 1. was determine	d as		
photo	e mercury eless atomic ometry using	n was added. shed and the me and vaporize E. 1. was determine absorption spe a mercury ana	d as d by ctro-	ESTIMATED ERROR:	
photo (JEOI sorpt JAA-7	e mercury eless atomic metry using AA-HG 01) tion spectr 2000).	n was added. shed and the me and vaporize f. 1. was determine absorption spe a mercury ana and an atomic ophotometer (d by ctro- lyzer JEOL	ESTIMATED ERROR: ^{&} c ₁ /ppm See ran ^{&} T/K Not give	ges in table above. en.
photo (JEOI sorpt JAA-7 Thr	e mercury eless atomic metry using AA-HG 01) tion spectr 000). cee determine	n was added. shed and the me and vaporize f. 1. was determine absorption spe a mercury and and an atomic ophotometer (inations were	rcury d as d by ctro- lyzer JEOL per-	ESTIMATED ERROR: $\delta c_1/\text{ppm}$ See range $\delta T/K$ Not give REFERENCES.	ges in table above. en.

COMPONENTS :			ORIGINAL MEASUREMENTS	S:
(1) Mercury; Hg; [74 (2) L-Lysine monohyd	139-97-6] Brochloride;		Kawakara, H.; N Ishizaki, N.; Y Kawamoto, T.; H	akamura, M.; amada, T.; ikari, S.;
C ₆ H ₁₄ N ₂ O ₂ .HC1;	[657-27-2]		Sogawa, K.; Mae	hara, S.
(3) Hanks' balanced	salt solution		Shika Rikogaku 137 - 41.	Zasshi <u>1979</u> , 20,
VARIABLES: $T/K = 310$.15		PREPARED BY:	
pH = 7.2 composition = See on	2 <u>+</u> 0.1 e description page 87 .		Hiroshi Miyamot	o
EXPERIMENTAL VALUES:				
Shaking L-Lys	sine HCl		Mercury	a
Time t/days c ₂ /n	ng dm ⁻³		ppm ^b	10 ⁷ c ₁ /mol dm ^{-;C} (compiler)
5 0) 0,	.173	< 0.208 < 0.243	10.4
5 0	.01 1.	.084	\leq 1.218 \leq 1.387	60.72
aThe compiler a solubility equi	ssumes that this	he f	ive day shaking t	time represents
^D The compiler o that ppm means ^C This value calo	alculated the grams of merc ulated from th	e con ury he m	ncentration of mo in 1 x 10° cm³ of iddle value of th	ercury assuming solution. he three numbers.
			. <u></u>	
	AUXIL	IARY	INFORMATION	
METHOD/APPARATUS/PROCEDU	RE:		SOURCE AND PURITY OF	MATERIALS:
Metallic mercury of amino acid solut in an Erlenmeyer fl stoppered flask was days in a thermostat The aqueous phas Acidified (H ₂ SO ₄) po ganate solution w sample was wet ashed reduced by air an described in ref. 1.	(U.3 g) and 25 ion were plac ask. The rubb s rotated 1 to t at 37°C. se was sample otassium perma 'as added. T d and the mercu d vaporized	ml ced oer 5 ed. an- lhe ury as	No information source and puri	h was given on the ty of materials.
The mercury was flameless atomic abs photometry using a (JEOL AA-HG 01) and sorption spectroph JAA-7000). Three determinat formed on each samp The solubility wi Much larger solubil obtained in the pH 2 11 ranges. All rep values are for solut 0.1. There was no m	determined sorption spectr mercury analyz d an atomic a otometer (JE ions were pe le. as pH depender lity values we 2 - 3 and pH 10 orted solubili tions at pH 7.2 mention of exc3	by ro- zer ab- cOL er- nt. er- ity 2 <u>+</u> lu-	ESTIMATED ERROR: &c ₁ /ppm See ran &T/K Not give REFERENCES: 1. Kimura, Y.; M Anal. Chim. A	ges in table above. en. iller, V. L. cta <u>1962</u> , 27, 325.
sion of oxygen from	the samples.			

COMPONENTS :	ORIGINAL MEASUREMENTS:
 Mercury; Hg; [7439-97-6] L-Arginine monohydrochloride; 	Kawakara, H.; Nakamura, M.; Ishizaki, N.; Yamada, T.; Kawamoto, T.; Hikari, S.;
$C_{6}H_{14}N_{4}O_{2}HC1;$ [1119-34-2]	Sogawa, K.; Maehara, S.
(3) Hanks' balanced salt solution	Shika Rikogaku Zasshi <u>1979</u> , 20, 137 - 41.
VARIABLES: $T/K = 310.15$	PREPARED BY:
$pH = 7.2 \pm 0.1$	Virachi Vivomoto
composition = See description on page 87 .	HIROSHI MIYAMOLO
EXPERIMENTAL VALUES:	
Shaking L-Arginine HCl	Mercury ^a
Time $$	$nnmb$ 107 mol $dm^{-3}C$
	(compiler)
5 0 0.173	\leq 0.208 \leq 0.243 10.4
5 0.01 0.315	$\leq 0.340 \leq 0.365$ 16.9
	_
^a The compiler assumes that the f solubility equilibrium.	ive day shaking time represents
^b The compiler calculated the contract that ppm means grams of mercury	ncentration of mercury assuming
This value calculated from the m	iddle value of the three numbers.
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Metallic mercury (0.3 g) and 25 ml	No information was given on the
in an Erlenmeyer flask. The rubber	source and purity of materials.
stoppered flask was rotated 1 to 5	
days in a thermostat at 37°C. The aqueous phase was sampled.	
Acidified (H_2SO_4) potassium perman-	
ganate solution was added. The	
sample was wet ashed and the mercury reduced by air and vaporized as	
described in ref. 1.	
The mercury was determined by	
photometry using a mercury analyzer	ESTIMATED ERROR:
(JEOL AA-HG 01) and an atomic ab-	$\delta c_1/\text{ppm}$ See ranges in table above.
sorption spectrophotometer (JEOL	δT7K Not given.
Three determinations were per-	DEPENDING
formed on each sample.	REFERENCES:
Much larger solubility values were	L. Kimura, Y.; Miller, V. L. Angl. Chim. Acta 1962 27 325
obtained in the pH 2 - 3 and pH 10 -	
11 ranges. All reported solubility	
0.1. There was no mention of exclu-	
sion of oxygen from the samples.	

COMPONENTS :				ORIGIN	AL MEASUREN	ÆNTS :		
(1) Mercury; Hg; [7439-97-6]				Gjes	Gjessing, E. T.; Rogne, A. K. G.			
(2) Humus				Vata	ten <u>1982</u>	, 38, 4	06 - 8.	
(3) Water;	н ₂ 0; [77	32-18-5	1					
VARIABLES:				PREPAR	ED BY:	<u> </u>		
T/K Not roor	given, a n tempera	ssumed t ture.	co be	H. I M. 3	5. Clever [wamoto			
XPERIMENTAL V	ALUES:							
Sample	pH	[Col Pt,/mg	or dm-3	TO /mg d	С m ⁻³	Mercury Solubility	
	Before	After	Before	After	Before	After	<i>c₁/</i> µgdm ⁻³	
Ser. A								
^H 2 ^O	 4.5	5.9	-	0 181	-	<0.5	7	
2	6.7	6.7	26	30	-	4.2	7	
3	6.8	6.8	24	28	-	4.9	8	
4 5	6.8 6.6	6.8 6.7	51 24	55 26	-	6.2 4.3	10	
Cor D							Ū	
HoO		5.7	-	0	-	0.6	9	
6	4.4	4.4	74	80	13.3	11.6	19	
7	4.4	4.5	96	104	14.8	16.1	21	
8	5.4	5.5	78	82	9.9	10.1	13	
Ser. C								
Blank	4.8	5.0	0	0	7.0	3.0	13	
9 10	5.7	6.6 57	67 128	71	6.3 11 1	4.8	28	
11	5.2	5.2	185	195	14.0	14.8	27	
12	4.9	5.0	205	215	16.0	17.0	28	
13	4.6	4.7	278	271	24.5	26.0	36	

The before and after refer to before and after saturation with metallic mercury.

The H₂O samples are distilled water. The water solubility of 7 - 9 micrograms of mercury per liter of water correspond to a mole fraction solubility of (6 - 8) x 10^{-10} or a molality of (3.5 - 4.5) x 10^{-10} .

The blank was prepared to be an artificial "surface water" without organic material. Its composition is $5.62 \text{ mg dm}^{-3} \text{ NaHCO}_3$, $1.18 \text{ mg dm}^{-3} \text{ MgCO}_3$, $7.17 \text{ mg dm}^{-3} \text{ CaSO}_4$, and $10.96 \text{ mg dm}^{-3} \text{ CaCl}_2$.

The samples are described further in the table below.

Sample Number	Location of Sample Taken	Date	Dilution of Mixing
1 2 3 4 5 6 7 8 9 10 11 12 13	Hellerudmyra Byvann Smavann Smavannsbekk Øvre Heffelivann Hellerudmyra Hellerudmyra	1980, Feb. 28 1980, Mar. 4 1980, Mar. 4 1980, Mar. 4 1980, Mar. 4 1980, May 1	None None None None None #1 and #6 mixed 1:1 #1 and #5 mixed 1:1 Blank and #13 mixed 3:1 Blank and #4 mixed 1:1 Blank and #4 mixed 1:2 Blank and #4 mixed 1:3 None

COMPONENTS:	ORIGINAL MEASUREMENTS:				
(1) Mercury; Hg; [7439-97-6]	Gjessing, E. T.; Rogne, A. K. G.				
(2) Humus	Vatten <u>1982</u> , 38, 406 - 8.				
(3) Water; H ₂ O; [7732-18-5]					
VARIABLES:	PREPARED BY:				
T/K Not given, assumed to be room temperature.	H. L. Clever M. Iwamoto				

EXPERIMENTAL VALUES:

The color and the total organic carbon, TOC, are measures of the humus in the samples. The authors show that "dissolvable" mercury increases linearly with both color and TOC.

The problem with the results of this study is that the reported mercury concentration in water is about one-tenth the value reported by most other workers at 298.15 K.

AUXILIARY INFORMATION

Some of the

Thus the

METHOD/APPARATUS/PROCEDURE:

different locations.

on other data sheet].

try (Perkin Elmer 460).

The experiment was performed by adding an aliquot amount of pure mercury (5 drops per 500 cm³ from a

polarographic analyzer) to natural

humus water samples from several

samples were diluted with artificial

"surface water" without organic material [see description of 'blank'

experiment covered a wide range of humus concentrations. All samples

were filtered through glass-fiberfilters (Whatman GF/C) before adding the mercury. The samples were left on a shaking table for 19 hours and the supernatant analyzed for mercury by atomic absorption spectrophotome-

SOURCE AND PURITY OF MATERIALS:

(1)	Mercur	y.	:	Sourc	е	not	given.
	Stated	τo	be	pure	me	rcury	•

- (2) Humus. Natural humus water. See information on other sheet.
- (3) Water. Distilled.

ESTIMATED ERROR:

REFERENCES:

96
Mercury in Aqueous Electrolyte and Nonelectrolyte Solutions

COMPONENTS :	ORIGINAL MEASUREMENTS:			
(1) Mercury; Hg; [7439-97-6] Mercury-203; ²⁰³ Hg; [13982-78-0]	Hursh, J. B.			
(2) Whole blood	JAT, J. Appl. Toxicol. <u>1985</u> , 5, 327 - 32.			
	, , , , , , , , , , , , , , , , , , ,			
VARIABLES:	PREPARED BY:			
T/K = 283 - 310	H. L. Clever			
EXPERIMENTAL VALUES:				
Temperature Ca Sample Ga	arrier Ostwald Concentration ^b			
t/°C T/K	Av. \pm SE (no.) $10^{7}c_{1}/mol dm^{-3}$			
10 283.15 Whole blood Whole blood	Air 10.50 <u>+</u> 0.25(5) 3.06			
(heparin no ethanol) Whole blood	Air $10.36 \pm 0.22(3)$ 3.02			
(heparin no ethanol)	N_2 11.12 ± 0.30(4) 3.24			
22 295.15 Whole blood	Air $6.62 \pm 0.06(5)$ 5.37			
37 310.15 Whole blood	Air $4.20 \pm 0.08(5)$ 10.9			
^a The Ostwald coefficient is ((ng H above is the average <u>+</u> standard er	g/mL fluid)/(ng Hg/mL air)). Given ror (number of determinations).			
^b The concentrations were calculated equilibrium with pure liquid mercur of Ambrose and Sprake (ref. 1). T concentration used at each temperat	by the compiler for mercury vapor in y from the vapor pressure evaluation he mercury vapor pressure and vapor cure are:			
7/K 283	3 295 310 5.869 19.90 66.89			
c1/(ng Hg/mL air)	6.85 16.27 52.03			
AUXILIARY	INFORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
The equilibrium cell is a 50 mL syringe thermostated in a Dewar flask. A 10 mL liquid sample and a 40 mL carrier gas with Hg vapor	(1) Mercury. Prepared by reduction of ²⁰³ HgCl ₂ . The Hg vapor is swept into a leak-proof Saran bag.			
cell is turned and rolled on the cylinder axis for 120 to 300 sec. Equilibrium is rapidly attained	(2) Whole blood. Red Cross fresh blood was used within 72 hours of withdrawal. As received,			
through the large contact area be- tween liquid and vapor phases. Both the liquid and vapor phases are	each 450 mL of blood was mixed with 63 mL CPDA-1 anticoagulant containing 2.0 g dextrose, 1.66			
ated and the Hg adsorbed on Hopca- lite. The Hg radioactivity is meas- ured on a liquid scintillation coun-	g Na citrate, 206 mg citric acid, 149 mg Na ₂ HPO ₄ , and 17.3 mg adenine. At time of use 30 ul. 95 % ethanol was added to 10			
ter. Corrections are applied for the counter efficiency, and for radioactive decay of the Hg. The	mL blood samples to inhibit Hg oxidation. Samples labelled (heparin no ethanol) were fresh			
whole blood results were adjusted to a hematocrit of 42 %. Blood speci- fic gravity was taken as 1.057. An	drawn blood to check effect of additives. The effect was con- sidered negligible.			
empirical correction was made for Hg oxidized during the experiment. The	REFERENCES :			
added ethanol inhibits the oxida- tion.	1. Ambrose, D.; Sprake, C. H. S. J. Chem. Thermodynam. <u>1972</u> , 4, 603.			

COMPONENTS :	ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6] Mercury-203: 203Hg, [13982-78-0]	Hursh, J. B.		
(2) Plasma (2) (2) Plasma	JAT, J. Appl. Toxicol. <u>1985</u> , 5, 327 - 32.		
VARIABLES:	PREPARED BY:		
T/K = 283 - 310	H. L. Clever		
EXPERIMENTAL VALUES:			
Temperature Carrier Ostw	ald Concentration ^b		
Gas Coef t/°C T/K Av.	ficient" <u>+</u> SE (no.) 10 ⁷ ° ₁ /mol dm ⁻³		
10 283.15 Air 5.76	<u>+</u> 0.15(5) 1.68		
22 295.15 Air 3.36	<u>+</u> 0.04(5) 2.94		
37 310.15 Air 2.40	<u>+</u> 0.03(5) 6.23		
^a The Ostwald coefficient is air)). Given above is the (number of determinations).	((ng Hg/mL fluid)/(ng Hg/mL average <u>+</u> standard error		
^b The concentrations were calc mercury vapor in equilibriu from the vapor pressure e Sprake (ref. 1). The mercur concentration used at each <i>T/K</i> 2 <i>p</i> ⁹ /Pa <i>c</i> ⁹ /(ng Hg/mL air)	culated by the compiler for im with pure liquid mercury evaluation of Ambrose and ry vapor pressure and vapor temperature are: 83 295 310 6.869 19.90 66.89 5.85 16.27 52.03		
AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE: The equilibrium cell is a 50 mL syringe thermostated in a Dewar flask. A 10 mL liquid sample and a 40 mL carrier gas with Hg vapor sample are drawn into the cell. The cell is turned and rolled on the cylinder axis for 120 to 300 sec. Equilibrium is rapidly attained through the large contact area be- tween liquid and vapor phases. Both the liquid and vapor phases are sampled. The liquid phase is aer- ated and the Hg adsorbed on Hopca- lite. The Hg radioactivity is mean	 SOURCE AND PURITY OF MATERIALS: (1) Mercury. Prepared by reduction of ²⁰³HgCl₂. The Hg vapor is swept into a leak-proof Saran bag. (2) Plasma. Prepared from the Red Cross fresh whole blood de- scribed on the previous data sheet. 		
ured on a liquid scintillation coun- ter. Corrections are applied for the counter efficiency, and for			
radioactive decay of the Hg.	REFERENCES: 1. Ambrose, D.; Sprake, C. H. S. J. Chem. Thermodynam. <u>1972</u> , 4, 603.		

Mercury in Aqueous Electrolyte and Nonelectrolyte Solutions

COMPONENTS :	ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6] Mercury-203; ²⁰ ³ Hg; [13982-78-0]	Hursh, J. B.		
(2) Hemoglobin	JAT, J. Appl. Toxicol. <u>1985</u> , 5, 327 - 32.		
(3) Water; H ₂ O; [7732-18-5]			
VARIABLES:	PREPARED BY:		
T/K = 295	H. L. Clever		
EXPERIMENTAL VALUES:			
Temperature Hemoglobin Carrie	r Ostwald Concentration ^b		
t/°C T/K wt. %	$10^{7}c_{1}/\text{mol dm}^{-3}$		
22 295.15 0 ^c -	(3.05) (2.47)		
2.32 Air 6.50 Air	3.44, 3.51 2.79, 2.85 4.49, 4.65 3.64, 3.77		
(14.0) -	(6.05) (4.91)		
^a The Ostwald coefficient is (<pre>/ng Hg/mL fluid)/(ng Hg/mL air)).</pre>		
 ^b The concentrations were calculations were calculated values at 295. 19.90 Pa and vapor concentrate ^c The value for water, 0 wt. % extrapolation of the other paper). The value is about 3.22 at 295.15 K calculated by in the mercury + water evalue hemoglobin is a value calculated value calculated the remaining solub water (see Fig. 3). 	alated by the compiler for mer- th pure liquid mercury from the of Ambrose and Sprake (ref. 1). 15 K are mercury vapor pressure tion 16.27 ng Hg/mL air. hemoglobin, is from a graphical three values (Fig. 3 in the 5 % smaller than the value of y the compiler from the results ation. The value at 14.0 wt. % ated from the whole blood Ost- contribution of 0.57 from the dility due to the hemoglobin and		
AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE: The equilibrium cell is a 50 mL syringe thermostated in a Dewar flask. A 10 mL liquid sample and a 40 mL carrier gas with Hg vapor sample are drawn into the cell. The cell is turned and rolled on the cylinder axis for 120 to 300 sec. Equilibrium is rapidly attained through the large contact area be- tween liquid and vapor phases. Both the liquid and vapor phases are sampled. The liquid phase is aer- ated and the Hg adsorbed on Hopca- lite. The Hg radioactivity is meas- ured on a liquid scintillation coun- ter. Corrections are applied for the counter efficiency, and for radioactive decay of the Hg.	<pre>SOURCE AND PURITY OF MATERIALS: (1) Mercury. Prepared by reduction of 203HgCl₂. The Hg vapor is swept into a leak-proof Saran bag. (2) Hemoglobin. Fisher Hemoglobin powder. Content determined in subsequent analysis. (3) Water. Distilled. (3) Water. Distilled. ESTIMATED ERROR: REFERENCES: 1. Ambrose, D.; Sprake, C. H. S. J. Chem. Thermodynam. 1972, 4, 603.</pre>		
L	l		



Mercury in Aqueous Electrolyte and Nonelectrolyte Solutions

COMPONENTS:	ORIGINAL MEASUREMENTS:
<pre>(1) Mercury; Hg; [7439-97-6] (From various dental amalgams)</pre>	Kawahara, H.; Yamada, T.; Nakamura, M.; Tomoda, T.; Kobayashi, H.; Saijo, A.; Kawata, Y.: Hikari, S.
(2) Tissue culture medium; YLH	
	Shika Rikogaku Zassi <u>1981</u> , 22, 295 - 9.
	Chem. Abstr. <u>1982</u> , 96, 91615a.
VARIABLES:	PREPARED BY:
$\pi/\kappa = 310$	H Mivamoto
17K - 510	n. Miyamoto
SOURCE AND PURITY OF MATERIALS (contir	uued):
(2) Tissue culture medium (YLH).	
The following components are diss	olved in water.
Component	c/mg dm ⁻³
KCl	400.0
Na ₂ HPO ₄ • 2H ₂ O	60.0
КН ₂ РО ₄ Мабо • 7Н ₂ О	60.0 200.0
CaCl ₂ (anhyd.)	140.0
Glucose Lactalbumin Hydrolys	1000.0 ate 5000.0
Yeast extract	1000.0
NaHCO3	700.0
Phenor red	5.0
Penicillin Streptomycin	100.000 unit
The figure is reproduced in a review	paper.
Kawahara, H.; Tomoda, T.; Kukizaki, H Nomura, Y.; Ikeda, H.; Kooda, Y.; Yok Yamanaka, M. <i>Bosei Kanri</i> <u>1982</u> , 26(3 Chem. Abstr. <u>1983</u> , 98, 90150z.	1.; Ogitani, Y.; Mitsutani, M.; ota, S.; Sakaguchi, K.; Iseki, T.;), 84 - 92;
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE:	REFERENCES:
The solutes were six dental amal-	Two additional studies on the solu-
mercury were mechanically tritu-	in saliva and in tissue culture
rated. The triturated dental amal-	media are:
medium (YLH) at 37°C and rotated at	Kawahara, H.; Tomoda, T.; Tomoda,
200 rpm for seven days. The amalgam	S.; Sakae, H.; Yokoyama, A.;
ratio is 1 cm ² /50 ml.	Biomater. <u>1983</u> , 1(1), 69 - 76.
Solution samples were taken on days	Kawahara, H.; Tomoda, T.; Tomoda,
tration in the YLH solution was	Kohda, H. J. Jpn. Soc. Biomater.
determined by atomic absorption spectroscopy.	$\frac{1983}{1}$, $1(1)$, $77 - 84$.
The results are presented graphi-	
cally. A copy of the figure is	
solubility is still increasing after	
seven days. The effect is greatest	l
Tor one copper amargame	
It is not clear that air (oxygen) was excluded.	
	1

COMPONENTS:

(1) Mercury; Hg; [7439-97-6]

(2) Alkanes

EVALUATOR:

H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA

<u>1985</u>, June

CRITICAL EVALUATION:

An Evaluation of the Solubility of Mercury in Alkanes.

The solubility of mercury in alkanes is reported in seven papers. Three of the papers are from the laboratory of A. F. Voigt. The other papers report independent measurements. The solvents include five normal alkanes and five branched alkanes. The solubility measurements were made over the 273 to 336 K range of temperature. Several of the papers report only smoothed data. Two authors, A. F. Voigt, Iowa State University, and S. Okouchi, Hosei University, kindly provided us with a full set of their experimental measurements to supplement the published values. The solubility of mercury in normal and branched alkanes is evaluated in separate sections.

I. Mercury + Normal Alkanes

When preparing the mercury + normal alkane molal solubility values for evaluation, it was observed that the solubility values at 298.15 K were independent of the solvent. The thirteen solubility values in pentane, hexane, heptane, octane and decane averaged 9.4 ± 0.6 mol kg⁻¹, or omitting the one outlaying value, the remaining twelve values averaged 9.6 ± 0.1 mol kg⁻¹. Further inspection of the data showed a similar constancy of the molal solubility at other temperatures although there were not as many data points to be as convincing as the data at 298.15 K.

of the molal solubility at other temperatures although there were not as many data points to be as convincing as the data at 298.15 K. Figure 1 shows $\ln(m_1/mol kg^{-1})$ vs. 1000/(T/K). Five solubility values deviated significantly from the line and were not used. They are Reichardt and Bonhoeffer's value in hexane at 336.15 K, Spencer and Voigt's value in octane at 313.15 K, Klehr and Voigt's values in decane at 308.15 and 318.15 K, and Kuntz and Mains's value in decane at 298.15 K.

Fifty-two of the fifty-seven mercury molal solubility values were combined in a linear regression to obtain the equation

 $\ln(m_7/mol kg^{-1}) = (5.105848 \pm 0.157626) - (49.70898 \pm 0.46401)/(T/100 K)$

with a standard error about the regression line of 4.0 x 10^{-7} .

The constants of the equation give thermodynamic changes for the transfer of one mole of mercury from the liquid metal to the hypothetical one molal solution of

 $\Delta H_1/kJ \text{ mol}^{-1} = 41.33 \pm 0.39 \text{ and } \Delta S_1/J \text{ K}^{-1} \text{ mol}^{-1} = 42.45 \pm 1.31.$

Table 1 summarizes the experimental molal solubility values, the average molal solubility at each temperature for all of the data for the five solvents, an average value omitting the doubtful value at each temperature, and the value from the smoothing equation. The smoothed values agree well with the experimental value averages. We believe the equation can be used with caution to predict the solubility in other normal hydrocarbons at temperatures beyond the experimental range.

The saturation concentration fits a similar pattern but with a little larger uncertainty. For the saturation concentration, the equation is

 $\ln(c_1/mo1 \, dm^{-3}) = (4.239037 \pm 0.247227) - (48.30896 \pm 0.72777)/(T/100 K).$

The smoothed values from the equation at selected temperatures are also in Table 1.

Each system is discussed separately with respect to the mole fraction solubility.

Mercury + Pentane; C₅H₁₂; [109-66-0]

Kuntz and Mains (ref. 4) report one solubility value at 298.15 K. Okouchi and Sasaki (ref. 7) report values at six temperatures between 278.15 and 313.15 K. The values at 298.15 K agree within 1.5 percent. All values were combined in a linear regression to obtain the equation for the 278 to 313 K temperature interval

Alkane		Molal solubility, 10 ^{°m} 1/mol kg ⁻¹ , at temperatures of										
	273.15	278.15	283.15	288.15	293.15	298.15	303.15	308.15	313.15	318.15	336.15	Ref.
Pentane	-	2.6	3.7	-	6.4 -	9.4 9.3	12.8	-	22.		-	(7) (4)
Hexane	- 2.1 -	2.8 - - - -	3.9 - - - -	- 5.6 -	6.8 - 7.3 -	9.6 9.8 9.6 9.5	13. 12.6	- 16.1 -	22. 21.	- - - -	- - - 82.8	(7) (4) (5) (2) (1)
Heptane	- 2.0	2.9	3.7 -	- 5.4	7.1 7.0	9.6 9.7	12.0 12.6	_ 16.2	22.	-	-	(7) (5)
Octane	2.2	2.9 - -	4.1 - -	- 5.4 -	6.9 -	9.6 9.6 9.6	12.0 12.4 -	15.5	20. 18.2 -	- - -		(7) (5) (6)
Nonane	-	-	-	-	-	-	-	-	-	-	-	
Decane	2.8	-	4.1 -	6.1 -	6.7 -	9.6 7.6	11.9	13.4	-	18.7	-	(3) (4)
Av. all	2.3 <u>+</u> 0.4	2.8 <u>+</u> 0.2	3.9 <u>+</u> 0.2	5.6 <u>+</u> 0.3	6.9 <u>+</u> 0.3	9.4 <u>+</u> 0.6	12.4 <u>+</u> 0.4	15.3 <u>+</u> 1.3	20.9 <u>+</u> 1.5	18.7	82.8	
omit one	2.1 <u>+</u> 0.1					9.6 <u>+</u> 0.1		15.9 <u>+</u> 0.4	21.4 <u>+</u> 0.9			
Equation molal (m) concentra-	2.06	2.86	3.92	5.31	7.13	9.48	12.48	16.28	21.06	27.03	62.4	
tion (c)) 1.45	1.99	2.70	3.63	4.83	6.37	8.32	10.78	13.84	17.64	39.8	

Table 1. The solubility of mercury in normal alkanes.



with a standard error about the regression line of 2.2 x 10⁻⁺. The thermodynamic changes for the transfer of one mole of mercury from the liquid metal to the infinitely dilute solution are

 $\Delta H_1/kJ \mod^{-1} = 44.1 \pm 1.0$ and $\Delta S_1/J K^{-1} \mod^{-1} = 29.8 \pm 3.4$. Smoothed values of the mole fraction solubility are in Table 2.

Mercury + Hexane; C_6H_{14} ; [110-54-3]

Reichardt and Bonhoeffer (ref. 1) report solubility values at 313.15 and 336.15 K, Moser and Voigt (ref. 2) report distribution data from which we estimated one solubility value at 298.15 K, Kuntz and Mains (ref. 4) report one value at 298.15 K, Spencer and Voigt (ref. 5) report six solubility values between 273.15 and 308.15 K and Okouchi and Sasaki (ref. 7) report six values between 278.15 and 313.15 K. At least three quite different methods were used. The only value that appears doubtful is the 336.15 K value of Reichardt and Bonhoeffer which appears to be about 15 percent too large. All except the 336.15 K value were treated by a linear regression to obtain the equation

 $\ln x_{1} = (2.76226 \pm 0.16258) - (49.9972 \pm 0.4804)/(T/100 \text{ K})$

with a standard error about the regression line of 2.5 x 10^{-4} . The thermodynamic changes for the transfer of one mole of mercury from the liquid metal to the infinitely dilute solution are

 $\Delta H_1/kJ \mod^{-1} = 41.6 \pm 0.4$ and $\Delta S_1/J K^{-1} \mod^{-1} = 23.0 \pm 1.4$.

Smoothed values of the mole fraction solubility are in Table 2.

Mercury + Heptane; C₇H₁₆; [142-82-5]

Spencer and Voigt (ref. 5) report six solubility values between 273.15 and 308.15 K; Okouchi and Sasaki (ref. 7) report six solubility values between 278.15 and 313.15 K.

The two data sets were combined in a linear regression to obtain the equation

 $\ln x_{1} = (3.10124 \pm 0.19810) - (50.5916 \pm 0.58183)/(T/100 \text{ K})$

with a standard error about the regression line of 2.9 x 10^{-4} . The thermodynamic changes for the transfer of one mole of mercury from the liquid metal to the infinitely dilute solution are

 $\Delta H_{1}/kJ \mod^{-1} = 42.1 \pm 0.5$ and $\Delta S_{1}/J K^{-1} \mod^{-1} = 25.8 \pm 1.6$.

The mole fraction solubility values have an average deviation from the regression line of 2.2 percent and a maximum deviation of 5.4 percent. The Okouchi and Sasaki data show more scatter (Av. dev. 2.9%) than the Spencer and Voigt data (Av. dev. 1.4%). Smoothed mole fraction solubility values are in Table 2.

Mercury + Octane; C₈H₁₈; [111-65-9]

As for the heptane, both Spencer and Voigt (ref. 5) and Okouchi and Sasaki (ref. 7) report six solubility values. Vogel and Gjaldbaek (ref. 6) report one value at 298.15 K. All three papers report a mole fraction solubility of 11.0 x 10^{-7} at 298.15 K. All data were combined in a linear regression to obtain the equation

 $\ln x_1 = (2.03628 \pm 0.23584) - (47.07542 \pm 0.69681)/(T/100 \text{ K})$

with a standard error about the regression line of 6.2×10^{-2} . The thermodynamic changes for the transfer at one mole of mercury from the liquid metal to the infinitely dilute solution are

 $\Delta H_1/kJ \mod^{-1} = 39.1 \pm 0.6$ and $\Delta S_1/J K^{-1} \mod^{-1} = 16.9 \pm 2.0$.

Smoothed values of the mole fraction solubility are in Table 2.

COMPONENTS:

(1) Mercury; Hg; [7439-97-6]

(2) Alkanes

EVALUATOR:

H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA

<u>1985</u>, June

CRITICAL EVALUATION:

Mercury + Decane; $C_{10}H_{22}$; [124-18-5]

Klehr and Voigt (ref. 3) report eight solubility values between 273.15 and 318.15 K. Kuntz and Mains (ref. 4) report one value at 298.15 K. The Kuntz and Mains value is one of the few values that does not fit the molality plot well (fig. 1). Thus, we consider it doubtful. The Klehr and Voigt paper is the first attempt of measuring mercury solubility in a hydrocarbon from that laboratory. Although the evidence is not as strong as we would like, we feel the Klehr and Voigt values at 308.15 and 318.15 K are also doubtful. The three doubtful values were omitted and the other values treated by a linear regression to obtain the equation

 $\ln x_1 = (0.05995 \pm 0.94229) - (40.5530 \pm 2.7261)/(T/100 \text{ K})$

with a standard error about the regression line of 6.8 x 10^{-4} . The thermodynamic changes for the transfer of one mole of mercury from the liquid metal to the infinitely dilute solution are

 $\Delta H_1/kJ \text{ mol}^{-1} = 33.7 \pm 2.3 \text{ and } \Delta S_1/J \text{ K}^{-1} \text{ mol}^{-1} = 0.5 \pm 7.8$

smoothed solubility values are in Table 2. We are concerned that the thermodynamic properties for decane differ so much from the values for the other normal alkanes.

Table 2. The solubility of mercury in normal alkanes. Tentative values of the mole fraction solubility as a function of temperature.

<i>T/K</i>	Mole Fracti Pentane	on solubility Hexane	, $10^7 x_1$, in Heptane	the normal a Octane	lkanes Decane
273.15 278.15 283.15 288.15 293.15 298.15 303.15 308.15 313.15 318.15 323.15 333.15 333.15	- 1.9 2.6 3.6 5.0 6.7 9.0 12.0 15.8 - - -	1.8 2.5 3.4 4.6 6.2 8.3 10.9 14.2 18.4 23.8 30.3 38.4 48.3 60.3	2.0 2.8 3.9 5.3 7.1 9.5 12.6 16.5 21.4 - -	2.5 3.4 4.6 6.2 8.1 10.6 13.8 17.8 22.7 - -	3.8 4.9 6.4 8.2 10.4 13.2 16.5 20.4 25.2 30.9 - -
ΔH ₁ ^a	44.1 <u>+</u> 1.0	41.6 <u>+</u> 0.4	42.1 <u>+</u> 0.5	39.1 <u>+</u> 0.6	33.7 <u>+</u> 2.3
Δ <i>S</i> ₁ ^b	29.8 <u>+</u> 3.4	26.0 <u>+</u> 1.4	25.8 <u>+</u> 1.6	16.9 <u>+</u> 2.0	0.5 <u>+</u> 7.8

a units kJ mol-1 b units J K-1 mol-1

II. Mercury + Branched Alkanes.

Although there are solubility data on five branched alkanes, there are many fewer values than there were for the five normal alkanes. The molality correlation for the normal alkanes does not hold true for the branched alkanes. The mole fraction solubilities at 298.15 K fall in a narrow range of values, but there are not enough data to support a generalization. The solubility of mercury is less in the branched alkane than in the corresponding normal alkane at a given temperature. This is expected because the branched hydrocarbons are of smaller cohesive energy

density than the corresponding normal alkane. Thus, the cohesive energy difference between mercury and branched alkanes is larger that between mercury and normal alkanes, and the branched alkane solvent is less ideal. Each system is discussed below.

Mercury + 2-Methylbutane; C₅H₁₂; [78-78-4]

The only measurement is that of Kuntz and Mains (ref. 4) at 298.15 K. It is classed as tentative. The value appears in the Tables 3, 4 and 5.

Mercury + 3-Methylpentane; C₆H₁₄; [96-14-0]

The only measurement is that of Kuntz and Mains (ref. 4) at 298.15 K. It is classed as tentative. The value appears in the Tables 3, 4 and 5.

Mercury + 2,2-Dimethylbutane; C_6H_{14} ; [75-83-2]

Kuntz and Mains (ref. 4) report one measurement at 298.15 K and Spencer and Voigt (ref. 5) report six values between temperatures of 273.15 and 308.15 K. All of the data were combined in a linear regression to obtain the equations

 $\ln(\sigma_{7}/mo1 \, dm^{-3}) = (1.89608 \pm 0.31898) - (42.21314 \pm 0.93774)/(T/100 K)$

 $\ln(m_1/mo1 \text{ kg}^{-1}) = (2.93988 \pm 0.32646) - (44.0108 \pm 0.9597)/(T/100 \text{ K})$

 $\ln x_7 = (0.23496 \pm 0.43775) - (43.2397 \pm 1.2869)/(T/100 \text{ K})$

with standard errors about the regression line of 1.5 x 10^{-7} , 2.6 x 10^{-7} , and 2.8 x 10^{-6} , respectively.

The thermodynamic changes for the transfer of one mole of mercury from the liquid metal to the solution and smoothed solubility values are in Tables 3, 4 and 5.

Mercury + 2,3-Dimethylbutane; C₆H₁₄; [79-29-8]

The only measurement is that of Kuntz and Mains (ref. 4) at 298.15 K. It is classed as tentative. The value appears in Tables 3, 4 and 5.

Mercury + 2,2,4-Trimethylpentane; C₈H₁₈; [540-84-1]

Kuntz and Mains (ref. 4) and Vogel and Gjaldbaek (ref. 6) each report one value at 298.15 K. Spencer and Voigt (ref. 5) report seven values between 273.15 and 308.15 K. At 298.15 K, the Vogel and Gjaldbaek and the Spencer and Voigt values agree within three percent while the Kuntz and Mains value is about 10 percent larger that the average of the other two. We classify all three data sets tentative, but we have used only the Vogel and Gjaldbaek and Spencer and Voigt data in the linear regression to obtain the equations

 $\ln(\sigma_1/mol \, dm^{-3}) = (3.19617 \pm 0.44480) - (46.5373 \pm 1.3034)/(T/100 \, K)$

 $\ln(m_{1}/mol \ kg^{-1}) = (3.97728 \pm 0.43080) - (47.7399 \pm 1.2624)/(T/100 \ K)$

 $\ln x_7 = (1.84306 \pm 0.44990) - (47.8583 \pm 1.3184)/(T/100 \text{ K})$

with standard errors about the regression line of 1.3 x 10^{-7} , 2.1 x 10^{-6} , and 2.3 x 10^{-6} , respectively. Smoothed solubility data and thermodynamic changes for the transfer

Smoothed solubility data and thermodynamic changes for the transfer of one mole of mercury from the liquid metal to the solution are in Tables 3, 4 and 5.

The solubility values in Tables 3, 4 and 5 are classed as tentative. The enthalpy and entropy changes on solution are smaller for the branched than for the normal alkanes. Since there are only limited data on two branched alkane solvents, it is not possible to judge whether or not the smaller values are significant.

COMPONENTS:	•		1	EVALUATO	R:	
(l) Merc (2) Alka	ury; Hg; [74 nes	439-97-6]		H. Law Chemis Emory Atlant	vrence Clever stry Departmen University ca, Georgia 3	t 0322 USA
				<u>1985</u> ,	June	
ODT TTOAT FL						
Table 3.	ALUATION:	to of merc	urv in t	ranched	alkanes. Ten	tative values of
Table J.	the satu:	ration conc	sentrati	on as a	function of t	emperature.
T/K	Saturation 2-Methyl butane	concentrat 3-Methyl pentane	ion, 10 2,2-di butane	*c1/mol methyl	dm ⁻³ , in the 2,3-dimethyl butane	branched alkanes 2,2,4-trimethyl pentane
273.15 278.15 283.15 283.15 293.15 298.15 303.15 308.15	5.5	5.1	1.3 1.7 2.2 2.9 3.7 4.7 6.0 7.5		6.0	0.97 1.3 1.8 2.4 3.1 4.1 5.3 6.7
ΔH_1^a	*		35.1	<u>+</u> 0.8	•••••	38.7 <u>+</u> 1.1
۸ <i>s</i> ₁ ^b			15.8	± 2.7	······································	26.6 <u>+</u> 3.7
Table 4. T/K	Solubilit the satur Saturati 2-Methyl	ty of mercuration mola 	y, 10°m ₁ 2,2-di	ranched lubility /mol kg ⁻ methyl	alkanes. Ten as a functio 	tative values of n of temperature.
	butane	pentane	butane	}	butane	pentane
273.15 278.15 283.15 288.15 293.15 293.15 303.15 308.15	8.9	7.7	1.9 2.5 3.4 4.4 5.7 7.3 9.4 11.9		9.1	1.4 1.9 2.5 3.4 4.5 5.9 7.7 10.0
			36.6 ±	0.8		39.7 <u>+</u> 1.0
∆ <i>s</i> 1 ^b			24.4 <u>+</u>	2.7		33.1 <u>+</u> 3.6
a units b units	kJ mol-1 J K-1 mol-1					

Table 5.	Solubil the mol	ity of merc e fraction	ury in branch solubility as	ed alkanes. I a function of	entative values of temperature.	
<i>T/K</i>	Mole 2-Methyl butane	fraction so 3-Methyl pentane	lubility, 10' 2,2-dimethy butane	x ₁ , in the bra 1 2,3-dimethy butane	nched alkanes 1 2,2,4-trimethyl pentane	
273.15 278.15 283.15 288.15 293.15 298.15 303.15 308.15	6.5	6.7	1.7 2.2 2.95 3.8 5.0 6.4 8.1 10.2	7.9	1.5 2.1 2.9 3.9 5.1 6.7 8.8 11.4	
AH1 ^a			36.0 <u>+</u> 1.1		39.8 <u>+</u> 1.1	
Δ <i>S</i> ₁ ^b			2.0 <u>+</u> 3.7		15.3 <u>+</u> 3.7	
a units b units	<j mol<sup="">-1 J K⁻¹ mol⁻</j>	1				
REFERENCI	ES:					
l. Reich	ardt, H.;	Bonhoeffer	, K. F. Z. Ph	ys. <u>1931</u> , 67,	780-9.	
2. Moser	, H. C.; V	oigt, A. F.	J. Am. Chem	. Soc. <u>1957</u> ,	79, 1837-9.	
3. Klehr Use, (Klehr, E. H.; Voigt, A. F. Radioisotopes Phys. Sci. Ind., Proc. Conf. Use, Copenhagen <u>1960</u>, 1, 517-29 (Pub. <u>1962</u>). 					
4. Kuntz, R. R.; Mains, G. J. <i>J. Phys. Chem.</i> <u>1964</u> , 68, 408-10.						
5. Spenc Spence	5. Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 464-70; Spencer, J. N. <u>Dissertation</u> , Iowa State University, <u>1967</u> .					
6. Vogel 9.	, A.; Gjal	dbaek, J. C	. Arch. Phar	m. Chem. Sci.	Ed. <u>1974</u> , 2, 25-	
7. Okouchi, S.; Sasaki, S. Bull. Chem. Soc. Jpn. <u>1981</u> , 54, 2513-4; Report of the College of Engineering of Hosei University <u>1983</u> , (No. 22), 55-106.						
8. Moser,	, H. C.; V	oigt, A. F.	USAEC Repor	t <u>1957</u> , ISC-89	2.	
ADDED NO	re:					
All of t based on Voigt (r is a rel Moser and	the solubi the hexar ef. 8). S ationship d Voigt da	lity value he solubili ee the Mose between the ta.	es reported b ty value at r and Voigt d Kuntz and M	by Kuntz and M 298.15 K repo data sheet, p. Mains solubili	Mains (ref. 4) are rted by Moser and 114. Thus, there ty values and the	

COMPONENTS :	ORIGINAL MEASUREMEN	ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6]	Kuntz, R. R.;	Kuntz, R. R.; Mains, G. J.		
(2) Pentane; C ₅ H ₁₂ ; [109-66-0]	J. Phys. Chem.	<u>1964</u> , <i>68</i> , 408 - 10.		
VARTABLES -	PPEDADED BY.			
	S. H. Johnson			
T/K = 298.15	H. L. Clever			
EXPERIMENTAL VALUES:				
Temperature Me	ercury Solubility			
t/°C T/K ^a Concentration 10°c ₁ /mol dm ⁻¹	Mole Fraction ^a 10'x ₁	Molality ^a 10 [°] m <u>1</u> /mol kg ⁻¹		
25 298.15 5.8 ~	6.7	9.3		
^a Calculated by compilers.				
AUXILIA	RY INFORMATION			
METHOD /APPARATUS / PROCEDURE :				
	SOURCE AND PURITY	OF MATERIALS:		
Spectrophotometric method. It w.	SOURCE AND PURITY	OF MATERIALS: No information given.		
Spectrophotometric method. It was assumed that the optical density 2560 A is a reliable measure of t	SOURCE AND PURITY as (1) Mercury.) at he (2) Pentane.	OF MATERIALS: No information given. Phillips "pure grade"		
Spectrophotometric method. It was assumed that the optical density 2560 A is a reliable measure of the solubility. It was further assum that the extinction coefficient	SOURCE AND PURITY as (1) Mercury. 1 at he (2) Pentane. ed hydrocarbo of by passag	OF MATERIALS: No information given. Phillips "pure grade" on solvents; purified e through silica gel		
Spectrophotometric method. It wassumed that the optical density 2560 A is a reliable measure of the solubility. It was further assume that the extinction coefficient mercury was the same in all hydr carbon solvents. The optical de	SOURCE AND PURITY as (1) Mercury. 1 at he (2) Pentane. ed hydrocarbo of by passago o- until opti and distil	OF MATERIALS: No information given. Phillips "pure grade" on solvents; purified e through silica gel cally pure, degassed led.		
Spectrophotometric method. It we assumed that the optical density 2560 A is a reliable measure of the solubility. It was further assume that the extinction coefficient mercury was the same in all hydr carbon solvents. The optical de sity of a saturated solution of in hexane was measured and, wh	SOURCE AND PURITY as (1) Mercury. 1 at (2) Pentane. ed hydrocarbo of by passage o- until opti and distil Hg en	OF MATERIALS: No information given. Phillips "pure grade" on solvents; purified e through silica gel cally pure, degassed led.		
Spectrophotometric method. It was assumed that the optical density 2560 A is a reliable measure of the solubility. It was further assum that the extinction coefficient mercury was the same in all hydr carbon solvents. The optical de sity of a saturated solution of in hexane was measured and, wh combined with the solubility me sured by Moser and Voigt (ref. 1	SOURCE AND PURITY as (1) Mercury. 1 at (2) Pentane. (2) Pentane. (2) Pentane. (3) Pentane. (4) Pentane. (5) P	OF MATERIALS: No information given. Phillips "pure grade" on solvents; purified e through silica gel cally pure, degassed led.		
Spectrophotometric method. It was assumed that the optical density 2560 A is a reliable measure of the solubility. It was further assum that the extinction coefficient mercury was the same in all hydr carbon solvents. The optical de sity of a saturated solution of in hexane was measured and, wh combined with the solubility me sured by Moser and Voigt (ref. 1 gives an extinction coefficient	SOURCE AND PURITY as (1) Mercury. 1 at (2) Pentane. (2) Pentane. (2) Pentane. (3) Pentane. (4) Pentane. (5) Pentane. (5) Pentane. (6) Pentane. (7) Pentane. (7	OF MATERIALS: No information given. Phillips "pure grade" on solvents; purified e through silica gel cally pure, degassed led.		
Spectrophotometric method. It we assumed that the optical density 2560 A is a reliable measure of the solubility. It was further assume that the extinction coefficient mercury was the same in all hydr carbon solvents. The optical de sity of a saturated solution of in hexane was measured and, wh combined with the solubility me sured by Moser and Voigt (ref. 1 gives an extinction coefficient sizes = 7.35 x 10° dm ³ mol ⁻¹ cm ⁻¹ 25°C. The value was used to calc	SOURCE AND PURITY as (1) Mercury. at (2) Pentane. (2) Pentane. (2) Pentane. by passage until opti and distil en a-), at ESTIMATED ERROR: er	OF MATERIALS: No information given. Phillips "pure grade" on solvents; purified e through silica gel cally pure, degassed led.		
Spectrophotometric method. It wassumed that the optical density 2560 A is a reliable measure of the solubility. It was further assume that the extinction coefficient mercury was the same in all hydr carbon solvents. The optical de sity of a saturated solution of in hexane was measured and, wh combined with the solubility me sured by Moser and Voigt (ref. I gives an extinction coefficient sizion = 7.35 x 10° dm³ mol ⁻¹ cm ⁻¹ 25°C. The value was used to calc late the solubility in the oth solvents.	SOURCE AND PURITY as (1) Mercury. (1) Mercury. (2) Pentane. hydrocarbo by passage until opti and distil Hg en a-), nt ESTIMATED ERROR: u- er	OF MATERIALS: No information given. Phillips "pure grade" on solvents; purified e through silica gel cally pure, degassed led.		
Spectrophotometric method. It wassumed that the optical density 2560 A is a reliable measure of the solubility. It was further assume that the extinction coefficient mercury was the same in all hydr carbon solvents. The optical de sity of a saturated solution of in hexane was measured and, wh combined with the solubility me sured by Moser and Voigt (ref. 1 gives an extinction coefficient size = 7.35 x 10 ³ dm ³ mol ⁻¹ cm ⁻¹ 25°C. The value was used to calc late the solubility in the oth solvents. The Hg and solvent were equilibrat	SOURCE AND PURITY as (1) Mercury. 1 at (2) Pentane. by passage o- until opti and distil en a-), nt ESTIMATED ERROR: er ed REFERENCES:	OF MATERIALS: No information given. Phillips "pure grade" on solvents; purified e through silica gel cally pure, degassed led.		
Spectrophotometric method. It was assumed that the optical density 2560 A is a reliable measure of the solubility. It was further assum that the extinction coefficient mercury was the same in all hydr carbon solvents. The optical de sity of a saturated solution of in hexane was measured and, wh combined with the solubility me sured by Moser and Voigt (ref. 1 gives an extinction coefficient ersso = 7.35 x 10 ³ dm ³ mol ⁻¹ cm ⁻¹ 25°C. The value was used to calc late the solubility in the oth solvents. The Hg and solvent were equilibrat for 20 minutes and the optical de sity was measured by a Beckman Spectrophotometer.	SOURCE AND PURITY as (1) Mercury. 1 at (2) Pentane. he (2) Pentane. hydrocarbo by passage until opti and distil Hg en a-), ht ESTIMATED ERROR: u- er er REFERENCES: 1. Moser, H. C USAEC Repor	OF MATERIALS: No information given. Phillips "pure grade" on solvents; purified e through silica gel cally pure, degassed led. .; Voigt, A. F. t <u>1957</u> , ISC-892.		

COMPONENTS :			OKOUCHIA S.: Sasakia S.			
(1) Mercury;	Hg; [743	9-97-6]	Bull. Chem. Soc. Jpn. <u>1981</u> , 54, 2513 - 4.			
(2) Pontanet	Съ н • [109-66-01				
(2) rentanc;	°5°12, '	105 00 05	Report of the	College of Engineering		
			of Hosei University <u>1983</u> , (No. 22), 55 - 106.			
VARTABLES :			PREPARED BY			
			H. L. Clever			
T/K = 278.	15 - 313	.15	M. Iwamoto			
EXPERIMENTAL VAL	UES:		<u></u>			
Tempera	ture	Merc				
t/°C I	r/K ^a	Concentration ^a 10 [°] c ₁ /mol dm ⁻³	Mole Fraction 10'x ₁	Molality ^a 10 [¢] m ₁ /mol kg ⁻¹		
5 2	78.15	1.7	1.9	2.6		
10 2	283.15	2.4	2.7	3.7		
20 2	93.15	4.0	4.6	6.4		
25 2	298.15	5.9	6.8	9.4		
30 3	803.15	7.9	9.3	12.8		
40 3	313.15	13	16	22		
^a Calcul	ated by	compilers.				
Dr. S.	Okouchi	kindly provided	the experimenta	1 mole fraction		
solubil	lity valu	es which did not	appear in the	original papers.		
The aut	thors fi	tted the data to	two equations.	The second is		
preterr	1	$\log x_1 = (17.375)$	log(T/K) - 49.10	59		
	נ	$\log x_1 = 1.3840 -$	2256.1/(T/K)			
-						
		AUXILIARY	INFORMATION			
METHOD/APPARATUS	/PROCEDURE	:	SOURCE AND PURITY	OF MATERIALS:		
Solubility	, experi	ments were con-	(1) Mercury.	Purified as did Glew		
ducted by sha	aking the	solvent with a	and Hames	(ref. 1).		
drop of mero thermostat.	cury for Separa	te experiments	(2) Pentane.	Analytical reagent		
showed the	mercury	concentration	grade. Par alumina an	ssed through activated d distilled.		
shaking.	scant ar	ter 24 nours of				
A 0.5 cm ³	sample	of the equili-				
cold-vapor at	ton was tomic ab	sorption method.				
Steps in th	e proce	1	,			
bubbling and	da radu	dure included				
	ide redu passage	through magne-	ESTIMATED ERROR:			
sium perchlo	ide redu passage orate to	dure included iction, nitrogen through magne- dry the Hg va-	ESTIMATED ERROR: $\delta T/K = \pm 0.1$			
sium perchlo por. The mercur	ide redu passage orate to ry was d	edure included iction, nitrogen through magne- dry the Hg va- etermined from	ESTIMATED ERROR: $\delta T/K = \pm 0.1$ $\delta x_1/x_1 = \pm (0.0)$	3 - 0.05) (compilers)		
sium perchlo por. The mercun the area unde peak at 253.7	ide redu passage orate to ry was d er the at nm com	edure included iction, nitrogen through magne- dry the Hg va- etermined from comic absorption pared to a cali-	ESTIMATED ERROR: $\delta T/K = \pm 0.1$ $\delta x_1/x_1 = \pm (0.0)$ REFERENCES.	3 - 0.05) (compilers)		
sium perchlo por. The mercun the area unde peak at 253.7 bration curv	ide redu passage orate to ry was d er the at 'nm comp e.	etermined from comic absorption pared to a cali-	ESTIMATED ERROR: $\delta T/K = \pm 0.1$ $\delta x_1/x_1 = \pm (0.0)$ REFERENCES: 1. Glew. D. N.	3 - 0.05) (compilers) ; Hames, D. A.		
sium perchlo por. The mercun the area unde peak at 253.7 bration curv In experim phinic acid	ide redu passage orate to ry was d er the at ' nm comp e. nents wi (0.001 mc	edure included iction, nitrogen through magne- dry the Hg va- etermined from comic absorption pared to a cali- th water, phos- ol) was added to	ESTIMATED ERROR: $\delta T/K = \pm 0.1$ $\delta x_1/x_1 = \pm (0.0)$ REFERENCES: 1. Glew, D. N. Can. J. Che	3 - 0.05) (compilers) ; Hames, D. A. m. <u>1971</u> , 49, 3114.		
sium perchlo por. The mercun the area unde peak at 253.7 bration curv In experim phinic acid prevent merc bydrocarbon	ide redu passage orate to ry was d er the at nm comp e. nents wi (0.001 mc cury oxi distribu	through magne- dry the Hg va- etermined from comic absorption pared to a cali- th water, phos- ol) was added to dation. Water-	ESTIMATED ERROR: $\delta T/K = \pm 0.1$ $\delta x_1/x_1 = \pm (0.0)$ REFERENCES: 1. Glew, D. N. Can. J. Che	3 - 0.05) (compilers) ; Hames, D. A. m. <u>1971</u> , 49, 3114.		
sium perchlo por. The mercun the area unde peak at 253.7 bration curv In experim phinic acid prevent merc hydrocarbon of Hg were a	ride redu passage orate to ry was d er the at ' nm comp e. ments wi (0.001 mc cury oxi distribu lso direc	edure included iction, nitrogen through magne- dry the Hg va- etermined from comic absorption pared to a cali- th water, phos- ol) was added to idation. Water- ition constants ctly determined.	ESTIMATED ERROR: $\delta T/K = \pm 0.1$ $\delta x_1/x_1 = \pm (0.0)$ REFERENCES: 1. Glew, D. N. Can. J. Che	3 - 0.05) (compilers) ; Hames, D. A. m. <u>1971</u> , 49, 3114.		

COMPONENTS:	ORIGINAL MEASUREMENTS:		
(1) Mercury: Hg: [7439-97-6]	Kuntz, R. R.; Mains, G. J.		
<pre>(2) 2-Methylbutane or Isopentane; C_{5H12}; [78-78-4]</pre>	J. Phys. Chem. <u>1964</u> , 68, 408 – 10.		
VARIABLES: T/K = 298.15	PREPARED BY: S. H. Johnson M. Iwamoto H. L. Clever		
EXPERIMENTAL VALUES:			
Temperature Merc	ury Solubility		
<i>t/°C T/K^a</i> Concentration 10 [*] c ₁ /mol dm ⁻³	Mole Fraction ^a Molality ^a $10^{7}x_{1}$ $10^{6}m_{1}/mol kg^{-1}$		
25 298.15 5.5	6.5 8.9		
^a Calculated by compilers.			
AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE: Spectrophotometric method. It was assumed that the optical density at 2560 A is a reliable measure of the solubility. It was further assumed that the extinction coefficient of mercury was the same in all hydro- carbon solvents. The optical den- sity of a saturated solution of Hg in hexane was measured and, when combined with the solubility mea- sured by Moser and Voigt (ref. 1), gives an extinction coefficient site = 7.35 x 10 ³ dm ³ mol ⁻¹ cm ⁻¹ at 25°C. The value was used to calcu- late the solubility in the other solvents. The Hg and solvent were equilibrated for 20 minutes and the optical den- sity was measured by a Beckman DU Spectrophotometer. The reliability of the results de- pends on the Moser and Voigt solu-	<pre>SOURCE AND PURITY OF MATERIALS: (1) Mercury. No information given. (2) Isopentane. Phillips "pure grade" hydrocarbon solvents; purified by passage through sil- ica gel until optically pure, degassed and distilled. ESTIMATED ERROR: REFERENCES: 1. Moser, H. C.; Voigt, A. F. USAEC Report 1957, ISC-892.</pre>		

COMPONENTS:	ORIGINAL MEASUREMENTS:		
(1) Mercury: Hg: [7439-97-6]	Poighardt H & Ponhooffor V B		
(2) Herane: $(-4, [1]) = 54 - 3]$	7 Physe 1021 cg 700 0		
(2) nexalle; C6n14; [110-34-3]	2. Frige. <u>1991</u> , 67, 780 - 9.		
VARIABLES:	PREPARED BY:		
T/K = 313.15 - 336.15	H. L. Clever M. Iwamoto		
EVDEDTAENTAT VALUES.	·····		
Temperature Me	ercury Solubility		
$t/^{\circ}C T/K^{a}$ Concentra	ation ^a Mole Fraction ^a Molality ^a		
40 313.15 2.7 1.3	3 1.8 2.1		
63 336.15 10.3 5.1	3 7.14 8.28		
-Calculated by compilers.			
AUXILIARY	INFORMATION		
METHOD /APPARATUS / PROCEDURE :	SOURCE AND PURITY OF MATERIALS.		
Some of these results are mentioned	(1) Mercury.		
in two earlier papers (ref. 1 and			
the solubility work in the most	(2) Hexane.		
detail.			
The solution is analyzed by weighing a gold foil before and after amalga-			
mation with the mercury of the satu- rated solution.			
	ESTIMATED ERROR:		
	$\delta c_1/\text{mg dm}^{-3} = \pm (0.1 - 0.2)$		
	REFERENCES :		
	 Bonhoeffer, K. F.; Reichardt, H. Naturwissenshaften 1929. 17. 933. 		
	2. Reichardt, H.: Bonhoeffer V P		
	Z. Electrochem. <u>1930</u> , 36, 753.		

COMPONENTS :	ORIGINAL MEASUREMENTS .				
(1) Mercury; Hq; $[7439-97-6]$	Moser, H. C.: Voigt, A. F.				
Mercury-203; 20 3Hg; [13982-78-0]	HSAFC Percent 1057 TCC-002				
(2) Hexane; C ₆ H ₁₄ ; [110-54-3]	Chem. Abstr. <u>1958</u> , 52, 10691h.				
VARIABLES:	PREPARED BY:				
T/K = 298.15	H. L. Clever M. Iwamoto				
BUDEDIACNEAL VALUES.					
Temperature Merc	cury Solubility				
t/°C T/K ^a Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a Molality ^a $10^{7}x_{1}$ $10^{6}m_{1}/mol kg^{-1}$				
25 298.15 6.1 - 6.7	8.0 - 8.8 9.3 - 10.2				
^a Calculated by compilers.					
Note: All of the results of based on the hexane s Voigt. Apparently Kunt: from the range above and to 6.4 x 10 ⁻⁶ mol dm ⁻³ y	Kuntz and Mains (ref. 1) are olubility value of Moser and z and Mains averaged the values referenced all of their values value in hexane at 298.15K.				
AUXILIARY	INFORMATION				
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:				
A globule of Hg metal prepared from radioactive mercury(II) nitrate by reduction with hypophosphorous acid was equilibrated with 5 - 10 ml of liquid by shaking in a thermostat. Aliquotes of the liquid were with- drawn periodically for up to two weeks and the Hg concentration determined radiochemically.	 (1) Mercury and Mercury-203. Oak Ridge National Lab; recieved as 0.31 M Hg(NO₃)₂ in 1.56 M HNO₃ solution. Initial activity 50 millicuries g⁻¹; half-life 48 days. Reduced to Hg by hypo- phosphorous acid; coagulated to a Hg droplet by addition of concentrated HI. (2) Hexane. Phillips Petroleum Co. 				
tone and equilibrated with $Hg(NO_3)_2$ carrier to exchange the radioactive mercury. The mercury was precipi- tated as HgS, mounted on a stainless steel planchet and counted with a Geiger-Mueller tube.	"pure grade"; shaken with con- centrated H ₂ SO ₄ and alkaline KMnO ₄ , passed through a column of dry activated Al ₂ O ₃ , and redistilled.				
	$\delta T/K = \pm 0.1$				
	REFERENCES :				
	1. Kuntz, R. R.; Mains, G. J. J. Phys. Chem. <u>1964</u> , 68, 408.				

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COMPONENTS :	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] Mercury-203; ²⁰³ Hg; [13982-78-	Moser, H. C.; Voigt, A. F. 0] J. Am. Chem. Soc. 1957, 79.
(2) Hexane; C ₆ H ₁₄ ; [110-54-3]	1837 - 9.
VARIABLES:	PREPARED BY:
<i>T/</i> K = 298.15	H. L. Clever
EXPERIMENTAL VALUES:	
Temperature Distribution	Mercury Solubility
Constant	tration ^a Mole Fraction ^a Molality ^a
$E^{\circ} = c_1 \operatorname{aq}/c_1 \operatorname{org} 10^{\circ} c_1/c_1$	nol dm ⁻³ 10' x_1 10' m_1 /mol kg ⁻¹
25.0 298.15 0.048 6	.2 ₅ 8.2 9.5
^a Calculated by compiler.	
The above mercury solubility values solubility in water of 3.0 x 10 ⁻⁷ r	e was calculated using the free mercury nol dm ⁻³ .
_	
METHOD /APPARATUS /PROCEDURE :	SOURCE AND PURITY OF MATERIALS.
The distribution of mercury-2	(1) Mercury and Mercury-203. Oak
between aqueous and organic phase	Ridge National Lab; obtained as
0.01 molar HNO ₃ containing a know	n tion of mercury(II) nitrate con-
amount of pure mercurous nitrative were shaken with an equal volume of	te taining isotope 203. In the 0.01 of molar HNO2 solution of mer-
organic liquid for about 12 hour	s. cury(I) nitrate, the authors
Both phases were analyzed for tota mercury by first converting to Hg ²	and 99% of the mercury(I) is Hg ²
precipitation as HgS, and countin	hg $Hg_2^{2^+}$. At this acidity, there is
In a thin window Geiger counter. In the aqueous phase the dispre	- nitrato complex formation.
portionation $Hg^{2+}(ag) = Hg^{2+}(ag) + Hg(ag)$	(2) Hexane, Phillips "pure grade",
and possibly the dissociation Hg $_2^{2^+}(aq) = 2 Hg^+(aq)$	
metallic Hg is extracted into the	Y DEFEDENCIS.
organic phase.	n literences:
the aqueous phase to total Hg in the	ne l
organic phase is determined as	
phase. From the slope and inter	

COMPONENTS :		DRIGINAL MEASUREMEN	IS:	
(1) Mercury; Hg; [7439-97-6]		Runcz, R. R. J		- 10
(2) Hexane; $C_{6}H_{14}$; [110-54-3]		J. Phys. Chem.	<u>1904</u> , 00, 408	- 10.
VARIABLES:	I	PREPARED BY:		
<i>T/</i> K = 298.15		S. H. Johnson M. Iwamoto H. L. Clever		
EXPERIMENTAL VALUES:				
Temperature	Mercu	iry Solubility		
t/°C T/K ^a Concentrati 10°c ₁ /mol c	ion dm ⁻ 3	Mole Fraction ^a 10 ⁷ x ₁	Molality ^a 10°m ₁ /mol kg ⁻¹	
25 298.15 6.4		8.4	9.8	
^a Calculated by compilers.				
AUX1	ILIARY I	INFORMATION		
METHOD/APPARATUS/PROCEDURE:	. [SOURCE AND PURITY O	F MATERIALS:	
Spectrophotometric method. It assumed that the optical densit	t was ty at	(1) Mercury. N	o information g	iven.
2560 A is a reliable measure of solubility. It was further ass	the sumed	(2) Hexane. Pl hydrocarbo	nillips "pure o n solvents; pur	ified
that the extinction coefficien mercury was the same in all hy	nt of vdro-	by passage through silica gel until optically pure, degassed		
carbon solvents. The optical	den-	and distill	led.	
in hexane was measured and,	when			
sured by Moser and Voigt (ref.	. 1),			
gives an extinction coefficient $\epsilon_{2560} = 7.35 \times 10^3 \text{ dm}^3 \text{ mol}^{-1} \text{ cm}^{-1}$ at		ESTIMATED ERROR:		
25°C. The value was used to ca late the solubility in the o solvents.	alcu- other			
The Hg and solvent were equilibr	rated	REFERENCES:	<u> </u>	
sity was measured by a Beckma Spectrophotometer.	an DU	1. Moser, H. C. USAEC Report	; Voigt, A. F. <u>1957</u> , ISC-892	•
The reliability of the results pends on the Moser and Voigt s bility value in hexane.	s de- solu-			

COMPONENTS :	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰ 'Hg; [13982-78-0]	Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 464 - 470.
(2) Hexane; C ₆ H ₁₄ ; [110-54-3]	Spencer, J. N. <u>Dissertation</u> , Iowa State University, <u>1967</u> .
VARIABLES:	PREPARED BY:
T/K = 273.15 - 308.15	M. Iwamoto H. L. Clever

EXPERIMENTAL VALUES:

Temperature		Mercury Solubility		
t/°C	<i>T</i> /K ^a	Concentration 10 [°] c ₁ /mol dm ⁻³	Mole Fraction ^a 10' <i>¤</i> 1	Molality ^a 10° <i>m</i> 1/mol kg ⁻¹
0	273.15	1.4 <u>+</u> .1	1.8	2.1
15	288.15	3.7 <u>+</u> .1	4.8	5.6
20	293.15	4.8 <u>+</u> .1	6.3	7.3
25	298.15	6.3 <u>+</u> .3	8.3	9.6
30	303.15	8.2 <u>+</u> .3	10.9	12.6
35	308.15	$10.4 \pm .2$	13.9	16.1

^aCalculated by compilers.

The authors smoothed their data according to the equation: $\log x_1 = (17.084 \pm .420)\log(T/K) - 48.366$ for the 273.15 to 308.15 temperature interval.

AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: (1) Mercury and Mercury-203. The A radioactive tracer method using isotope decays by emission of a beta particle at an energy of mercury-203 was used. 210 kev, accompanied by a gamma ray of 279 kev. The isotope The mercury and solvent were shaken continuously for 24 hours in 25 ml half-life is 47 days. glass stoppered volumetric flasks in Aliquots of the a thermostat. (2) Hexane. Research grade obtained equilibrated solution were counted from Phillips; used without by a conventional single channel further purification. scintilation counter. The window width was set to count only the photopeak at 279 kev. ESTIMATED ERROR: $\delta T/K = \pm 0.1$; See random error repor-Solvents were treated to remove ted by authors with concentration values above. traces of peroxides. If peroxides were not removed a black coating formed on the mercury. **REFERENCES:**

COMPONENTS :			ORIGINAL MEASUREMEN	NTS:
		Okouchi, S.; Sasaki, S.		
(l) Mercury; Hg; [7439-97-6] (2) Hexane; C ₆ H ₁₄ ; [ll0-54-3]		Bull. Chem. Soc. Jpn. <u>1981</u> , 54, 2513 - 4. Report of the College of Engineering of Hosei University <u>1983</u> , (No. 22), 55 - 106.		
VARIABLES:			PREPARED BY:	
T/K = 27	8.15 - 31	3.15	H. L. Clever M. Iwamoto	
EXPERIMENTAL VA	ALUES:			
Tempe	rature	Merc	ury Solubility	
t∕°C	T/K ^a	Concentration ^a 10 [°] c ₁ /mol dm ⁻³	Mole Fraction 10'x ₁	Molality ^a 10° <i>m</i> 1/mol kg ⁻¹
5	278.15	1.9	2.4	2.8
10	283.15	2.6	3.4	3.9
20	293.15	4.5	5.9	6.8
25	298.15	6.3	8.3	9.6
30	303.15	8.3	11	13
40	313.15	14	19	22
aCalc	ulated by	compilers.		
The authors fitted the data to two equations. The second is preferred. $\log x_1 = (17.111)\log(T/K) - 48.432$ $\log x_1 = 1.3441 - 2215.2/(T/K)$. The second is 32
		AUXILIARY	INFORMATION	
METHOD /APPARATUS / PROCEDURE -		SOURCE AND PURITY	OF MATERIALS:	
Solubility experiments were con- ducted by shaking the solvent with a drop of mercury for 24 hours in a thermostat. Separate experiments showed the mercury concentration remained constant after 24 hours of shaking. A 0.5 cm ³ sample of the equili- brated solution was analyzed by the cold-vapor atomic absorption method. Steps in the procedure included			 Mercury. Purified as did Glew and Hames (ref. 1). Hexane. Analytical reagent grade. Passed through activated alumina and distilled. 	
cold-vapor atomic absorption method. Steps in the procedure included tin(II) chloride reduction, nitrogen bubbling and passage through magne- sium perchlorate to dry the Hg va- por. The mercury was determined from the area under the atomic absorption peak at 253.7 nm compared to a cali- bration curve. In experiments with water, phos- phinic acid (0.001 mol) was added to prevent mercury oxidation. Water- hydrocarbon distribution constants of Hg were also directly determined.		ESTIMATED ERROR: $\delta T/K = \pm 0.1$ $\delta x_1/x_1 = \pm (0.03 - 0.05)$ (compilers) REFERENCES: 1. Glew, D. N.; Hames, D. A. <i>Can. J. Chem.</i> <u>1971</u> , 49, 3114.		

COMPONENTS :	ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6]	Kuntz, R. R.; Mains, G. J.		
(2) 3-Methylpentane; C ₆ H ₁₄ ; [96-14-0]	J. Phys. Chem. <u>1964</u> , 68, 408 - 10.		
VARIABLES: T/K = 298.15	PREPARED BY: S. H. Johnson M. Iwamoto H. L. Clever		
EXPERIMENTAL VALUES:	······		
Temperature Merc	cury Solubility		
t/°C T/K ^a Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a Molality ^a 10 ⁷ x ₁ 10 ^{\$m} 1/mol kg ⁻¹		
25 298.15 5.1	6.7 7.7		
^a Calculated by compilers.			
AUXILIARY	INFORMATION		
METHOD /APPARATUS / PROCEDURE :	SOURCE AND PURITY OF MATERIALS:		
Spectrophotometric method. It was	(1) Mercury. No information given.		
assumed that the optical density at 2560 A is a reliable measure of the	(2) 3-Methylpentane. Phillips "pure		
solubility. It was further assumed that the extinction coefficient of	grade" hydrocarbon solvents; purified by passage through sil-		
mercury was the same in all hydro-	ica gel until optically pure, decassed and distilled.		
sity of a saturated solution of Hg			
in hexane was measured and, when combined with the solubility mea-			
sured by Moser and Voigt (ref. 1),			
<pre>\$2500 = 7.35 x 10³ dm³ mol⁻¹ cm⁻¹ at 25°C. The value was used to calcu- late the solubility in the other solvents.</pre>	ESTIMATED ERROR:		
The Hg and solvent were equilibrated for 20 minutes and the optical den- sity was measured by a Beckman DU Spectrophotometer.	REFERENCES: 1. Moser, H. C.; Voigt, A. F. USAEC Report <u>1957</u> , ISC-892.		
The reliability of the results de- pends on the Moser and Voigt solu- bility value in hexane.			

COMPONENTS:	ORIGINAL MEASUREMENTS:	
(1) Mercury; Hg; [7439-97-6]	Kuntz, R. R.; Mains, G. J.	
(2) 2,2-Dimethylbutane; C ₆ H ₁₄ ; [75-83-2]	J. Phys. Chem. <u>1964</u> , 68, 408 - 10.	
VARIABLES: T/K = 298.15	PREPARED BY: S. H. Johnson M. Iwamoto H. L. Clever	
EXPERIMENTAL VALUES:		
Temperature Merci	ury Solubility	
t/°C T/K ^a Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a Molality ^a 10 [°] x ₁ 10 [°] m ₁ /mol kg ⁻¹	
25 298.15 5.0	6.7 7.8	
^a Calculated by compilers.		
	INFORMATION	
	CONDECT AND DUDITY OF MATERIALS.	
Spectrophotometric method. It was assumed that the optical density at 2560 A is a reliable measure of the solubility. It was further assumed that the extinction coefficient of mercury was the same in all hydro- carbon solvents. The optical den- sity of a saturated solution of Hg in hexane was measured and, when combined with the solubility mea- sured by Moser and Voigt (ref. 1), gives an extinction coefficient $\epsilon_{2560} = 7.35 \times 10^3$ dm ³ mol ⁻¹ cm ⁻¹ at 25°C. The value was used to calcu- late the solubility in the other solvents.	 (1) Mercury. No information given. (2) 2,2-Dimethylbutane. Phillips "pure grade" hydrocarbon sol- vents; purified by passage through silica gel until opti- cally pure, degassed and dis- tilled. ESTIMATED ERROR: 	
The Hg and solvent were equilibrated for 20 minutes and the optical den- sity was measured by a Beckman DU Spectrophotometer.	REFERENCES: 1. Moser, H. C.; Voigt, A. F. USAEC Report <u>1957</u> , ISC-892.	
pends on the Moser and Voigt solu- bility value in hexane.		

COMPONENTS :	ORIGINAL MEASUREMENTS:			
<pre>(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³Hg; [13982-78-0] (2) 2,2-Dimethylbutane; C₆H₁₄; [75-83-2]</pre>	Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 464 - 470. Spencer, J. N. Dissertation, Iowa State University,			
	<u>1967</u> .			
VARIABLES: T/K = 273.15 - 308.15	PREPARED BY: S. H. Johnson M. Iwamoto H. L. Clever			
EXPERIMENTAL VALUES:				
Temperature Mercur	y Solubility			
t/°C T/K ^a Concentration Mo 10 [°] c ₁ /mol dm ⁻³ 10	ble Fraction ^a Molality ^a $7x_1$ $10^s m_1/mol kg^{-1}$			
0 273.15 1.3 <u>+</u> .1	1.7 1.9			
15 288.15 2.8 ± .2	3.7 4.3			
20 293.15 3.7 <u>+</u> .1	4.9 5.7			
25 298.15 4.7 <u>+</u> .3	6.3 7.3			
30 303.15 6.0 <u>+</u> .1	8.1 9.4			
35 308.15 7.3 <u>+</u> .7	9.9 11.5			
^a Calculated by compilers. The authors smoothed their data according to the equation: $\log x_1 = (14.905 \pm .380) \log(T/K) - 43.089$ for the 273.15 to 308.15 temperature interval.				
AUXILIARY	INFORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
A radioactive tracer method using mercury-203 was used. The mercury and solvent were shaken continuously for 24 hours in 25 ml glass stoppered volumetric flasks in a thermostat. Aliquots of the equilibrated solution were counted by a conventional single channel scintilation counter. The window width was set to count only the photopeak at 279 kev.	 Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. 2,2-Dimethylbutane. Research grade obtained from Phillips; used without further purification. 			
Solvents were treated to remove traces of peroxides. If peroxides were not removed a black coating formed on the mercury.	δT/K = ±0.1; See random error re- ported by authors with concentration values above. REFERENCES:			

COMPONENTS :		ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6]		Kuntz, R. R.; I	Mains, G. J.	
(2) 2,3-Dimethylbutane; C ₆ H ₁₄ ; [79-29-8]		J. Phys. Chem.	<u>1964</u> , 68, 408 - 10.	
VARIABLES:			PREPARED BY:	· · · · · · · · · · · · · · · · · · ·
T/K = 29	8.15		S. H. Johnson M. Iwamoto H. L. Clever	
EXPERIMENTAL V	ALUES:			
 Tempe	erature	Merc	ury Solubility	
t/°C	<i>T/K^a</i>	Concentration 10°c1/mol dm ⁻³	Mole Fraction ^a 10 ⁷ x ₁	Molality ^a 10°m ₁ /mol kg ⁻¹
25	298.15	6.0	7.9	9.1
aCalc	ulated by	compilers.		
		AUXILIARY	INFORMATION	
METHOD/APPARAT	TUS/PROCEDUR	Æ:	SOURCE AND PURITY OF MATERIALS:	
Spectropho assumed th 2560 A is a solubility, that the e mercury wa carbon sol sity of a in hexane combined w sured by M gives an	otometric at the op reliable trinction as the saturates waturates with the loser and extincti	method. It was btical density at measure of the further assumed coefficient of me in all hydro- The optical den- d solution of Hg sured and, when solubility mea- Voigt (ref. 1), on coefficient	 (1) Mercury. N (2) 2,3-Dimeth "pure grad vents; pu through si cally pure tilled. 	o information given. ylbutane. Phillips le" hydrocarbon sol- prified by passage lica gel until opti- e, degassed and dis-
$\epsilon_{2500} = 7.3$ 25°C. The late the solvents.	35 x 103 d value wa solubili	m ³ mol ⁻¹ cm ⁻¹ at s used to calcu- ty in the other	ESTIMATED ERROR:	
The Hg and for 20 min sity was Spectropho	solvent w utes and measured tometer.	were equilibrated the optical den- by a Beckman DU	REFERENCES: 1. Moser, H. C. USAEC Report	; Voigt, A. F. <u>1957</u> , ISC-892.
The reliat pends on t bility val	oility of he Moser ue in hex	the results de- and Voigt solu- ane.		

COMPONENTS :	ORIGINAL MEASUREMENTS:			
<pre>(1) Mercury-203; ²⁰³Hg; [13982-78-0] (2) Heptane; C₇H₁₆; [142-82-5]</pre>	Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 464 - 470. Spencer, J. N. <u>Dissertation</u> , Iowa State University, <u>1967</u> .			
VARIABLES: T/K = 273.15 - 308.15	PREPARED BY: S. H. Johnson M. Iwamoto			
EXPERIMENTAL VALUES:	H. D. Clever			
Temperature Mercu	ry Solubility			
t/°C T/K ^a Concentration M 10 [°] c ₁ /mol dm ⁻² 1	ole Fraction ^a Molality ^a 0^{x_1} $10^{s_m}/mol kg^{-1}$			
0 273.15 1.4 <u>+</u> .1	2.0 2.0			
15 288.15 3.7 <u>+</u> .1	5.4 5.4			
20 293.15 4.8 <u>+</u> .1	7.0 7.0			
25 298.15 6.6 <u>+</u> .2	9.7 9.7			
30 303.15 8.5 <u>+</u> .4	12.6 12.6			
35 308.15 10.9 <u>+</u> .8	16.3 16.2			
The authors smoothed their data according to the equation: $\log x_7 = (17.462 \pm .301) \log(T/K) - 49.234$ for the 273.15 to 308.15 temperature interval.				
AUXILIARY	INFORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
A radioactive tracer method using mercury-203 was used. The mercury and solvent were shaken continuously for 24 hours in 25 ml glass stoppered volumetric flasks in a thermostat. Aliquots of the equilibrated solution were counted by a conventional single channel scintilation counter. The window width was set to count only the photopeak at 279 kev.	 Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. Heptane. Research grade ob- tained from Phillips; used with- out further purification. 			
Solvents were treated to remove traces of peroxides. If peroxides were not removed a black coating formed on the mercury.	$\delta T/K = \pm 0.1$; See random error repor- ted by authors with concentration values above. REFERENCES:			

		,	.,		
COMPONENTS:		ORIGINAL MEASUREMENTS:			
(1) 10 17 17 17 17 17 17 17 17 17 17 17 17 17		Okouchi, S.; Sasaki, S.			
 (1) Mercury; Hg; [7439-97-6] (2) Heptane; C₇H₁₆; [142-82-5] 		Bull. Chem. Soc. Jpn. <u>1981</u> , 54, 2513 - 4. Report of the College of Engineering			
			55 - 106.	ersity <u>1983</u> , (No. 22),	
VARIABLES:			PREPARED BY:	PREPARED BY:	
T/K = 278.15 - 313.15		H. L. Clever M. Iwamoto	H. L. Clever M. Iwamoto		
EXPERIMENTAL	VALUES:		4		
 Temp	erature	Merc	ury Solubility		
t∕°C	T/K ^a	Concentration ^a 10° <i>c</i> 1/mol dm ⁻³	Mole Fraction 10'¤1	Molality ^a 10 [°] m ₁ /mol kg ⁻¹	
5	278.15	2.0	2.9	2.9	
10	283.15	2.6	3.7	3.7	
20	293.15	4.8	7.1	7.1	
25	298.15	6.5	9.6	9.6	
30	303.15	8.1	12	12	
40	313.15	15	22	22	
aCal	culated by	y compilers.			
Dr. solu	S. Okouch bility val	i kindly provided lues which did not	the experimenta t appear in the	al mole fraction original papers.	
The authors fitted the data to preferred.		o two equations	• The second is		
$\log x_1 = (17.250)$ $\log x_1 = 1.3461 -$)log(T/K) - 48.7 - 2195.1/(T/K)	05		
				,	
AUXILIARY INFORMATION					
METHOD/APPARA	TUS/PROCEDU	KE:	SOURCE AND PURITY OF MATERIALS:		
Solubil	ity exper shaking t	iments were con- he solvent with a	and Hames	(ref. 1).	
drop of m	ercury fo	or 24 hours in a		nu - 1	
thermostat. Separate experiments showed the mercury concentration remained constant after 24 hours of		(2) Heptane.	sed through activated		
		alumina an	d distilled.		
A 0.5 c	m ³ sample	e of the equili-			
brated sol	lution was	s analyzed by the			
steps in the procedure included tin(II) chloride reduction, nitrogen					
		ESTIMATED PROD-			
bubbling a sium perc	and passag hlorate t	e cnrougn magne- o dry the Hq va-	ESTIMATED EKKUR:		
por.			$\delta T/K = \pm 0.1$	a = 0.05 (compilars)	
The mer	cury was	determined from atomic absorption	$\int_{0}^{0} \frac{x_{1}}{x_{1}} = \pm 0.0$	$\delta x_1/x_1 = \pm (0.03 - 0.05)$ (compilers)	
peak at 253.7 nm compared to a cali-		REFERENCES :			

Glew, D. N.; Hames, D. A. Can. J. Chem. <u>1971</u>, 49, 3114.

bration curve.

In experiments with water, phos-phinic acid (0.001 mol) was added to prevent mercury oxidation. Water-hydrocarbon distribution constants of Hg were also directly determined.

COMPONENTS :			ORIGINAL MEASUR	EMENTS:	
<pre>(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³Hg; [13982-78-0]</pre>		Spencer, J. J. Phys. Ch	N.; Voigt, A. F. 1968, 72, 464	- 47	
(2) Octane; C ₈ H ₁₈ ; [111-65-9]			Spencer, J. <u>Dissertatic</u> <u>1967</u> .	N. <u>On</u> , Iowa State Unive	rsit
ARIABLES:			PREPARED BY:	······································	
T/K	= 273.15	- 313.15	S. H. Johns M. Iwamoto H. L. Cleve	son er	
EXPERIMENT	AL VALUES:				
Temp	erature	Ме	rcury Solubility		
t/°C	Т/К ^а	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a 10'x ₁	Molality ^a 10 [°] m ₁ /mol kg ⁻¹	
0	273.15	1.6 <u>+</u> .1	2.5	2.2	
15	288.15	3.8 <u>+</u> .1	6.1	5.4	
25	298.15	6.7 <u>+</u> .1	10.9	9.5	
30	303.15	8.7 <u>+</u> .3	14.2	12.4	
35	308.15	10.8 <u>+</u> .3	17.8	15.5	
40	313.15	12.6 <u>+</u> 1.0	20.8	18.2	
aCalo	culated by	compilers.	a according to th	e equation.	
for t	log the 273.15	$x_1 = (16.583 \pm .555 \pm 0.000)$ 5 to 313.15 temper	228)log(T/K) - 47 rature interval.	.003	

AUXILIARY	INFORMATION
METHOD /APPARATUS / PROCEDURE :	SOURCE AND PURITY OF MATERIALS:
A radioactive tracer method using mercury-203 was used. The mercury and solvent were shaken continuously for 24 hours in 25 ml glass stoppered volumetric flasks in a thermostat. Aliquots of the equilibrated solution were counted by a conventional single channel scintilation counter. The window width was set to count only the photopeak at 279 kev. Solvents were treated to remove traces of peroxides. If peroxides	 Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. Octane. Research grade obtained from Phillips; used without further purification. ESTIMATED ERROR: δT/K = ±0.1; See random error reported by authors with concentration values above.
tormed on the mercury.	REFERENCES :

COMPONENTS: ORIGINAL MEASUREMENTS: (1) Mercury; Hg; [7439-97-6] Vogel, A.; Gjaldbaek, J. Chr. Arch. Pharm. Chem. Sci. Ed. (2) Octane; C₈H₁₈; [111-65-9] 1974, 2, 25 - 9. VARIABLES: PREPARED BY: H. L. Clever T/K = 298.15M. Iwamoto EXPERIMENTAL VALUES: بعد حج 60 من عن عد عد عد حد من من حد عن عب من عد بين مع جد وي مو عد بين من عد عد عد عد Temperature Mercury Solubility ConcentrationMole FractionaMolalitya $10^{\circ}c_{1}/mol dm^{-3}$ $10^{\circ}x_{1}$ $10^{\circ}m_{1}/mol$ t/°C T/K^a No. of Exps. 10°m₁/mol kg⁻¹ Exps. -----25 298.15 6 6.7 <u>+</u> .5 11 9.6 ^aCalculated by compilers. The error is the standard deviation of an individual measurement. ADDITIONAL COMMENTS: The authors state that they found the same solubility after shaking mercury + solvent for 48 hours as for shaking times of up to one month. The authors also found the same solubility within experimental error when the solvent was saturated with oxygen and with nitrogen. The authors took special care to see that the glassware surface of the sampling pipet was equilibrated with the saturated solution of mercury. Special care was taken to see that colloidal mercury did not form in the solution. AUXILIARY INFORMATION METHOD / APPARATUS / PROCEDURE : SOURCE AND PURITY OF MATERIALS: The mercury was analyzed by cold (1) Mercury. Source not given, purvapor atomic absorption spectroscopy ified by distillation. (ref. 1). The solvent was saturated with Hg in a special glass container in (2) Octane. British Drug House; spectroscopic quality, used without further purification. which a few grams of mercury was kept in a cellulose extraction thimble. The container was shaken at least 48 hours at 25°C. A 10.00 cm³ sample of the saturated solution was taken. It was treated to convert the Hg to Hg 2+ and extracted into an aqueous phase. ESTIMATED ERROR: An aliquot of the aqueous phase was diluted, treated with tin(II) $\delta c_1/c_1 = \pm 0.07$ See standard deviation above. chloride to reduce the mercury, and the solution analyzed by cold vapor atomic absorption spectroscopy. The apparatus allowed measurements down **REFERENCES:** to one part per billion of Hg. 1. Hatch, W. R.; Ott, W. L. Anal. Chem. <u>1968</u>, 10, 2085. Similtaneous measurements were made under the same conditions of samples containing a known amount of mercury.

COMPONENTS:			ORIGINAL MEASUREMENTS:	
<pre>(1) Mercury; Hg; [7439-97-6] (2) Octane; C₈H₁₈; [111-65-9]</pre>			Okouchi, S.; S Bull. Chem. So 2513 - 4. Report of the of Hosei Unive 55 - 106.	Sasaki, S. oc. Jpn. <u>1981</u> , 54, College of Engineering ersity <u>1983</u> , (No. 22),
VARIABLES:			PREPARED BY:	
T/K = 278.15 - 313.15			H. L. Clever M. Iwamoto	
EXPERIMENTAL VA	LUES:		4	
Temperature Merc		ury Solubility		
t/°C	T/K ^a	Concentration ^a 10 [°] c ₁ /mol dm ⁻³	Mole Fraction	Molality ^a 10°m ₁ /mol kg ⁻¹
5	278.15	2.1	3.3	2.9
10	283.15	2.9	4.7	4.1
20	293.15	4.9	7.9	6.9
25	298.15	6.7	11	9.6
30	303.15	8.5	14	12
40	313.15	14	23	20
^a Calcu	lated by	compilers.		
solubi The au prefer	lity valuthors fired.	ues which did not tted the data to log $x_1 = (16.500)$ log $x_1 = 1.1542 -$	appear in the two equations. log(T/K) - 46.8(2122.0/(T/K)	original papers. . The second is 00
AUXILIARY INFORMATION				
METHOD /APPARATUS / PROCEDURE:			SOURCE AND PURITY	OF MATERIALS.
Solubility experiments were con- ducted by shaking the solvent with a			(1) Mercury. I and Hames	Purified as did Glew (ref. 1).
thermostat. Separate experiments showed the mercury concentration remained constant after 24 hours of shaking. A 0.5 cm ³ sample of the equili- brated solution was analyzed by the cold-vapor atomic absorption method. Steps in the procedure included			(2) Octane. grade. Pas alumina and	Analytical reagent sed through activated d distilled.
tin(II) chloride reduction, nitrogen			ESTIMATED ERROR.	
bubbling and passage through magne- sium perchlorate to dry the Hg va-			$\delta T/K = \pm 0.1$	
por. The mercury was determined from the area under the atomic absorption			$\delta x_1 / x_1 = \pm (0.0)$	3 - 0.05) (compilers)
peak at 253.7 nm compared to a cali- bration curve.			REFERENCES:	
In experiments with water, phos- phinic acid (0.001 mol) was added to prevent mercury oxidation. Water- hydrocarbon distribution constants of Hg were also directly determined.			L. Glew, D. N.; Can. J. Cher	; Hames, D. A. m. <u>1971</u> , 49, 3114.

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COMPONENTS:	ORIGINAL MEASUREMENTS:	
<pre>(1) Mercury; Hg; [7439-97-6]; Mercury-203; *° 'Hg; [13982-78-0]</pre>	Klehr, E. H.; Voigt, A. F. Radioisotopes Phys. Sci. Ind.,	
(2) 2,2,4-Trimethylpentane or <i>Iso</i> octane; C ₈ H ₁₈ ; [540-84-1]	Proc. Conf. Use, Copenhagen <u>1960</u> , 1, 517 - 29 (Pub. <u>1962</u>).	
VARIABLES :	PREPARED BY:	
	S. H. Johnson	
T/K = 298.15	M. Iwamoto H. L. Clever	
EXPERIMENTAL VALUES:		
Temperature Mercur	y Solubility	
t/°C T/K ^a Concentration Mc 10°c ₁ /mol dm ⁻³ 10	ble Fraction ^a Molality ^a x_1 10 ^e m ₁ /mol kg ⁻¹	
25 298.15 4.6 <u>+</u> .1	7.6 6.7	
^a Calculated by compilers.		
The value above is from the direct indirect measurement result is 4.7	measurement technique. The x 10 ^{-\$} mol dm ⁻³ at 25°C.	
AUXILIARY INFORMATION		
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:	
Direct Method. A globule of mer- cury containing 203-Hg was placed in 50 ml of solvent in a 100 ml flask and agitated in a thermostated bath.	(1) Mercury and Mercury-203. Reduced from a mercury nitrate sample. Half-life is 47 days.	
Samples were taken until the solu- tion appeared to be at equilibruim. Analysis were made by GM-counting by one of two techniques: (i) Solid precipitate counting. The Hg in a 0.5 ml aliquote was exchanged and reprecipitated on a	(2) <i>Iso</i> octane. Pure grade, used without futher repurification.	
fide was dried and counted. Details	ESTIMATED ERROR:	
in Moser an Voigt (ref. 1). (ii) Liquid aliquote scintilla- tion-counting 0.05 ml aliquote of	See random error reported by authors	
the saturated solution was diluted		
and transferred to the counting tube	REFERENCES:	
The 0.28 MeV gamma radiation was	1. Moser, H. C.; Voigt, A. F.	
counted. Error due to radiation ad- sorbed by the benzene and water was shown to be less than one percent. Indirect Method. The distribution coefficient between solvent and wa-	Radiochemical Studies of Mercury and its Ions in Dilute Solutions US AEC Report ISC-892, March 1957.	
ter was measured.		

Components :		ORIGINAL MEASUR	REMENTS :	
(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³ Hg; [13982-78-0]		Spencer, J. J. Phys. Ch	N.; Voigt, A. F. 1em. <u>1968</u> , 72, 464 - 470.	
(2) 2,2,4-Trimethylpentane or <i>Iso</i> octane; C ₈ H ₁₈ ; [540-84-1]		Spencer, J. <u>Dissertatio</u> <u>1967</u> .	N. M. Iowa State University,	
VARIA	ABLES:		PREPARED BY:	
T/K = 273.15 - 308.15			S. H. Johns M. Iwamoto H. L. Cleve	ion er
EXPER	RIMENTAL VALUES:			
Temperature Mercury Sol			cury Solubility	, e e e a a e e e e e e e e e e
	t∕°C T∕K ^a	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a $10^{7}x_{1}$	Molality ^a 10 [°] <i>m</i> ₁ /mol kg ⁻¹
1				

0	273.15	1.0 ± .1	1.6	1.4
13.5	286.65	2.1 <u>+</u> .1	3.4	3.0
15	288.15	2.2 <u>+</u> .1	3.6	3.2
20	293.15	3.3 <u>+</u> .1	5.4	4.8
25	298.15	4.2 <u>+</u> .2	7.0	6.1
30	303.15	5.3 <u>+</u> .1	8.9	7.8
35	308.15	6.6 <u>+</u> .3	11.1	9.7

^aCalculated by compilers.

The authors smoothed their data according to the equation: $\log x_1 = (16.583 \pm .228) \log(T/K) - 47.003$ for the 273.15 to 308.15 temperature interval.

 METHOD/APPARATUS/PROCEDURE: A radioactive tracer method using mercury-203 was used. The mercury and solvent were shaken continuously for 24 hours in 25 ml glass stoppered volumetric flasks in a thermostat. Aliquots of the equilibrated solution were counted by a conventional single channel scintilation counter. The window width was set to count only the photopeak at 279 kev. Solvents were treated to remove traces of peroxides. If peroxides were not removed a black coating formed on the mercury. SOURCE AND PURITY OF MATERIALS: SOURCE AND PURITY OF MATERIALS: SOURCE AND PURITY OF MATERIALS: Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. (2) Isooctane. Research grade obtained from Phillips; used without further purification. ESTIMATED ERROR: & \$T/K = ±0.1; See random error reported by authors with molar solubility values above. 	AUXILIARY	INFORMATION
 A radioactive tracer method using mercury-203 was used. (1) Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. (2) Isooctane. Research grade obtained from Phillips; used without further purification. (2) Isooctane. Research grade obtained from Phillips; used without further purification. (2) Isooctane. Research grade obtained from Phillips; used without further purification. (2) Isooctane. Research grade obtained from Phillips; used without further purification. (2) Isooctane. Research grade obtained from Phillips; used without further purification. (3) Solvents were treated to remove traces of peroxides. If peroxides were not removed a black coating formed on the mercury. 	METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
REFERENCES :	A radioactive tracer method using mercury-203 was used. The mercury and solvent were shaken continuously for 24 hours in 25 ml glass stoppered volumetric flasks in a thermostat. Aliquots of the equilibrated solution were counted by a conventional single channel scintilation counter. The window width was set to count only the photopeak at 279 kev. Solvents were treated to remove traces of peroxides. If peroxides were not removed a black coating formed on the mercury.	 (1) Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. (2) <i>Iso</i>octane. Research grade obtained from Phillips; used without further purification. ESTIMATED ERROR: δ<i>T</i>/K = ±0.1; See random error reported by authors with molar solubility values above. REFERENCES:

COMPONENTS :	ORIGINAL MEASUREMENTS:		
(l) Mercury; Hg; [7439-97-6]	Vogel, A.; Gjaldbaek, J. Chr.		
(2) 2,2,4-Trimethylpentane or <i>Iso</i> octane; C ₈ H ₁₈ ; [540-84-1]	Arch. Pharm. Chem. Sci. Ed. <u>1974</u> , 2, 25 - 9.		
VARIABLES:	DEDADEN BY.		
T/K = 298.15	H. L. Clever M. Iwamoto		
EXPERIMENTAL VALUES:	·····		
Temperature Mer	cury Solubility		
t/°C T/K ^a No. of Concentratio Exps. 10°c ₁ /mol dm	n Mole Fraction ^a Molality ^a 10 [*] m ₁ /mol kg ⁻¹		
25 298.15 27 4.1 <u>+</u> .25	6.8 6.0		
^a Calculated by compilers.			
The error is the standard deviation	of an individual measurement.		
ADDITIONAL COMMENTS: The authors state that they found the same solubility after shak mercury + solvent for 48 hours as for shaking times of up to one mon The authors also found the same solubility within experimental ex- when the solvent was saturated with oxygen and with nitrogen. The authors took special care to see that the glassware surface of sampling pipet was equilibrated with the saturated solution of merc Special care was taken to see that colloidal mercury did not form the solution. METHOD/APPARATUS/PROCEDURE: The mercury was analyzed by cold vapor atomic absorption spectroscopy (ref. 1). The solvent was saturated with Hg in a special glass container in			
which a few grams of mercury was kept in a cellulose extraction thim- ble. The container was shaken at least 48 hours at 25°C. A 10.00 cm ³ sample of the satu- rated solution was taken. It was treated to convert the Hg to Hg ² and extracted into an aqueous phase. An aliquot of the aqueous phase was diluted, treated with tin(II) chloride to reduce the mercury, and the solution analyzed by cold vapor atomic absorption spectroscopy. The apparatus allowed measurements down to one part per billion of Hg. Similtaneous measurements were made under the same conditions of samples containing a known amount of mercury.	Without further purification. ESTIMATED ERROR: $\delta c_1/c_1 = \pm 0.07$ See standard deviation above. REFERENCES: 1. Hatch, W. R.; Ott, W. L. Anal. Chem. <u>1968</u> , 10, 2085.		

COMPONENTS: (1) Mercury: Ha: [7439-97-6];	ORIGINAL MEASUREMENTS:			
Mercury-203; 20 3Hg; [13982-78-0]	Radioisotopes Phys. Sci. Ind.,			
(2) Decane; C ₁₀ H ₂₂ ; [124-18-5]	Proc. Conf. Use, Copenhagen 1960. 1. 517 - 29 (Pub. 1962).			
VARIABLES:	PREPARED BY:			
T/K = 273.15 - 318.15	S. H. Johnson M. Iwamoto			
EXPERIMENTAL VALUES:	H. L. Clever			
Temperature Merci	rv Solubility			
+/°c #/ya Concentration	Ale Fraction ^a Molality ^a			
$10^{\circ}c_1/\text{mol dm}^{-3}$	$10^{*}x_{1}$ $10^{*}m_{1}/mol kg^{-1}$			
0 273.15 2.1 <u>+</u> .1	4.0 2.8			
10 283.15 3.0 <u>+</u> .1	5.8 4.1			
15 288.15 4.5 <u>+</u> .1	8.7 6.1			
20 293.15 4.9 <u>+</u> .1	9.6 6.7			
25 298.15 7.0 \pm .1	13.7 9.6			
30 303.15 8.6 <u>+</u> .1	16.9 11.9			
35 308.15 9.6 <u>+</u> .1	19.0 13.4			
45 318.15 13.3 <u>+</u> .1	26.6 18.7			
acalaulated by compilers.				
-Carculated by complicits.				
<u></u>				
AUXILIARY INFORMATION				
Direct Method. A globule of mer-	(1) Mercury and Mercury-203. Reduced			
cury containing 203-Hg was placed in 50 ml of solvent in a 100 ml flask	from a mercury nitrate sample. Half-life is 47 days.			
and agitated in a thermostated bath.	(2) Decane. Pure grade, used with-			
tion appeared to be at equilibruim.	out futher repurification.			
one of two techniques: (i) Solid precipitate counting				
The Hg in a 0.5 ml aliquote was				
stainless steel panchet as the sul-	ESTIMATED ERROR:			
in Moser an Voigt (ref. 1).	See random error reported by authors			
tion-counting. A 0.5 ml aliquote of the saturated solution was diluted	with concentration values above.			
and transferred to the counting tube with a known volume of benzene.	REFERENCES :			
The 0.28 MeV gamma radiation was	1. Moser, H. C.; Voigt, A. F. Radiochemical Studies of Mercury			
sorbed by the benzene and water was	and its Ions in Dilute Solutions US AEC Report ISC-892. March			
Indirect Method. The distribution	<u>1957</u> .			
ter was measured.				

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COMPONENTS :	ORIGINAL MEASUREMENTS:	
(1) Mercury; Hg; [7439-97-6]	Kuntz, R. R.; Mains, G. J.	
(2) Decane; C ₁₀ H ₂₂ ; [124-18-5]	J. Phys. Chem. <u>1964</u> , 68, 408 - 10.	
	1	
VADTARI FS •		
	S. H. Johnson	
T/K = 298.15	M. Iwamoto H. L. Clever	
EXPERIMENTAL VALUES:		
Temperature Merc	cury Solubility	
t/°C T/K ^a Concentration 10 [°] c ₁ /mol dm ⁻³	Mole Fraction ^a Molality ^a $10^{s}x_{1}$ $10^{s}m_{1}/mol kg^{-1}$	
25 298.15 5.5	1.1 7.6	
^a Calculated by compilers.		
AUXILIARY	INFORMATION	
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:	
Spectrophotometric method. It was	(1) Mercury. No information given.	
2560 A is a reliable measure of the	(2) Decane. Phillips "pure grade"	
that the extinction coefficient of	by passage through silica gel	
carbon solvents. The optical den-	and distilled.	
sity of a saturated solution of Hg in hexane was measured and, when		
combined with the solubility mea- sured by Moser and Voigt (ref. 1),		
gives an extinction coefficient $g_{2560} = 7.35 \times 10^3 \text{ dm}^3 \text{ mol}^{-1} \text{ cm}^{-1} \text{ at}$	ESTIMATED ERROR:	
25°C. The value was used to calcu- late the solubility in the other solvents.		
The Hg and solvent were equilibrated	REFERENCES :	
for 20 minutes and the optical den- sity was measured by a Beckman DU Spectrophotometer.	1. Moser, H. C.; Voigt, A. F. USAEC Report <u>1957</u> , ISC-892.	
The reliability of the results de- pends on the Moser and Voigt solu- bility value in hexane.		
COMPONENTS:	EVALUATOR:	
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(l) Mercury; Hg; [7439-97-6] (2) Cycloalkanes	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA <u>1985</u> , July	

An Evaluation of the Solubility of Mercury in Cycloalkanes.

There are data on the solubility of mercury in six cycloalkanes. A. F. Voigt and co-workers (ref. 1 - 4) have measured all but one of the reported cycloalkane solubilities by a radioactive tracer technique. A single value is reported by Vogel and Gjaldbaek (ref. 5) by atomic absorption spectroscopy. The data on the six cycloalkanes are discussed below.

Mercury + Cyclohexane; C_6H_{12} ; [110-82-7]

There are four values of the solubility of mercury in cyclohexane at 298.15 K. They are:

(12.1 ± 0.3)	x 10 ^{-\$}	mol dm ⁻³	Spencer and Voigt (ref. 3)
(11.0 ± 0.2)	x 10 ^{-•}	mol dm ⁻³	Moser and Voigt (ref. 1)
9.7	x 10 ⁻⁶	mol dm ⁻³	Moser and Voigt (ref. 2)
(9.6 <u>+</u> 0.4)	x 10 ⁻⁸	mol dm ⁻³	Vogel and Gjaldbaek (ref. 5)

In addition, Spencer and Voigt (ref. 3) report five additional values in the 288.15 to 313.15 K interval. The Moser and Voigt (ref. 2) value was calculated from their cyclohexane/water distribution coefficient by the evaluator. It is of lesser reliability than the other values since it assumes unit activity coefficients and depends on the value chosen for the solubility of mercury in water.

The agreement among the values at 298.15 K is not as good as one would like. They differ by about 25 percent. Vogel and Gjaldbaek (ref. 5) took special care to see that the glassware surface of the sampling pipet was equilibrated with a saturated solution of mercury to prevent loss of mercury by adsorption on the surface and that colloidal mercury did not form in the sampled saturated solution. Their first precaution would result in a larger solubility and the second would result in a smaller solubility if adsorption of mercury by glass and colloidal mercury formation were problems. Vogel and Gjaldbaek suggest their smaller value formation were problems. is due to the precaution about colloidal mercury. Vogel and Gjaldbaek did four determinations of the solubility of mercury in cyclohexane by direct shaking without the precaution to remove colloidal mercury. The average solubility was $(12.4 \pm 1.5) \times 10^{-6}$ mol dm⁻³ which does agree with the Spencer and Voigt value. However, Vogel and Gjaldbaek also measured the solubility of mercury in octane and in 2,2,4-trimethylpentane. Their solubility values in these solvents agree well with the Spencer and Voigt values. At present, there is no reason why colloidal mercury would be a problem in cyclohexane but not with the octanes. It is a point that deserves futher experimental investigation. Vogel and Gjaldbaek also show that they obtain the same solubility value with an oxygen atmosphere or with a nitrogen atmosphere. They obtained equilibrium within 48 hours and found the same result after equilibrating for one month.

For this evaluation we prefer the Spencer and Voigt data because it is a self-consistent set of data over a 25 degree temperature interval. If Vogel and Gjaldbaek are correct, then the values from the Spencer and Voigt experiments should be reduced by about 20 percent. The six experimental values of Spencer and Voigt (ref. 3) and the one value of Moser and Voigt (ref. 1) were combined in a linear regression to obtain the equations for the 288.15 to 313.15 K interval.

 $\ln (c_1/\text{mol dm}^{-3}) = (1.6014 \pm 0.5296) - (38.6262 \pm 1.5886)/(T/100 \text{ K})$ with a standard error about the regression line of 4.9 x 10⁻⁷. $\ln x_1 = (0.2949 \pm 0.5246) - (39.5782 \pm 1.5740)/(T/100 \text{ K})$ with a standard error about the regression line of 5.3 x 10⁻⁹. $\ln (m_1/\text{mol kg}^{-1}) = (2.2128 \pm 0.5213) - (39.6850 \pm 1.5639)/(T/100 \text{ K})$ with a standard error about the regression line of 6.2×10^{-7} .

Smoothed data from the equations are in Table 1 below. Also in the table are the values of the enthalpy and entropy changes for the transfer of one mole of mercury from liquid mercury to the hypothetical unit concentration solution.

Table 1. Solubility of mercury in cyclohexane. Tentative values of $c_1/mol dm^{-3}$, $m_1/mol kg^{-1}$, and mole fraction, x_1 , solubility as a function of temperature.

 Т/К	Mercury Solubility				
	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction 10' <i>x₁</i>	Molality 10 ^{°m} 1/mol kg ⁻¹		
288.15 293.15 298.15 303.15 308.15 313.15	7.5 9.4 11.7 14.5 17.9 21.8	8.1 10.2 12.8 15.9 19.7 24.2	9.5 12.1 15.1 18.9 23.3 28.7		
Δ <i>H</i> 1 ^a	32.1 <u>+</u> 1.3	32.9 <u>+</u> 1.3	33.0 <u>+</u> 1.3		
Δ <i>S</i> ₁ ^b	13.3 <u>+</u> 4.4	2.5 <u>+</u> 4.4	18.4 <u>+</u> 4.3		

a units kJ mol⁻¹

Mercury + Methylcyclohexane; C₇H₁₄; [108-87-2] *cis*-1,2-Dimethylcyclohexane; C₈H₁₆; [2207-01-4] *trans*-1,2-Dimethylcyclohexane; C₈H₁₆; [6876-23-9] *cis*-1,4-Dimethylcyclohexane; C₈H₁₆; [624-29-3] *trans*-1,4-Dimethylcyclohexane; C₈H₁₆; [2207-04-7]

Spencer and Voigt (ref. 3 and 4) made the only measurements on these systems. The data are classed as tentative. The data were fit by a linear regression in the solubility units of concentration, $c_1/mol \ dm^{-3}$, mole fraction, x_1 , and molality, $m_1/mol \ kg^{-1}$ to a two constant equation. The constants of the equations and the smoothed data are given in Tables 2 - 7.

The solubility of mercury in the substituted cyclohexanes has a significantly more positive enthalpy of solution than in cyclohexane, but less positive enthalpy than for normal alkanes of the same carbon number. The enthalpy of solution of mercury in the substituted cyclohexanes is the same within experimental error for the five solvents. The solubility of mercury parallels closely for methylcyclohexane and the cis-1,2- and cis-1,4-dimethylcyclohexanes as a function of temperatures. The trans-1,2- and trans-1,4-dimethylcyclohexanes mercury solubilities parallel quite closely, but at about a 10 percent lower value than the solubility in the other three substituted cyclohexanes at a corresponding temperature.

b units J K⁻¹ mol⁻¹

Mercury in Hydrocarbons

COMPONENTS:			EVALUATOR:	EVALUATOR:		
(l) Mercury; Hg; [7439-97-6] (2) Cycloalkanes			H. Lawren Chemistry Emory Uni Atlanta,	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA		
			<u>1985</u> , Jul	Ŷ		
CRITICAL EV	ALUATION:		······································			
Table 2.	Constants f K).	or the equation	on ln(c ₁ /mol	dm ⁻³) = A(1)) + A(2)/(T/100	
Compound	A	(1) <u>+</u> Error	A(2) <u>+</u> Err	or Si al Re	td. error Sout the Egression Line	
Methylcyc cis-1,2-E trans-1,2 cis-1,4-E trans-1,4	Clohexane3.DMC2.2-DMC2.DMC3.3-DMC2.	$\begin{array}{r} 6095 \pm 0.1461 \\ 6380 \pm 0.6568 \\ 9009 \pm 0.7042 \\ 3771 \pm 0.4927 \\ 9205 \pm 0.6169 \end{array}$	-45.4364 + -42.3938 + -43.5886 + -43.7188 + -43.7078 +	0.4285 1.9581 2.0979 1.4679 1.8378	1.33 x 10 ⁻⁷ 3.33 x 10 ⁻⁷ 3.76 x 10 ⁻⁷ 2.14 x 10 ⁻⁷ 3.30 x 10 ⁻⁷	
Table 3.	Solubility c concentratio	of mercury in n as a functio	cycloalkanes on of tempera	• Tentative ture at 0.1	values of the MPa.	
T/K	ستا ست سه جه هو چو جو کا مت حد نده دور	Concentratio	on, 10°c ₁ /mol	dm ⁻³ , in		
	Methyl- cyclohexane	cis-1,2- dimethyl- cyclohexane	trans-1,2- dimethyl- cyclohexane	cis-1,4- dimethyl- cyclohexane	trans-1,4- dimethyl- cyclohexane	
273.15 278.15 283.15 288.15 293.15 298.15 303.15 308.15	2.2 3.0 4.0 5.2 6.9 8.9 11.4 14.6	- 5.7 7.3 9.3 11.8 14.8	- - - 6.3 8.1 10.4 13.1	- 5.3 6.9 9.0 11.5 14.6	- - 4.8 6.2 8.0 10.2 12.8	
	37.8 <u>+</u> 0.4	35.2 <u>+</u> 1.6	36.2 <u>+</u> 1.7	37.2 <u>+</u> 1.2	36.3 <u>+</u> 1.5	
	30.0 <u>+</u> 1.2	21.9 <u>+</u> 5.5	24.1 <u>+</u> 5.8	28.1 ± 4.1	24.3 <u>+</u> 5.1	
8						

a units kJ mol⁻¹ b units J K⁻¹ mol⁻¹

Compound		A(1) <u>+</u> Error	A(2) <u>+</u> Eri	or	Std. error about the Regression Line
Methylcyc cis-1,2-E trans-1,2 cis-1,4-E trans-1,4	Lohexane DMC C-DMC DMC C-DMC	$\begin{array}{r} 2.0035 \pm 0.160 \\ 1.0312 \pm 0.706 \\ 1.2975 \pm 0.709 \\ 1.7676 \pm 0.509 \\ 1.3569 \pm 0.593 \end{array}$	$ \begin{array}{r} -46.7699 \\ -43.4305 \\ -44.5584 \\ -45.6945 \\ -45.7394 \\ -44.7394 \\ $ -44.748 \\ -44.748 \\ -44.748 \\	0.4716 2.1072 2.1139 1.5185 1.7669	1.98 x 10 ^{-*} 5.00 x 10 ^{-*} 5.56 x 10 ^{-*} 3.14 x 10 ^{-*} 4.78 x 10 ^{-*}
Table 5.	Solubility mole frac MPa.	y of mercury i tion solubili	n cycloalkanes ty as a funct	. Tentati ion of ten	ve values of ti perature at 0
T/K		Mole F	raction, 10 ⁷ x	, in	و الای ها ها ها جو دو ها هه بعد الله الله الله الله الله الله الله الل
	Methyl- cyclohexa	<i>cis-</i> 1,2- ne dimethy1-	trans-1,2- dimethy1-	cis-1,4- dimethyl-	trans-1,4- dimethy1-
		cyclohexane	cyclohexane	cyclohexa	ne cyclohexan
273.15 278.15 283.15 288.15 293.15 298.15 303.15 308.15	2.7 3.7 5.0 6.6 8.7 11.4 14.8 19.0	cyclohexane 	cyclohexane 	cyclohexa 	ne cyclohexano
273.15 278.15 283.15 293.15 293.15 298.15 303.15 308.15 	2.7 3.7 5.0 6.6 8.7 11.4 14.8 19.0 38.9 <u>+</u> 0.4	cyclohexane - - 8.0 10.3 13.2 16.8 21.2 4 36.1 ± 1.8	cyclohexane 	cyclohexa - - 7.6 10.0 12.9 16.65 21.3 38.0 ± 1.	ne cyclohexano

COMPONENTS:			EVALUATOR:	EVALUATOR:		
(l) Mercury; Hg; [7439-97-6] (2) Cycloalkanes		H. Lawrer Chemistry Emory Uni Atlanta,	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA			
			<u>1985</u> , Jul	L y		
CRITICAL EV	ALUATION:		l			
Table 6.	Constants f	for the equation	on ln(m ₁ /mol	kg ⁻¹)= A(l)	+ A(2)/(T/100	
Compound		(1) <u>+</u> Error	A(2) <u>+</u> Err	or	Std. error about the Regression Line	
Methylcyc	lohexane 4	.2093 <u>+</u> 0.1477	-46.4212 ±	0.4331	1.67 x 10 ⁻⁷	
cis-1,2-D		-2107 ± 0.6326	-43.4077 +	- 1.8858 - 2.0210	4.03 x 10 ⁻⁷	
cis-1,4-D	MC 3	$.9300 \pm 0.5118$	-45.6200 ±	1.5245	4.72 x 10 2.80 x 10 ⁻⁷	
trans-1,4	-DMC 3	$.5862 \pm 0.6524$	-44.8727 <u>+</u>	1.9436	4.63 x 10 ⁻⁷	
				, in in in in in		
Table 7.	Solubility molality as	of mercury in ; a function of	cycloalkanes. temperature	Tentativ at 0.1 MPa	e values of	
<i>T/</i> K		Molality	, 10° <i>m</i> 1/mol k	g ⁻¹ , in		
	Methyl- cyclohexane	cis-1,2- dimethy1- cyclohexane	trans-1,2- dimethy1- cyclohexane	cis-1,4- dimethy1- cyclohexa	trans-1,4- dimethyl- ne cyclohexane	
273.15	2.8	-		-	-	
278.15	3.8	-	-	-	-	
288.15	6.8	7.1	6.3	6.8	6.2	
293.15	8.9	9.2	8.2	8.9	8.1	
298.15 303.15	11.0 15.1	11.8 15.0	10.6 13.5	11.5 14.8	10.5	
308.15	19.3	18.9	17.1	18.9	17.1	
Δ <i>H</i> ₁ ^a	38.6 <u>+</u> 0.4	36.1 <u>+</u> 1.6	36.8 <u>+</u> 1.7	37.9 <u>+</u> 1.	3 37.3 <u>+</u> 1.6	
Δ <i>S</i> 1 ^b	35.0 <u>+</u> 1.2	26.7 <u>+</u> 5.3	28.2 <u>+</u> 5.6	32.7 <u>+</u> 4.3	3 29.8 <u>+</u> 5.4	
a units kJ mol ⁻¹ b units J K ⁻¹ mol ⁻¹						
REFERENCE	S:					
1. Moser, Chem. 2	H. C.; Voig Abstr. <u>1958</u>	:, A. F. <i>USAEC</i> , 52, 10691h.	Report <u>195</u>	<u>7</u> , ISC-892	, 65 pp.	
2. Moser,	H. C.; Voig	t, A. F. J. Am	1. Chem. Soc.	<u>1957</u> , 79,	, 1837 - 9.	
3. Spence Spence	r, J. N.; Vo r, J. N. <u>Di</u> f	igt, A. F. J. J. ssertation, Iov	Phys. Chem. va State Univ	<u>1968</u> , 72, ersity, <u>19</u>	464 - 70. <u>67</u> .	
 Spence Voigt, 	r, J. N.; Vo: A. F. Pers	igt, A. F. J. J onal communica	Phys. Chem. tion.	<u>1968</u> , 72,	1913 - 7;	
5. Vogel, 9.	A.; Gjaldba	ek, J. C. Arch	h. Pharm. Che	m. Sci. Ed	. <u>1974</u> , 2, 25 -	

COMPONENTS:	ORIGINAL MEASUREMENTS:			
(1) Mercury; Hg; [7439-97-6]	Moser, H. C.; Voigt, A. F.			
(2) Cyclohexane; C ₆ H ₁₂ ; [110-82-7]	USAEC Report <u>1957</u> , ISC-892. Chem. Abstr. <u>1958</u> , 52, 10691h.			
	DEDARED BY			
VARIABLES.	H. L. Clever			
T/K = 298.15	M. Iwamoto			
EXPERIMENTAL VALUES:				
Temperature Merc	cury Solubility			
<i>t</i> /°C <i>T</i> /K ^a Concentration 10° <i>c</i> 1/mol dm ⁻³	Mole Fraction ^a Molality ^a $10^{r}x_{1}$ $10^{s}m_{1}/mol kg^{-1}$			
25 298.15 11.0 <u>+</u> 0.2	12.0 14.2			
^a Calculated by compilers.				
AUXILIARY	INFORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
A globule of Hg metal prepared from radioactive mercury(II) nitrate by reduction with hypophosphorous acid was equilibrated with 5 - 10 ml of liquid by shaking in a thermostat. Aliquotes of the liquid were with- drawn periodically for up to two weeks and the Hg concentration determined radiochemically	(1) Mercury and Mercury-203. Oak Ridge National Lab; recieved as 0.31 M Hg(NO ₃) ₂ in 1.56 HNO ₃ solution. Initial activity 50 millicuries g ⁻¹ ; half-life 48 days. Reduced to Hg by hypo- phosphorous acid; coagulated to a Hg droplet by addition of concentrated HI.			
The aliquot was diluted with ace- tone and equilibrated with Hg(NO ₃) ₂ carrier to exchange the radioactive mercury. The mercury was precipi- tated as HgS, mounted on a stainless steel planchet and counted with a	(2) Cyclohexane. Eastman Co. Spec- tro-Grade; shaken with concen- trated H ₂ SO ₄ and alkaline KMnO ₄ passed through a column of dry activated Al ₂ O ₃ and redistilled.			
Geiger-Mueller tube.	ESTIMATED ERROR:			
	$\delta T/K = \pm 0.1$			

COMPONENTS:	ORIGINAL MEASUREMENTS:			
<pre>(1) Mercury; Hg; [7439-97-6] Mercury-203; ** Hg; [13982-78-0] (2) Cyclohexane; C₆H₁₂; [110-82-7]</pre>	Moser, H. C.; Voigt, A. F. J. Am. Chem. Soc. <u>1957</u> , 79, 1837 - 9.			
VARIABLES:	PREPARED BY:			
T/K = 298.15	H. L. Clever			
EXPERIMENTAL VALUES:				
Temperature Distribution	Mercury Solubility			
$t/^{\circ}C T/K^{a}$ $E^{\circ}=c_{1}aq/c_{1}org 10^{\circ}c_{1}/mol$	tion ^a Mole Fraction ^a Molality ^a dm ⁻³ 10 ⁷ x ₁ 10 ⁶ m ₁ /mol kg ⁻¹			
25.0 298.15 0.031 9.7	10.5 12.5			
^a Calculated by compiler, assuming act	ivity coefficients are unity.			
The above mercury solubility value w solubility in water of 3.0 x 10 ⁻⁷ mol	as calculated using the free mercury dm ⁻³			
AUXILIARY	INFORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
The distribution of mercury-203 between aqueous and organic phases was measured. Dilute solutions of 0.01 molar HNO_3 containing a known amount of pure mercurous nitrate were shaken with an equal volume of organic liquid for about 12 hours. Both phases were analyzed for total mercury by first converting to Hg ²⁺ , precipitation as HgS, and counting in a thin window Geiger counter. In the aqueous phase the dispro- portionation Hg ²⁺ (aq) = Hg ²⁺ (aq) + Hg(aq) and possibly the dissociation Hg ²⁺ (aq) = 2 Hg ⁺ (aq) take place. It is assumed that only metallic Hg is extracted into the organic phase. The distribution of total Hg in the experies of determined page	 (1) Mercury and Mercury-203. Oak Ridge National Lab; obtained as a high specific activity solu- tion of mercury(II) nitrate con- taining isotope 203. In the 0.01 molar HNO₃ solution of mer- cury(I) nitrate, the authors estimate 96% mercury(II) is Hg²⁺ and 99% of the mercury(I) is Hg²⁺. At this acidity, there is no minimum hydrolysis and nitrato complex formation. (2) Cyclohexane. Eastman Spectro Grade. 			

COMPONENTS:	ORIGINAL MEASUREMENTS:
<pre>(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³Hg; [13982-78-0]</pre>	Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 464 - 470.
(2) Cyclohexane; C ₆ H ₁₂ ; [110-82-7]	Spencer, J. N. <u>Dissertation</u> , Iowa State University, <u>1967</u> .
VARIABLES:	PREPARED BY:
T/K = 288.15 - 313.15	S. H. Johnson M. Iwamoto H. L. Clever
EXPERIMENTAL VALUES:	
Temperature Mercu	cy Solubility
t/°C T/K ^a Concentration Mo 10 [°] c ₁ /mol dm ⁻³ 10	Die Fraction ^a Molality ^a 1^{x_1} $10^{e_m_1/mol kg^{-1}}$
15 288.15 7.6 <u>+</u> 0.2	8.2 9.7
20 293.15 9.4 <u>+</u> 0.2	10.2 12.1
25 298.15 12.1 <u>+</u> 0.3	13.2 15.6
30 303.15 14.8 <u>+</u> 0.4	16.2 19.2
35 308.15 17.4 <u>+</u> 0.2	19.2 22.8
40 313.15 22.3 <u>+</u> 1.5	24.7 29.3
log $x_1 = (13.140 \pm .359)$ for the 288.15 to 313.15 temperate	$\log(T/K) - 38.405$ are interval.
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to metallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried. The mercury and solvent were shaken continuously in 25 ml glass stop- pered volumetric flasks in a thermo- stat for 24 hours. Aliquots of the equilibrated solution were counted by a conventional single channel scintilation counter. The window width was set to count only the photopeak at 279 kev. The solubil- ity values were the average of at least six determinations over a three day period.	 (1) Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. (2) Cyclohexane. Phillips Petroleum Co., Research Grade, used as received. ESTIMATED ERROR: δT/K = ±0.1; See random error reported by authors with concentration values above. REFERENCES:

l

COMPONENTS:	ORIGINAL MEASUREMENTS:			
(1) Mercury; Hg; [7439-97-6];	Vogel, A.; Gjaldbaek, J. Chr.			
(2) Cyclohexane; C ₆ H ₁₂ ; [110-82-7]	Arch. Pharm. Chem. Sci. Ed. <u>1974</u> , 2, 25 - 9.			
VARTARIES -	DDEDADED BV.			
T/K = 298.15	H. L. Clever M. Iwamoto			
EXPERIMENTAL VALUES:	L			
Temperature Mercury	Solubility			
t/%	Mole Fraction ^a Kolalitud			
Exps. 10° c ₁ /mol dm	1^{-3} $10^{7}x_1$ $10^{6}m_1/mol kg^{-1}$			
25 298.15 24 9.6 \pm 0.4	10.4 12.4			
ADDITIONAL COMMENTS: The authors state that they found the same solubility after shaking mercury + solvent for 48 hours as for shaking times of up to one month. The authors also found the same solubility within experimental error when the solvent was saturated with oxygen and with nitrogen. The authors took special care to see that the glassware surface of the sampling pipet was equilibrated with the saturated solution of mercury. Special care was taken to see that colloidal mercury did not form in the solution. METHOD/APPARATUS/PROCEDURE: Source AND PURITY OF MATERIALS:				
The mercury was analyzed by cold vapor atomic absorption spectroscopy (ref. 1). The solvent was saturated with Hg in a special glass container in which a few grams of mercury was kept in a cellulose extraction thim- ble. The container was shaken at least 48 hours at 25°C. A 10.00 cm ³ sample of the satu- rated solution was taken. It was treated to convert the Hg to Hg ²⁺ and extracted into an aqueous phase. An aliquot of the aqueous phase was diluted, treated with tin(II) chloride to reduce the mercury, and the solution analyzed by cold vapor atomic absorption spectroscopy. The apparatus allowed measurements down to one part per billion of Hg. Similtaneous measurements were made under the same conditions of samples containing a known amount of mercury.	<pre>(1) Mercury. Source not given, pur- ified by distillation. (2) Cyclohexane. Merck; Uvasol grade spectroscopic quality, used without further purifica- tion. ESTIMATED ERROR:</pre>			

COMPO	NENTS :				ORIGINAL MEASU	IREMENTS	:		
(1)	Mercu Mercu	ry; Hg; ry-203;	[7439-97-6]; ²⁰³ Hg; [13982-7	78-0]	Spencer, J J. Phys. C	J. N.; Chem.	Voigt, A. <u>1968</u> , 72,	F. 464 -	470.
(2) Methylcyclohexane; C ₇ H ₁₄ ; [108-87-2]			Spencer, J <u>Dissertati</u> 1967.	J. N. Lon, Id	owa State I	Jniver	sity,		
VARIA	BLES:				PREPARED BY:				
	T/K =	273.15 -	308.15		S. H. Johr M. Iwamoto H. L. Clev	nson D Ver			
EXPER	IMENTAL	VALUES:		·					
	Temper	ature		lercur	y Solubility	 ?	م منه جي منه منه جو منه بين جه جه منه م	-	
	t∕°C	<i>T/</i> K ^a	Concentration 10°c1/mol dm ⁻¹	Mo 10	le Fraction ⁶	a Mola 10°n	ality ^a n ₁ /mol kg ⁻¹	- -	
	0	273.15	2.2 <u>+</u> 0.1		2.7		2.8		
	15	288.15	5.2 <u>+</u> 0.1		6.6		6.7		
	20	293.15	6.9 <u>+</u> 0.2		8.8		9.0		
	25	298.15	9.1 <u>+</u> 0.1		11.7		11.9		
	30	303.15	11.3 <u>+</u> 0.2		14.6		14.9		
	35	308.15	14.5 <u>+</u> 0.4		18.8		19.2		
	for th	log . 10g . ne 273.15	$x_1 = (16.011 \pm 100)$ to 308.15 temp	.226) peratu	log(T/K) - 4 re interval.	45.563			
AUXILIARY				INFORMATION					
METH	OD/APPA	RATUS/PROCI	EDURE:		SOURCE AND PU	RITY OF	MATERIALS:		
A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to metallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried. The mercury and solvent were shaken continuously in 25 ml glass stop- pered volumetric flasks in a thermo- stat for 24 hours. Aliquots of the		 Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. Methylcyclohexane. Phillips Petroleum Co., Research Grade, used as received. 		The of a y of amma tope lips ade,					
equ by sci wic pho ity lea thr	ilibr a con ntila Ith w topea valu st s ee day	ated sol nvention tion cou as set t k at 279 es were ix deter y period.	ution were cou al single cha nter. The wi to count only kev. The solu the average o minations ov	inted innel ndow the ibil- of at er a	ESTIMATED ERF $\delta T/K = \pm 0.1$ ted by aut values above REFERENCES:	ROR: ; See hors ve.	random er: with conc	ror re entra	por- tion

	Tyurocarbons 143
COMPONENTS :	ORIGINAL MEASUREMENTS:
<pre>(1) Mercury; Hg; [7439-97-6]; Mercury-203; ***Hg; [13982-78-0]</pre>	Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 1913 - 7.
(2) <i>cis</i> -1,2-Dimethylcyclohexane; C ₈ H ₁₆ ; [2207-01-4]	Voigt, A. F. Personal communication
VARIABLES:	PREPARED BY:
T/K = 289.15 - 308.15	S. H. Johnson M. Iwamoto H. L. Clever
EXPERIMENTAL VALUES:	
Temperature Mercu	ry Solubility
t/°C T/K ^a Concentration Ma 10°c ₁ /mol dm ⁻³ 1	ble Fraction ^a Molality ^a 1^{x_1} $10^{s_m} m_1/mol kg^{-1}$
16 289.15 5.8 <u>+</u> 0.1	8.1 7.25
20 293.15 7.5 <u>+</u> 0.2	10.6 9.4
25 298.15 9.57 <u>+</u> 0.14	13.56 12.08
30 303.15 12.0 <u>+</u> 0.2	17.1 15.2
35 308.15 14.4 <u>+</u> 0.9	20.6 18.4
^a Calculated by compilers.	
values from J. N. Spencer's resappear in the published paper. The authors smoothed their data at $\log x_1 = (14.57 \pm .)$ for the 289.15 to 308.15 temperate	earch notebook that do not cording to the equation: 73)log(T/K) - 41.93 are interval.
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE: The method and procedure are re- ported in an earlier paper (ref. 1). A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to metallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried. The mercury and solvent were shaken continuously in glass stoppered vol- umetric flasks in a thermostat for 24 hours. Aliquots of the equili- brated solution were counted by a conventional single channel scinti- lation counter. The window width was set to count only the photopeak at 279 kev. The solubility values were the average of at least six determinations over a 3 day period.	 SOURCE AND PURITY OF MATERIALS: (1) Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. (2) cis-1,2-Dimethylcyclohexane. Matheson Coleman and Bell. Distilled, refluxed twice with NaOH and hydroquinone to reduce peroxides. ESTIMATED ERROR: 5T/K = ±0.1; See random error reported by authors with concentration values above. REFERENCES: Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u>, 72, 464.
At some temperatures the solubility increased with time unless the sys- tem was protected from light.	

COMPONENTS:	ORIGINAL MEASUREMENTS:			
<pre>(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³Hg; [13982-78-0]</pre>	Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 1913 - 7.			
(2) <i>trans</i> -1,2-Dimethylcyclohexane; C ₈ H ₁₆ ; [6876-23-9]	Voigt, A. F. Personal communication			
VARIADLES:	S. H. Johnson			
T/K = 288.15 - 308.15	M. Iwamoto H. L. Clever			
EXPERIMENTAL VALUES:				
Temperature Mercur	y Solubility			
$t/^{\circ}C$ T/K^{a} Concentration Mol $10^{\circ}c_{1}/mol dm^{-3}$ 10	le Fraction ^a Molality ^a $7x_1$ 10 ^e m ₁ /mol kg ⁻¹			
15 288.15 4.8 <u>+</u> 0.2	6.9 6.2			
-	9.1 8.1			
$25 298.15 8.49 \ \pm \ 0.30$	12-34 11-00			
$30 303.15 10.6 \pm \ 0.1$	15.5 13.8			
55 500.15 12.0 <u>+</u> 0.5	10.5 10.5			
^a Calculated by compilers.				
Professor Voigt provided the expo values from J. N. Spencer's rese appear in the published paper.	erimental molar solubility arch notebook that do not			
The authors smoothed their data according to the equation: $\log x_1 = (15.12 \pm .80) \log (T/K) - 43.29$ for the 288.15 to 308.15 temperature interval.				
AUXILIARY	INFORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
The method and procedure are re- ported in an earlier paper (ref. 1). A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to metallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried.	 Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. trans-1,2-Dimethylcyclohexane. Phillips Petroleum Co., Research Grade, used as received. 			
The mercury and solvent were shaken continuously in 25 ml glass stop- pered volumetric flasks in a thermo- stat for 24 hours. Aliquots of the equilibrated solution were counted by a conventional single channel scintilation counter. The window width was set to count only the photopeak at 279 kev. The solubil- ity values were the average of at least six determinations over a three day period.	ESTIMATED ERROR: δT/K = ±0.1; See random error repor- ted by authors with concentration values above. REFERENCES: 1. Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 464.			

COMPONENTS:	ORIGINAL MEASUREMENTS:				
(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³ Hg; [13982-78-0]	Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 1913 - 7.				
(2) <i>cis-</i> 1,4-Dimethylcyclohexane; C ₈ H ₁₆ ; [624-29-3]	Voigt, A. F. Personal communication				
VARIABLES:	PREPARED BY:				
T/K = 288.15 - 308.15	S. H. Johnson M. Iwamoto H. L. Clever				
EXPERIMENTAL VALUES:					
Temperature Mercu	ry Solubility				
t/°C T/K ^a Concentration Mo 10°c ₁ /mol dm ⁻³ 10	Die Fraction ^a Molality ^a $10^{s} m_{1}^{mol} \text{ kg}^{-1}$				
15 288.15 5.2 <u>+</u> 0.3	7.4 6.6				
20 293.15 7.1 <u>+</u> 0.4	10.2 9.1				
25 298.15 9.20 <u>+</u> 0.18	13.26 11.81				
30 303.15 11.3 <u>+</u> 0.5	16.4 14.6				
35 308.15 14.5 <u>+</u> 0.5	21.1 18.8				
values from J. N. Spencer's res appear in the published paper. The authors smoothed their data ac $\log x_7 = (15.38 \pm .)$ for the 288.15 to 308.15 temperatu	values from J. N. Spencer's research notebook that do not appear in the published paper. The authors smoothed their data according to the equation: $\log x_1 = (15.38 \pm .61) \log (T/K) - 43.96$ for the 288.15 to 308.15 temperature interval.				
AUXILIARY	INFORMATION				
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:				
The method and procedure are re- ported in an earlier paper (ref. 1). A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to metallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried.	 (1) Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. (2) cis-1,4-Dimethylcyclohexane. Matheson Coleman and Bell. Refluxed with NaOH and hydroquinone, distilled twice to remove peroxides. 				
The mercury and solvent were shaken continuously in 25 ml glass stop- pered volumetric flasks in a thermo- stat for 24 hours. Aliquots of the equilibrated solution were counted by a conventional single channel scintilation counter. The window width was set to count only the photopeak at 279 kev. The solubil- ity values were the average of at least six determinations over a three day period.	ESTIMATED ERROR: $\delta T/K = \pm 0.1$; See random error repor- ted by authors with concentration values above. REFERENCES: 1. Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 464.				

COMPONENTS:	ORIGINAL MEASUREMENTS:			
(1) Mercury; Hg; [7439-97-6]; Mercury-203; 203Hg; [13982-78-0]	Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 1913 - 7.			
<pre>(2) trans-1,4-Dimethylcyclohexane; C₈H₁₆; [2270-04-7]</pre>	Voigt, A. F. Personal communication			
VARIABLES:	PREPARED BY:			
<i>T/</i> K = 288.15 - 308.15	S. H. Johnson M. Iwamoto H. L. Clever			
EXPERIMENTAL VALUES:				
Temperature Mercur	y Solubility			
<i>t/°C T/K^a</i> Concentration Mc 10 [°] c ₁ /mol dm ⁻³ 10	ble Fraction ^{a.} Molality ^a r_{x_1} 10 ^s m_1 /mol kg ⁻¹			
15 288.15 4.7 <u>+</u> 0.2	6.9 6.1			
20 293.15 6.2 <u>+</u> 0.2	9.1 8.1			
25 298.15 8.24 <u>+</u> 0.20	12.19 10.87			
30 303.15 10.4 <u>+</u> 0.4	15.5 13.8			
35 308.15 12.4 <u>+</u> 0.4	18.6 16.5			
^a Calculated by compilers. Professor Voigt provided the experimental molar solubility values from J. N. Spencer's research notebook that do not appear in the published paper. The authors smoothed their data according to the equation:				
for the 288.15 to 308.15 temperatu	re interval.			
AUXILIARY	INFORMATION			
METHOD/APPARATUS/PROCEDURE: The method and procedure are re- ported in an earlier paper (ref. 1). A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to metallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried. The mercury and solvent were shaken continuously in 25 ml glass stop- pered volumetric flasks in a thermo- stat for 24 hours. Aliquots of the equilibrated solution were counted by a conventional single channel scintilation counter. The window width was set to count only the photopeak at 279 kev. The solubil- ity values were the average of at least six determinations over a three day period.	 SOURCE AND PURITY OF MATERIALS: (1) Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. (2) trans-1,4-Dimethylcyclohexane. Matheson Coleman and Bell. Refluxed with NaOH and hydroquinone, distilled twice to remove peroxides. ESTIMATED ERROR: &T/K = ±0.1; See random error reported by authors with concentration values above. REFERENCES: 1. Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u>, 72, 464. 			

COMPO	DNENTS:		EVALUATOR:
(1) (2)	Mercury; Hg; Mercury-203; Cyclohexene;	[7439-97-6] ² ³ Hg; [13982-78-0] C ₆ H ₁₀ ; [110-83-8]	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA
			<u>1985</u> , August

An Evaluation of the Solubility of Mercury in Cyclohexene.

Only Spencer and Voigt (ref. 1) report measurements of the solubility of mercury in cyclohexene. They report five measurements in the 273.15 to 303.15 K interval. The data are classed as tentative.

The five solubility values were subjected to a linear regression in concentration, mole fraction and molality. The results are in Tables 1 and 2 below.

Table 1. The solubility of mercury in cyclohexene. Least square parameters of the equation $\ln (soly) = A(1) + A(2)/(T/100 \text{ K})$.

Solubility	A(1) <u>+</u> Error	A(2) <u>+</u> Error	Std. error about the Regression Line
$c_1/\text{mol dm}^{-3}$	$\begin{array}{r} 4.9664 \pm 0.2723 \\ 2.8777 \pm 0.3261 \\ 5.5816 \pm 0.2461 \end{array}$	-48.2391 ± 0.7914	2.4 x 10 ⁻⁷
x_1		-48.8341 ± 0.9476	2.9 x 10 ⁻⁸
$m_1/\text{mol kg}^{-1}$		-49.4324 ± 0.7153	2.8 x 10 ⁻⁷

Table 2. The solubility of mercury in cyclohexene. Tentative values of the concentration, mole fraction and molality as a function of temperature at 0.1 MPa and thermodynamic changes.

T/K	M	ercury Solubility	Y
	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction 10'x ₁	Molality 10°m ₁ /mol kg ⁻¹
273.15 278.15 283.15 288.15 293.15 298.15 303.15	3.1 4.2 5.7 7.7 10.2 13.5 17.6	3.1 4.2 5.7 7.7 10.4 13.7 17.9	3.7 5.1 7.0 9.4 12.6 16.7 22.0
∆ <i>H</i> 1 ^a	40.1 <u>+</u> 0.7	40.6 <u>+</u> 0.8	41.1 ± 0.6
∆ <i>s</i> 1 ^b	41.3 <u>+</u> 2.3	23.9 <u>+</u> 2.7	46.4 <u>+</u> 2.0

^a units kJ mol⁻¹ ^b units J K⁻¹ mol⁻¹

The solubility of mercury in cyclohexene is larger than in the other six carbon substances: hexane, cyclohexane and benzene. For example the mole fraction solubility at 298.15 K in cyclohexene is 40 percent larger than in hexane, 7 percent larger than in cyclohexane, and 23 percent larger than in benzene.

REFERENCES:

 Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u>, 72, 464 - 70; Spencer, J. N. <u>Dissertation</u> <u>1967</u>, Iowa State University.

COMPON	ENTS:			ORIGINAL MEASUREMEN	TS:	
(1)	(1) Mercury; Hg; [7439-97-6]; Mercury-203; ***Hg; [13982-78-0]			Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 464 - 470.		
(2) Cyclohexene; C ₆ H ₁₀ ; [110-83-8]			H ₁₀ ; [110-83-8]	Spencer, J. N. <u>Dissertation</u> , Iowa State University, <u>1967</u> .		
VARIA	BLES:			PREPARED BY:		
T	/K = 27	3.15 - 30	03.15	S. H. Johnson M. Iwamoto H. L. Clever		
EXPERI	MENTAL V	ALUES:				
	Tempe	rature	Mer	cury Solubility	au an an im in lu lu an an an an lu lu lu lu lu lu an an in lu lu	
	t/°C	<i>T/</i> K ^a	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a 10'x ₁	Molality ^a 10 [°] m ₁ /mol kg ⁻¹	
	0	273.15	3.1 <u>+</u> 0.1	3.1	3.7	
	15	288.15	7.5 <u>+</u> 0.1	7.5	9.2	
	20	293.15	10.4 <u>+</u> 0.3	10.5	12.8	
	25	298.15	13.3 <u>+</u> 0.3	13.5	16.5	
	30	303.15	17.9 <u>+</u> 1.0	18.3	22.3	
	aCalc	ulated by	Z compilers.	ین می بود بو با کر کر در به می بود از ما بود بود به ا		
	The a	uthors su	noothed their data	according to th	e equation.	
	for t	lc he 273.15	$x_1 = (17.148 \pm 15.15)$.230)log(T/K) -	48.294	
	202 0					
		<u></u>	<u></u>	<u></u>		
			AUXILIARY	INFORMATION		
METHO	D/APPARAT	US/PROCEDUI	RE :	SOURCE AND PURITY (OF MATERIALS:	
Ara	adioact	ive tra	cer method was	(1) Mercury ar	nd Mercury-203. The	
merc	ury-20	3 nitrat	e was added to	beta parti	cle at an energy of	
mer	cury(I)	[) nitra	te, reduced to	210 kev, accompanied by a gamma ray of 279 key. The isotope		
acid	, coagu	lated int	to a drop, washed	half-life i	s 47 days.	
and	dried.			(2) Cyclohexene	. Phillips Petroleum	
The	mercury	and sol	vent were shaken	Co., 99.34	mol %. Matheson	
pere	d flask	s in a tl	hermostat for 24	Both washe	d with aqueous NaOH,	
hour	s. Al	iquots	of the equili-	dried, refl	uxed over and distil-	
conv	entiona	l single	channel scinti-	hydroquinon	e to prevent peroxide	
lati was	on cou set to	nter. T count on	he window width ly the photopeak	formation.		
at 2	79 kev.	. The so	blubility values	ESTIMATED EBBOD-		
det	erminat	tions ov	ver a three day	STITALED ERKOR:		
peri	od.			$oT/K = \pm 0.1; S$ ported by autho	ee random error re- rs with concentration	
				values above.		
ļ				1		
				1		

COMPONENTS :	EVALUATOR:
(1) Mercury; Hg; [7439-97-6](2) Aromatic Hydrocarbons	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA
	<u>1985</u> , July

An Evaluation of the Solubility of Mercury in Aromatic Hydrocabons.

The solubility of mercury in five aromatic hydrocarbons was measured by a radioactive tracer method in the laboratory of A. F. Voigt, Iowa State University. The results are reported in three papers (ref. 1 - 3).

Mercury + Benzene; C_6H_6 ; [71-43-2]

All three papers report solubility values at 298.15 K. The values are:

11.0	<u>+</u>	0.6)	х	10-6	mol	dm " "	Moser and Voigt (ref. 1)
11.4	Ŧ	0.3)	х	10 - *	mol	dm ⁻³	Klehr and Voigt (ref. 2)
11.9	±	0.6)	х	10-6	mol	dm-3	Spencer and Voigt (ref. 3)

Spencer and Voigt report five additional values at various temperatures between 288.15 and 308.15 K.

All of the data were treated by a linear regression. The Moser and Voigt value at 298.15 K was dropped because it was just at two standard deviations from the regression line. The data were treated again to obtain two constant equations in concentration, mole fraction and molality. The equation constants are in Table 1. The smoothed data and values of the thermodynamic changes for the transfer of mercury from the liquid metal to the hypothetical unit concentration solution are in Table 2. The enthalpy of solution is similar in magnitude to the value for alkanes of similar carbon number.

Table 1. The solubility of mercury in benzene. Least square parameters for the equation ln(soly) = A(1) + A(2)/(T/100 K).

Solubility	A(1) <u>+</u> Error	A(2) <u>+</u> Error	Std. error about the Regression Line
		میں سے بچر میں میں میں سے من	
$c_1/mol dm^{-3}$	5.6307 <u>+</u> 0.4801	-50.6159 <u>+</u> 1.4287	3.9 x 10 ⁻⁷
x -	3.6560 ± 0.4621	-51.9295 ± 1.3752	3.4 x 10 ^{-*}
$m_1/mol kg^{-1}$	6.0509 ± 0.5041	-51.4670 ± 1.3008	4.6 x 10 ⁻⁷

Table 2. The solubility of mercury in benzene. Tentative values of the concentration, mole fraction and molality as a function of temperature.

<i>т/</i> к	М	Y	
	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction 10'x ₁	Molality 10 [*] m ₁ /mol kg ⁻¹
288.15	6.6	5.8	7.4
293.15	8.8	7.8	10.1
298.15	11.8	10.6	13.5
303.15	15.6	14.1	18.0
308.15	20.5	18.6	23.7
Δ <i>H</i> 1 ^a	42.1 <u>+</u> 1.2	43.2 <u>+</u> 1.1	42.8 <u>+</u> 1.1
AS, ^b	46.8 <u>+</u> 4.0	30.4 ± 3.8	50.3 ± 4.2

Mercury + Methylbenzene; C7Hg; [108-88-3]

All three papers report solubility values at 298.15 K. The values are:

In addition Klehr and Voigt report seven more values in the 273.15 to 318.15 K interval and Spencer and Voigt report five more values in the 273.15 to 308.15 K interval.

The Klehr and Voigt, the Spencer and Voigt, and the combined data set were treated by linear regressions to obtain two constant equations of the type

$$\ln(soly) = A(1) + A(2)/(T/100 \text{ K}).$$

The Klehr and Voigt data showed more scatter and gave significantly smaller solubility values in the 308.15 to 318.15 K temperature interval than the other data sets. The enthalpy of solution was nearly 5 kJ mol⁻¹ less than the benzene enthalpy value for the combined fit. The Klehr and Voigt values at 308.15 and 318.15 K did not quite deviate a full two standard deviations from the combined data regression line. However, they were arbitrarily omitted and the remaining data refit by the linear regression to obtain the values in Tables 3 and 4 for concentration, mole fraction and molality. The enthalpy of solution is the smallest for this system amoung the five aromatic hydrocarbon solvents by several percent.

Table 3. The solubility of mercury in methylbenzene. Least square parameters for the equation $\ln(soly) = A(1) + A(2)/(T/100 \text{ K})$.

Solubility	A(1) <u>+</u> Error	A(2) <u>+</u> Error	Std. error about the Regression Line
$c_1/\text{mol dm}^{-3}$ $x_1/mol kg^{-1}$	$3.5029 \pm 0.5883 \\ 1.6227 \pm 0.5686 \\ 3.9894 \pm 0.5724$	-44.2469 <u>+</u> 1.7135 -45.3066 <u>+</u> 1.6563 -45.2540 <u>+</u> 1.6673	7.5 x 10 ⁻⁷ 7.8 x 10 ⁻⁸ 8.5 x 10 ⁻⁷

Table 4. The solubility of mercury in methylbenzene. Tentative values of the concentration, mole fraction and molality as a function of temperature.

T/K	Mercury Solubility					
	Concentration 10°c ₁ /mol dm [~]	Mole Fraction 10'x ₁	Molality 10°m ₁ /mol kg ⁻¹			
273.15 278.15 283.15 288.15 293.15 298.15 303.15 303.15 313.15	3.1 4.1 5.4 7.1 9.3 11.9 15.2 19.3 24.3 30.3	3.2 4.3 5.7 7.5 9.8 12.7 16.4 20.9 26.4 33 1	3.4 4.6 6.2 8.2 10.7 13.8 17.8 22.6 28.6 35.9			
$\Delta H_1^{\mathbf{a}}$	36.8 ± 1.4 29.1 ± 4.9	37.7 ± 1.4 13.5 ± 4.7	37.6 ± 1.4 33.2 ± 4.8			

COMPONENTS :	EVALUATOR:
(1) Mercury; Hg; [7439-97-6]	H. Lawrence Clever Chemistry Department
(2) Aromatic Hydrocarbons	Emory University Atlanta, Georgia 30322 USA
	<u>1985</u> , July

Mercury + 1,2-Dimethylbenzene; C₈H₁₀;[95-47-6] + (1-methylethyl)Benzene; C₉H₁₂; [98-82-8] + (2-methylpropyl)Benzene; C₁₀H₁₄; [538-93-2]

Only Spencer and Voigt (ref. 3) report solubility data on these systems. The data are classed as tentative. Each system was subject to a linear regression in concentration, mole fraction and molality. The results are in Table 5. The smoothed solubility values as a function of temperature and the enthalpy and entropy changes for the transfer of one mole of mercury from the liquid metal to the hypothetical unit solutions are in Tables $\overline{6}$, 7 and 8.

It is interesting to note that the mole fraction solubilities for the three hydrocarbons above are the same within experimental error at a given temperature. The mole fraction solubilities in benzene and methylbenzene are about 28 and 15 percent smaller, respectively, than the average mole fraction solubility of the C_8 , C_9 and C_{10} hydrocarbons above. The enthalpy of solution in mercury in the aromatic hydrocarbons is similar in magnitude to the values in the alkanes.

Table 5.	The solubility of mercury in 1,2-dimethylbenzene, (1-methyl	-
	ethyl)benzene and (2-methylpropyl)benzene. Least square para	-
	meters for the equation $ln(soly) = A(1) + A(2)/(T/100 K)$.	

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Solubility	A(l) <u>+</u> Error	A(2) <u>+</u> Error	Std. error about the Regression Line
مة خاري بي بي بي خا عا بر			
	1,2-Dimethyide	nzene or <i>ortno</i> -xylene	2
c ₁ /mol dm ⁻³ x ₁ m ₁ /mol kg ⁻¹	5.4863 <u>+</u> 0.2771 3.5834 <u>+</u> 0.2744 5.8912 <u>+</u> 0.2858	-50.1083 <u>+</u> 0.8157 -50.7252 <u>+</u> 0.8079 -50.9159 <u>+</u> 0.8414	4.2 x 10 ⁻⁷ 5.3 x 10 ⁻⁸ 5.0 x 10 ⁻⁷
	(1-methylethyl)Be	nzene or <i>Iso</i> propylben	izene
$c_1/mol dm^{-3}$ $m_1/mol kg^{-1}$	3.7336 ± 0.2107 2.0351 ± 0.2155 4.0998 ± 0.2056	-45.2228 ± 0.6203 -46.0108 ± 0.6343 -45.8465 ± 0.6052	2.6 x 10 ⁻⁷ 3.7 x 10 ⁻⁸ 3.0 x 10 ⁻⁷
	(2-methylpropyl)B	enzene or <i>t-</i> Butylbenz	ene
$c_1/mol dm^{-3}$ x_1 $m_1/mol kg^{-1}$	4.1354 ± 0.3899 2.5225 ± 0.3729 4.5045 ± 0.3503	-46.9025 ± 1.1555 -47.6384 ± 1.1052 -47.5591 ± 1.0383	5.7 x 10 ⁻⁷ 8.4 x 10 ⁻⁸ 6.1 x 10 ⁻⁷

273.15 278.15 283.15 283.15 293.15 293.15 303.15 303.15 308.15	Concentration 10°c1/mol dm ⁻³ 2.6 3.6	Mole Fraction	
273.15 278.15 283.15 288.15 293.15 298.15 303.15 308.15	2.6 3.6	10'x ₁	Molality 10° <i>m</i> 1/mol kg ⁻¹
283.15 288.15 293.15 298.15 303.15 308.15	3.0	3.1	2.9
288.15 293.15 298.15 303.15 308.15	5.0	6.0	5.6
293.15 298.15 303.15 308.15	6.8	8.1	7.7
303.15	9.1		10.4
308.15	16.0	19.5	18.4
	20.9	25.5 .	24.1
∆ <i>H</i> 1 ^a	41.7 <u>+</u> 0.7	42.2 ± 0.7	42.3 <u>+</u> 0.7
∆ <i>s</i> 1 ^b	45.6 <u>+</u> 2.3	29.8 <u>+</u> 2.3	49.0 <u>+</u> 2.4
 T/K	M	ercury Solubility	/
<i>T/</i> K	M Concentration 10°c1/mol dm ⁻³	ercury Solubility Mole Fraction 10 ⁷ ¤ ₁	Molality 10°m ₁ /mol kg ⁻¹
т/к 273.15	M Concentration 10°c1/mol dm ⁻³ 2.7	ercury Solubility Mole Fraction 10 ⁷ x ₁ 3.7	Molality 10°m ₁ /mol kg ⁻¹ 3.1
T/K 273.15 278.15 283.15	Concentration 10°c ₁ /mol dm ⁻³ 2.7 3.6 4.8	ercury Solubility Mole Fraction $10^{7}x_1$ 3.7 5.0 6 7	Molality $10^{\circ}m_1/mol kg^{-1}$ 3.1 4.2 5.6
T/K 273.15 278.15 283.15 288.15	M Concentration 10°c1/mol dm ⁻³ 2.7 3.6 4.8 6.4	ercury Solubility Mole Fraction 10 ⁷ <i>x</i> ₁ 3.7 5.0 6.7 8.9	Molality $10^{\circ}m_1/mol \ kg^{-1}$ 3.1 4.2 5.6 7.4
T/K 273.15 278.15 283.15 288.15 293.15	M Concentration 10°c1/mol dm ⁻² 2.7 3.6 4.8 6.4 8.4	ercury Solubility Mole Fraction 10 ⁷ x ₁ 3.7 5.0 6.7 8.9 11.7	Molality 10°m ₁ /mol kg ⁻¹ 3.1 4.2 5.6 7.4 9.7
T/K 273.15 278.15 283.15 288.15 293.15 293.15 298.15	M Concentration 10°c1/mol dm ⁻² 2.7 3.6 4.8 6.4 8.4 10.8 12.0	ercury Solubility Mole Fraction 10 ⁷ x ₁ 3.7 5.0 6.7 8.9 11.7 15.2 10.6	Molality 10°m ₁ /mol kg ⁻¹ 3.1 4.2 5.6 7.4 9.7 12.7
T/K 273.15 278.15 283.15 288.15 293.15 298.15 303.15 308.15	M Concentration 10°c1/mol dm ⁻³ 2.7 3.6 4.8 6.4 8.4 10.8 13.9 17.7	ercury Solubility Mole Fraction 10 ⁷ x ₁ 3.7 5.0 6.7 8.9 11.7 15.2 19.6 25.1	Molality 10°m ₁ /mol kg ⁻¹ 3.1 4.2 5.6 7.4 9.7 12.7 16.3 20.8
T/K 273.15 278.15 283.15 288.15 293.15 298.15 303.15 308.15 ΔH ₁ ^a	M Concentration 10°c1/mol dm ⁻² 2.7 3.6 4.8 6.4 8.4 10.8 13.9 17.7 37.6 ± 0.5	ercury Solubility Mole Fraction 10 ⁷ x ₁ 3.7 5.0 6.7 8.9 11.7 15.2 19.6 25.1 38.3 ± 0.5	Molality 10°m ₁ /mol kg ⁻¹ 3.1 4.2 5.6 7.4 9.7 12.7 16.3 20.8 38.1 ± 0.5

	wercury	In Hydrocarbons		153
COMPONENTS: (1) Mercury; Hg; (2) Aromatic Hyd	[7439-97-6] rocarbons	EVALUATOR: H. Lawrenc Chemistry I Emory Univ Atlanta, G <u>1985</u> , July	e Clever Department ersity eorgia 30322	USA
CRITICAL EVALUATION: Table 8. The so	lubility of mercu	ry in (2-methylp	ropyl)benzene.	Tentative
values functi	s of the concentr on of temperature	ation, mole fra	ction and mola	lity as a
	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction	Molality 10 [°] m ₁ /mol kg ⁻¹	-
273.15 278.15 283.15 288.15 293.15 298.15 303.15 308.15 313.15	2.2 3.0 4.0 5.3 7.0 9.2 11.9 15.3 19.6	3.3 4.5 6.1 8.2 10.9 14.3 18.7 24.1 30.8	2.5 3.4 4.6 6.1 8.1 10.7 13.9 17.9 22.9	-
ΔH_1^a ΔS_1^b a units h b units b	39.0 ± 1.0 34.4 ± 3.2 34.4 ± 3.2 34.4 ± 3.2	39.6 <u>+</u> 0.9 21.0 <u>+</u> 3.1	39.5 <u>+</u> 0.9 37.5 <u>+</u> 2.9	
REFERENCES:				

- 1. Moser, H. C.; Voigt, A. F. USAEC Report <u>1957</u>, ISC-892, 65 pp.; Chem. Abstr. <u>1958</u>, 52, 10691h.
- Klehr, E. H.; Voigt, A. F. Radioisot. Phys. Sci. Ind., Proc. Conf., Copenhagen, <u>1960</u>, 1, 517 29 (pub. <u>1962</u>); Chem. Abstr. <u>1962</u>, 57, 6681b.
- Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u>, 72, 464 70; Spencer, J. N. <u>Dissertation</u> <u>1967</u>, Iowa State University.

COMPONENTS :	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] Mercury-203: 203Hg; [13982-78-0]	Moser, H. C.; Voigt, A. F.
(2) Benzene; C_6H_6 ; [71-43-2]	USAEC Report <u>1957</u> , ISC-892. Chem. Abstr. <u>1958</u> , 52, 10691h.
VARIABLES:	PREPARED BY:
T/K = 298.15	H. L. Clever M. Iwamoto
EXPERIMENTAL VALUES:	1
Temperature Merc	cury Solubility
t/°C T/K ^a Concentration 10 [°] c ₁ /mol dm ⁻³	Mole Fraction ^a Molality ^a 10 ⁷ x ₁ 10 ⁸ m ₁ /mol kg ⁻¹
25 298.15 12.0 <u>+</u> 0.6	_ 10.7 13.7
^a Calculated by compilers.	
	THEODHATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
A globule of Hg metal prepared from radioactive mercury(II) nitrate by reduction with hypophosphorous acid was equilibrated with 5 - 10 ml of liquid by shaking in a thermostat. Aliquotes of the liquid were with- drawn periodically for up to two weeks and the Hg concentration determined radiochemically.	(1) Mercury and Mercury-203. Oak Ridge National Lab; recieved as 0.31 M Hg(NO ₃) ₂ in 1.56 HNO ₃ solution. Initial activity 50 millicuries g ⁻¹ ; half-life 48 days. Reduced to Hg by hypo- phosphorous acid; coagulated to a Hg droplet by addition of concentrated HI.
The aliquot was diluted with ace- tone and equilibrated with Hg(NO ₃) ₂ carrier to exchange the radioactive mercury. The mercury was precipi-	 (2) Benzene. Baker and Adamson; reagent grade, thiophene-free. Used without further purifica- tion.
steel planchet and counted with a Geiger-Mueller tube.	ESTIMATED ERROR:
	$\delta T/K = \pm 0.1$

COMPONENTS :	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³ Hg; [13982-78-0]	Klehr, E. H.; Voigt, A. F.
(2) Benzene; C ₆ H ₆ ; [71-43-2]	Radioisotopes Phys. Sci. Ind., Proc. Conf. Use, Copenhagen <u>1960</u> , 1, 517 - 29 (Pub. <u>1962</u>).
VARIABLES:	PREPARED BY:
T/K = 298.15	M. Iwamoto H. L. Clever
EXPERIMENTAL VALUES:	
Temperature Mercur	y Solubility
t/°C T/K ^a Concentration Mo 10°c ₁ /mol dm ⁻³ 10	le Fraction ^a Molality ^a x_1 10 [*] m_1 /mol kg ⁻¹
25 298.15 11.4 <u>+</u> 0.3	10.2 13.0
^a Calculated by compilers.	
The value above is from the direct indirect measurement result is 1 K obtained by multiplying the merc x 10 ⁻⁷ mol dm ⁻³ , times the distrib	measurement technique. The 1.1 x 10 ^{-®} mol dm ⁻³ at 298.15 cury solubility in water, 3.0 pution coefficient.
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Direct Method. A globule of mer- cury containing 203-Hg was placed in 50 ml of solvent in a 100 ml flask and agitated in a thermostated bath	 Mercury and Mercury-203. Reduced from a mercury nitrate sample. Half-life is 47 days.
Samples were taken until the solu- tion appeared to be at equilibrium. Analyses were made by GM-counting by one of two techniques: (i) Solid precipitate counting. The Hg in a 0.5 ml aliquot was ex- changed and reprecipitated on a stainless steel panchet as the sul-	(2) Benzene. Repurified by stirring with repeated portions of con- centrated sulfuric acid and then redistilling.
fide was dried and counted. Details	ESTIMATED ERROR:
in Moser and Voigt (ref. 1). (ii) Liquid aliquot scintillation- counting. A 0.5 ml aliquot of the saturated solution was diluted and	See random error reported by authors with concentration values above.
transferred to the counting tube with a known volume of benzene. The 0.28 MeV gamma radiation was counted. Errorduetoradiation ad- sorbed by the benzene and water was shown to be less than one percent. Indirect Method. The distribution coefficient between solvent and wa- ter was measured.	REFERENCES: 1. Moser, H. C.; Voigt, A. F. USAEC Report <u>1957</u> , ISC-892, 65 pp.

COMPONENTS:	ORIGINAL MEASUREMENTS:	
(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³ Hg; [13982-78-0]	Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 464 - 470.	
(2) Benzene; C ₆ H ₆ ; [71-43-2]	Spencer, J. N. <u>Dissertation</u> , Iowa State University, <u>1967</u> .	
VARIABLES:	PREPARED BY:	
	S. H. Johnson	
T/K = 288.15 - 308.15	M. Iwamoto H. L. Clever	
EXPERIMENTAL VALUES:		
Temperature Mercur	ry Solubility	
t/°C T/K^a Concentration Mo 10°c ₁ /mol dm ⁻³ 10	ble Fraction ^a Molality ^a $10^{s} m_{1} / mol kg^{-1}$	
15 288.15 6.6 \pm 0.1	5.8 7.5	
20 293.15 8.9 + 0.1	7.9 10.1	
	0.07 13.0	
	9.27 11.9	
$25 298.15 11.9 \pm 0.6$	10.6 13.6	
30 303.15 15.2 ± 0.2	13.7 17.5	
35 308.15 · 21.1 ± 1.3	19.1 24.4	
$\log x_1 = (17.407 \pm .360)$ for the 288.15 to 308.15 temperate)log(T/K) - 49.047 ure interval.	
AUXILIARY	INFORMATION	
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:	
A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to me- tallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried. The mercury and solvent were sha-	 Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. Benzene. Phillips Petroleum Co. 	
ken continuously in 25 ml glass stoppered flasks in a thermostat for 24 hours. Aliquots of the equili- brated solution were counted by a conventional single channel scinti-	Research Grade, used as re- ceived.	
lation counter. The window width was set to count only the photopeak at 279 kev. The solubility values were the average of at least six determinations over a three day	ESTIMATED ERROR: $\delta T/K = \pm 0.1$; See random error re- ported by authors with concentration values above.	
period. The solubility of mercury in ben- zene was followed for several days. It was found that the mercury con- centration was constant after about 24 hours of shaking and remained constant over a period of several days. Radiation damage sufficient to affect the solubilities would have caused a noticeable increase with time.	REFERENCES :	

[
COMPONE	INTS:			URIGINAL MEASUREMEN	NTS:
	Mercury Mercury	; Hg; [74 -203; ²⁰³	139-97-6] Hg; [13982-78-0]	Moser, H. C.;	Voigt, A. F.
(2) Methylbenzene or Toluene; C ₇ H ₈ ; [108-88-3]		Chem. Abstr.	<u>1957</u> , ISC-892. <u>1958</u> , <i>52</i> , 10691h.		
VARIABI	LES:			PREPARED BY:	
Т	/K = 29	8.15		H. L. Clever M. Iwamoto	
EXPERIN	ENTAL VA	LUES:		L	
	 Тетре	 rature	Merc	ury Solubility	هن اعل ها ها به بال مل ها ها مع بي بي وا الله ما هو بي وا
	t/°C	<i>т</i> /к ^а	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a 10' <i>x</i> 1	Molality ^a 10° <i>m₁</i> /mol kg ⁻¹
	25	298.15	12.5 <u>+</u> 0.5	13.4	14.5
	^a Calc	ulated by	compilers.	و هوا هي الله الله الله الله الله من جو الله الله الله الله الله الله الله الل	
1					
	-			······································	
			AUXILIARY	INFORMATION	
METHOD	APPARATU	IS/PROCEDUR	E:	SOURCE AND PURITY (OF MATERIALS:
A glo radio reduc was o liqu Aliqu draw week deter	obule o cactive tion w equilib id by s uotes c n peri s and cmined	f Hg meta e mercury ith hypoporated wi bhaking i of the li odically the Hg radiochem	al prepared from y(II) nitrate by phosphorous acid ith 5 - 10 ml of n a thermostat. quid were with- for up to two concentration hically.	<pre>(1) Mercury an Ridge Nati 0.31 M Hg solution. millicurie days. Red phosphorous a Hg drop concentrate</pre>	and Mercury-203. Oak onal Lab; recieved as $(NO_3)_2$ in 1.56 HNO_3 Initial activity 50 es g ⁻¹ ; half-life 48 luced to Hg by hypo- s acid; coagulated to let by addition of ed HI.
The a tone carri mercu tated steel	aliquot and eq er to ury. T as Hgs pland	was di uilibrate exchange he mercu s, mounte thet and	luted with ace- ed with Hg(NO ₃) ₂ the radioactive ry was precipi- d on a stainless counted with a	(2) Toluene. I from tolu Shaken with through d redistilled	Eastman Co.; prepared tene sulfonic acid. h aqueous NaOH, passed try silica gel and l.
Geige	-r-muel	ter tube.		STRUCTUP DARVAT	
				δ <i>T</i> /K =	= <u>+</u> 0.1
L.					

COMPO	NENTS:	ORIGINAL MEASUREMENTS:
(1) (2)	Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³ Hg; [13982-78-0] Methylbenzene or Toluene; C ₇ H ₈ ; [108-88-3]	Klehr, E. H.; Voigt, A. F. <i>Radioisotopes Phys. Sci. Ind.,</i> <i>Proc. Conf. Use, Copenhagen</i> <u>1960</u> , 1, 517 - 29 (Pub. <u>1962</u>).
VARIA	BLES:	PREPARED BY:
	T/K = 273.15 - 318.15	M. Iwamoto H. L. Clever
EXPER	IMENTAL VALUES:	
	Temperature Mer	cury Solubility

Temperature		Meloury Boundrincy			
t∕°C	<i>T/</i> K ^a	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a 10'x ₁	Molality ^a 10 [°] m ₁ /mol kg ⁻¹	
0	273.15	3.4 <u>+</u> 0.1	3.5	3.8	
10	283.15	5.1 <u>+</u> 0.1	5.4	5.8	
15	288.15	6.6 <u>+</u> 0.1	7.0	7.6	
20	293.15	8.5 <u>+</u> 0.1	9.0	9.8	
25	298.15	13.4 <u>+</u> 0.1	14.3	15.5	
30	303.15	14.4 <u>+</u> 0.1	15.5	16.8	
35	308.15	16.5 ± 0.1	17.8	19.3	
45	318.15	26.9 <u>+</u> 0.2	29.4	31.9	

^aCalculated by compilers.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Direct Method. A globule of mercury containing 203-Hg was placed in 50 ml of solvent in a 100 ml flask and agitated in a thermostated bath. Samples were taken until the solution appeared to be at equilibrium. Analyses were made by GM-counting by one of two techniques:

(i) Solid precipitate counting. The Hg in a 0.5 ml aliquot was exchanged and reprecipitated on a stainless steel panchet as the sulfide was dried and counted. Details in Moser and Voigt (ref. 1).

(ii) Liquid aliquot scintillationcounting. A 0.5 ml aliquot of the saturated solution was diluted and transferred to the counting tube with a known volume of benzene.

The 0.28 MeV gamma radiation was counted. Errorduetoradiation adsorbed by the benzene and water was shown to be less than one percent.

SOURCE AND PURITY OF MATERIALS:

- (1) Mercury and Mercury-203. Reduced from a mercury nitrate sample. Half-life is 47 days.
- (2) Toluene. Research grade, used without further purification.

ESTIMATED ERROR:

See random error reported by authors with concentration values above.

REFERENCES:

1. Moser, H. C.; Voigt, A. F. USAEC Report <u>1957</u>, ISC-892, 65 pp.

(1) Mercury; Hq; [7439-97-6];	ORIGINAL MEASUREMENTS: Spencer, J. N.: Voigt, A. F.		
Mercury-203; ***Hg; [13982-78-0]	J. Phys. Chem. <u>1968</u> , 72, 464 - 470.		
<pre>(2) Methylbenzene or Toluene; C₇H₈; [108-88-3]</pre>	Spencer, J. N. <u>Dissertation</u> , Iowa State University, <u>1967</u> .		
VARIABLES:	PREPARED BY:		
<i>T</i> /K = 273.15 - 308.15	S. H. Johnson M. Iwamoto H. L. Clever		
EXPERIMENTAL VALUES:	· · · · · · · · · · · · · · · · · · ·		
Temperature Mer	cury Solubility		
t/°C T/K ^a Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a Molality ^a 10 [°] x ₁ 10 [°] m ₁ /mol kg ⁻¹		
0 273.15 3.1 <u>+</u> 0.3	3.2 3.5		
15 288.15 6.5 <u>+</u> 0.1	6.9 7.5		
20 293.15 9.7 <u>+</u> 0.6	10.3 11.2		
25 298.15 12.0 <u>+</u> 0.1	12.8 13.9		
30 303.15 16.1 <u>+</u> 0.3	17.3 18.8		
35 308.15 19.8 <u>+</u> 0.9	21.4 23.2		
^a Calculated by compilers. The authors smoothed their data $\log x_1 = (16.034 \pm 100)$ for the 273.15 to 308.15 temper	according to the equation: .538)log(T/K) - 45.567 ature interval.		
AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:		
A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to metallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried.	 Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. 		
The mercury and solvent were shaken continuously in 25 ml glass stop- pered flasks in a thermostat for 24 hours. Aliquots of the equili-	(2) Toluene. Phillips Petroleum Co. Research Grade, used as re- ceived.		
brated solution were counted by a conventional single channel scinti- lation counter. The window width was set to count only the photopeak at 279 kev. The solubility values	ESTIMATED ERROR: $\delta T/K = \pm 0.1$; See random error re- ported by authors with concentration values above.		
were the average of at least six determinations over a three day period.	REFERENCES :		

COMPONENTS :	ORIGINAL MEASUREMENTS:			
<pre>(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³Hg; [13982-78-0]</pre>	Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 464 - 470.			
<pre>(2) 1,2-Dimethylbenzene or o-Xylene; C₈H₁₀; [95-47-6]</pre>	Spencer, J. N. <u>Dissertation</u> , Iowa State University, <u>1967</u> .			
VARIABLES:	PREPARED BY:			
T/K = 273.15 - 308.15	S. H. Johnson M. Iwamoto H. L. Clever			
EXPERIMENTAL VALUES:				
Temperature Me	ccury Solubility			
t/°C T/K ^a Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a Molality ^a 10 [°] x ₁ 10 [°] m ₁ /mol kg ⁻¹			
0 273.15 2.6 <u>+</u> 0.3	3.1 2.9			
20 293.15 9.3 <u>+</u> 0.1	11.2 10.6			
25 298.15 12.0 <u>+</u> 0.3	14.5 13.7			
30 303.15 15.5 <u>+</u> 0.5	18.9 17.8			
35 308.15 21.4 <u>+</u> 1.7	26.2 24.7			
^a Calculated by compilers.				
The authors smoothed their data according to the equation: log $x_1 = (17.635 \pm .316)\log(T/K) - 49.473$ for the 273.15 to 308.15 temperature interval.				
AUXILIAR	INFORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to metallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried.	 (1) Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. (2) 1,2-Dimethylbenzene. Phillips 			
The mercury and solvent were shaken continuously in 25 ml glass stop- pered flasks in a thermostat for 24 hours. Aliguots of the equili-	Petroleum Co. Research Grade, used as received.			
brated solution were counted by a conventional single channel scinti- lation counter. The window width was set to count only the photopeak at 279 kev. The solubility values	ESTIMATED ERROR: $\delta T/K = \pm 0.1$; See random error re- ported by authors with concentration values above.			
were the average of at least six determinations over a three day period.	REFERENCES:			

Mercury in Hydrocarbons

COMPONENTS:		ORIGINAL MEASUREMEN	TS:
(1) Mercury; Hg; [7439-9 Mercury-203; ²⁰³ Hg;	7-6]; [13982-78-0]	Spencer, J. N. J. Phys. Chem.	; Voigt, A. F. <u>1968</u> , 72, 464 - 470.
<pre>(2) (1-methylethyl)Benzer Isopropylbenzene; Cgl [98-82-8]</pre>	ne or ¹ 12;	Spencer, J. N. <u>Dissertation</u> , <u>1967</u> .	Iowa State University,
VARIABLES:		PREPARED BY:	
T/K = 273.15 - 308.15		S. H. Johnson M. Iwamoto H. L. Clever	
EXPERIMENTAL VALUES:			
Temperature	Mer	cury Solubility	الله الله الي الله الله الله الله الله ا
t/°C T/K ^a Cond 10°c	centration 21/mol dm ⁻³	Mole Fraction ^a 10 ⁷ *1	Molality ^a 10°m ₁ /mol kg ⁻¹
0 273.15 2	.7 <u>+</u> 0.1	3.7	3.1
20 293.15 8.	.5 <u>+</u> 0.2	11.9	9.9
25 298.15 10.	.6 <u>+</u> 0.3	14.9	12.4
30 303.15 13.	.7 <u>+</u> 0.3	19.3	16.1
35 308.15 18.	0 <u>+</u> 1.3	25.5	21.2
	ین جو بند ما جو می می دو می بند بو بی بی برد م	ر عن جار ہے جار دار کا ہوا دار کا ہوا ہی جار ہی کہ اور برا اور اور اور اور اور اور اور اور اور ا	الله الله الله والله الله الله الله الله
^a Calculated by comp	pilers.		
The authors smooth log x_1 for the 273.15 to 3	ed their data = (15.957 <u>+</u> 108.15 temper	according to the .235)log(T/K) - 4 ature interval.	e equation: 45.307
	AUXILIARY	INFORMATION	
METHOD/APPARATUS/PROCEDURE:	·	SOURCE AND PURITY C	DF MATERIALS;
A radioactive tracer ; used. A high activity mercury-203 nitrate wa mercury(II) nitrate, metallic mercury by hypo acid, coagulated into a c	method was sample of s added to reduced to phosphorous lrop, washed	(1) Mercury an isotope dec beta partic 210 kev, ac ray of 279 half-life i	d Mercury-203. The eays by emission of a cle at an energy of companied by a gamma kev. The isotope s 47 days.
The mercury and solvent continuously in 25 ml of pered flasks in a thermo hours. Aliquots of t	were shaken glass stop- stat for 24	(2) Isopropylbenzene. Phillips Pe- troleum Co. Research Grade, used as received.	
brated solution were counted by a conventional single channel scinti- lation counter. The window width was set to count only the photopeak at 279 kev. The solubility values		ESTIMATED ERROR: $\delta T/K = \pm 0.1$; See random error re- ported by authors with concentration values above.	
were the average of at determinations over a period.	least six three day	REFERENCES :	

Mercury in Hydrocarbons

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				<u>`</u>
COMPONENTS :			ORIGINAL MEASUREMENTS	S:
(1) Mercury; Mercury-2	(1) Mercury; Hg; [7439-97-6]; Mercury-203; ***Hg; [13982-78-0]			; Voigt, A. F. <u>1968</u> , 72, 464 - 470.
<pre>(2) (2-methylpropyl)Benzene or t-Butylbenzene; C₁₀H₁₄; [538-93-2]</pre>			Spencer, J. N. <u>Dissertation</u> , <u>1967</u> .	Iowa State University,
VARIABLES:	. <u></u> .		PREPARED BY:	
T/K = 273	.15 - 31	3.15	S. H. Johnson M. Iwamoto	
EXPERIMENTAL VALU	ES:		n. h. ciever	
Tempera	ature	Ме	rcury Solubility	
t/°C	<i>т</i> /к ^а	Concentration 10°c ₁ /mol dm ⁻	Mole Fraction ^a 10'x ₁	Molality ^a 10°m ₁ /mol kg ⁻¹
0 2	273.15	2.1 <u>+</u> 0.1	3.2	2.4
15 2	288.15	5.5 <u>+</u> 0.2	8.5	6.3
25 2	298.15	9.6 <u>+</u> 0.3	14.9	11.1
30 3	303.15	12.3 <u>+</u> 0.9	19.2	14.3
35 3	308.15	15.1 <u>+</u> 0.5	23.7	17.7
40 3	313.15	18.6 <u>+</u> 1.0	29.4	21.9
The aut	thors sm lo e 273.15	boothed their dat $g x_1 = (16.689 \pm 100)$ to 313.15 tempe	a according to th .388)log(T/K) - rature interval.	e equation: 47.140
		AUXILIARY	INFORMATION	
METHOD /APPARATUS /	PROCEDURE		SOURCE AND PURITY OF	F MATERIALS;
A radioacti used. A hi mercury-203 mercury(II) metallic mer acid, coagula and dried. The mercury continuously pered flasks hours. Ali brated solut conventional lation count was set to c at 279 kev. were the av determination period.	ve tra gh acti nitra cury by ated int and sol y in 25 s in a th quots tion we single ter. Th ount on The so erage c	cer method was vity sample of e was added to te, reduced to hypophosphorous o a drop, washed vent were shaken ml glass stop- nermostat for 24 of the equili- re counted by a channel scinti- ne window width ly the photopeak lubility values of at least six er a three day	 (1) Mercury ar isotope dec beta parti 210 kev, ac ray of 275 half-life i (2) t-Butylbenz leum Co. 1 as received ESTIMATED ERROR: &T/K = ±0.1; S ported by autho values above. REFERENCES: 	nd Mercury-203. The cays by emission of a cle at an energy of companied by a gamma) kev. The isotope s 47 days. ene. Phillips Petro- Research Grade, used i.

¹⁶²

COMPONENTS:	EVALUATOR:
(1) Mercury; Hg; [7439-97-6] (2) Alcohols	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA
	<u>1985</u> , August

An Evaluation of the Solubility of Mercury in Alcohols.

There are measurements of the solubility of mercury in only two alcohols. They are methanol and 2-propanol. The systems are discussed below.

Mercury + Methanol

Reichardt and Bonhoeffer (ref. 1) measured the solubility at 313.15 and 336.15 K, Kuntz and Mains (ref. 2) at 298.15 K, and Spencer and Voigt (ref. 3) at five temperatures between 288.15 and 308.15 K. Three quite different methods were used: an amalgamation method, a spectroscopic method and a radioactive tracer method.

Figure 1 show the mole fraction solubilities on a $\ln x_1$ vs. 1000/(T/K) plot. The Kuntz and Mains (ref. 2) value was obtained assuming the mercury extinction coefficient is the same in a hydrocarbon and methanol. As the authors mention, this is a poor assumption and may be the reason for the apparent low value. The extinction coefficient was obtained by the spectroscopic measurement of a mercury saturated hexane solution assuming the solubility value of mercury in hexane of Moser and Voigt (ref. 4) was correct. The Reichardt and Bonhoeffer values were obtained by a method that has not been thoroughly tested as some other methods. The dotted line of Figure 1 is the linear regression line for all of the data. The solid line is for the Spencer and Voigt (ref. 3) data only. We have arbitrarily chosen to use the Spencer and Voigt data only as the basis for the tentative values.



and Tabi the liqu	The S molali le l. therm id met	Spencer a ty were Table 2 o odynamic tal to th	nd Voigt data in treated by linea contains the smu changes for the e hypothetical u	h units of concent r regression to ob oothed tentative s e transfer of one nit concentration	ration, mole fract otain the constants solubility values mole of mercury f solution.	tion of and rom
Tabl	le l.	Mercury - = A(1) +	+ Methanol. Lin A(2)/(T/100 K).	ear regression for	the equation ln(s	oly)
2	Solubil	ity A	(1) <u>+</u> Error	A(2) <u>+</u> Error	Std. Error about the Regression Line	
- 2 7	21/mol 1 11/mol	dm ⁻³ 2. -0. kg ⁻¹ 3.	.3763 <u>+</u> 0.7650 .7753 <u>+</u> 0.8625 .0153 <u>+</u> 0.6046	$\begin{array}{r} -45.1788 \pm 2.2789 \\ -45.3539 \pm 2.5693 \\ -46.3685 \pm 1.8012 \end{array}$	1.2 x 10 ⁻⁷ 5.7 x 10 ⁻⁰ 1.3 x 10 ⁻⁷	
Tabl	Le 2. Tempe	The solud solubili function erature	oility of mercur ty in concentra of temperature	y in methanol. Te tion, mole fracti at 0.1 MPa and the Mercury Solubility	entative values of ion and molality a rmodynamic changes Y	the as a •
	t∕°C	T/K	Concentration 10°c ₁ /mol dm ⁻	Mole Fraction 3 10°x ₁	Molality 10 [¢] m ₁ /mol kg ⁻¹	
	15 20 25 30 35 40 50 60	288.15 293.15 298.15 303.15 308.15 313.15 323.15 333.15	1.7 2.2 2.8 3.6 4.6 5.8 9.1 13.9	6.7 8.8 11.4 14.7 18.7 23.6 37.0 56.4	2.1 2.8 3.6 4.6 6.0 7.6 12.0 18.4	
	$\frac{\Delta H_1^{a}}{\Delta S_1^{b}}$		37.6 ± 1.9 19.8 ± 6.4	37.7 ± 2.1 -6.4 ± 7.2	38.6 ± 1.5 25.1 ± 5.0	

a units kJ mol⁻¹ b units J K⁻¹ mol⁻¹

Mercury + 2-Propanol

Only Spencer and Voigt (ref. 3) report the solubility of mercury in 2-propanol. Their data, classed as tentative, were treated by linear regression in the units of concentration, mole fraction and molality. The regression constants are in Table 3 and the smoothed data and thermodynamic changes are in Table 4.

The enthalpy changes are the same within experimental error for the solution of mercury in methanol and 2-propanol. The mole fraction solubility of mercury in methanol is only about one-tenth of the solubility in an alkane, but it is 22 times more soluble than in water.

Table 3. Mercury + 2-Propanol. Linear regression for the equation $\ln(\text{soly}) = A(1) + A(2)/(T/100 \text{ K}).$

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Solubility	A(1) <u>+</u> Error	A(2) <u>+</u> Error	Std. Error about the Regression Line
$c_1/mol dm^{-3}$ $x_1/mol kg^{-1}$	1.8159 ± 0.1402 -0.4575 ± 0.1901 2.5947 ± 0.2825	-43.6772 ± 0.4175 -44.5711 ± 0.5665 -45.2572 ± 0.8417	1.7 x 10 ^{-*} 1.6 x 10 ^{-*} 4.0 x 10 ^{-*}

COMPONENTS:	EVALUATOR:
(1) Mercury; Hg; [7439-97-6] (2) Alcohols	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA <u>1985</u> , August
CRITICAL EVALUATION:	

Table 4. The solubility of mercury in 2-propanol. Tentative values of the solubility in concentration, mole fraction and molality as a function of temperature at 0.1 MPa and thermodynamic changes.

Temperature		Mercury Solubility			
t∕°C	T/K	Concentration 10 [°] c ₁ /mol dm ⁻³	Mole Fraction 10* <i>*1</i>	Molality 10 ^{°m} 1/mol kg ⁻¹	
15	288.15	1.6	12.1	2.0	
20	293.15	2.1	15.8	2.6	
25	298.15	2.67	20.4	3.4	
30	303.15	3.4	26.1	4.4	
35	308.15	4.3	33.1	5.6	
Δ <i>H</i> 1 ^a		36.3 <u>+</u> 0.3	37.1 <u>+</u> 0.5	37.6 <u>+</u> 0.7	
ΔS, ^b		15.1 <u>+</u> 1.2	-3.8 <u>+</u> 1.6	21.6 <u>+</u> 2.3	

a units kJ mol⁻¹ b units J K⁻¹ mol⁻¹

REFERENCES:

- 1. Reichardt, H.; Bonhoeffer, K. F. Z. Phys. 1931, 67, 780 9.
- 2. Kuntz, R. R.; Mains, G. J. J. Phys. Chem. 1964, 68, 408 10.
- 3. Spencer, J. N.; Voigt, A. F. J. Phys. Chem. 1968, 72, 1913 7.
- 4. Moser, H. C.; Voigt, A. F. USAEC Report 1957, ISC-892, 65 pp.

ADDENDUM:

A recent paper reports the partition coefficient of mercury between water and octanol-1. The evaluator estimates a solubility of mercury in water saturated octanol-1 (4.6 wt % water) of 1.18×10^{-5} mol dm⁻³ at 298.15 K. In dry octanol-1 the solubility may be 4×10^{-5} mol dm⁻³. See the data sheets and original paper for more details.

5. Okouchi, S.; Sasaki, S. Bull. Chem. Soc. Jpn. <u>1985</u>, 58, 3401 - 2.

C. H. Kim and G. K. Vemulapalli (University of Arizona, Tucson) have new measurements in progress on the solubility of mercury in methanol, ethanol, hexane, and 3-methylpentane by atomic absorption. They are also measuring the absolute extinction coefficient of mercury in the solvents.

6. Vemulapalli, G. K. private communication.

COMPONENTS:			ORIGINAL	MEASUREMENTS:	
(1) Mercury; Hg; [7439-97-6]			Reichardt, H.; Bonhoeffer, K. F.		
(2) Methanol or Methyl alcohol; CH _d O; [67-56-1]			Z.Ph	ys. <u>1931</u> , 67,	780 - 9.
VARIABLES:			PREPARED	BY:	
			H. L.	Clever	
T/K = 313.1	5 - 336.15		M. IW	amoto	
EXPERIMENTAL VALUES	3:				
Temperature		Me	ercury S	olubility	
t/°C T/K ^a	$c_1/\text{mg dm}^{-3}$ 10 ⁵	$centr c_1/mo$	ation ^a 1 dm ⁻³	Mole Fraction	^a Molality ^a 10 ^{\$m} 1/mol kg ⁻¹
40 313.15	0.6	0.3	3	1.2	0.4
63 336.15	3.6	1.8	3	7.7	2.4
acalculated by	compilers.				
carculated by	compilers.				
	AUXI	LIARY	INFORMAT	ION	
METHOD/APPARATUS/P	ROCEDURE :		SOURCE A	AND PURITY OF MAT	ERIALS:
Some of these	results are menti	oned	(1) Me	rcury. No inf	formation given.
in two earlie	r papers (ref. 1	and			
2), but the pr the solubili detail.	esent paper discu ty work in the r	sses most	(2) Me	thanol. No ir	formation given.
The solution i	s analyzed by weig	hing			
a gold foil be mation with th rated solution	fore and after ama e mercury of the s . Ultraviolet abs	lga- satu- sorp-			
tion at 257.15	nm is also used.				
			ESTIMAT	ED ERROR:	
			δ <i>c</i> 1/m	$dm^{-3} = \pm (0.1)$	- 0.2)
			REFEREN	CES :	
			1. Bor	hoeffer, K. F.	.; Reichardt, H. en 1929, <i>1</i> 7, 933.
			2. Rei	chardt, H.; Bo	onhoeffer, K. F.
				J FOUFLUGASM.	<u></u> ,,

COMPONENTS:		ORIGINAL MEASUREMEN	TS:	
(1) Mercury; Hg; [743	9-97-6]	Kuntz, R. R.; Mains, G. J.		
(2) Methanol or Methy CH ₄ O; [67-56-1]	l alcohol;	J. Phys. Chem.	<u>1964</u> , <i>68</i> , 408 - 10.	
VARTABLES :		PREPARED BY:		
		S. H. Johnson		
T/K = 298.15		M. Iwamoto H. L. Clever		
EXPERIMENTAL VALUES:				
Temperature	Merc	ury Solubility		
t/°C T/K ^a	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a 10°x ₁	Molality ^a 10°m ₁ /mol kg ⁻¹	
25 298.15	1.52	6.19	1.93	
^a Calculated by	compilers.			
	AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE	:	SOURCE AND PURITY O	F MATERIALS:	
Spectrophotometric m	nethod. It was	(1) Mercury. No	o information given.	
assumed that the option of the second s	ical density at measure of the	(2) Methanol.	Phillips Petroleum	
solubility. It was f	further assumed	Co. Pure G	rade hydrocarbon sol-	
that the extinction	coefficient of	vent, pur	ified by passage ica gel until opti-	
carbon solvents. Th	e optical den-	cally pure.	Degassed and dis-	
sity of a saturated	solution of Hg	tilled.		
combined with the so	plubility mea-			
sured by Moser and V	Voigt (ref. 1),			
$s_{2500} = 7.35 \times 10^3 \text{ dm}^3 \text{ mol}^{-1} \text{ cm}^{-1} \text{ at}$		ESTIMATED ERROR:		
25°C. The value was late the solubility solvents.	used to calcu- in the other			
The Hg and solvent we	re equilibrated	REFERENCES :		
for 20 minutes and th sity was measured by Spectrophotometer.	ne optical den- y a Beckman DU	1. Moser, H. C.; USAEC Report 65 pp	; Voigt, A. F. <u>1957</u> , <i>ISC-892</i> ,	
The reliability of t pends on the Moser a bility value in hexan	he results de- nd Voigt solu- e.	00 FF.		

COMPONE	NTS:			ORIGINAL MEASUREMENTS:		
<pre>(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³Hg; [13982-78-0]</pre>			39-97-6]; Hg; [13982-78-0]	Spencer, J. N. J. Phys. Chem.	; Voigt, A. F. <u>1968</u> , 72, 1913 - 7.	
<pre>(2) Methanol or Methyl alcohol; CH₄O; [67-56-1]</pre>			nyl alcohol;	Voigt, A. F. Personal communication		
		<u> </u>	<u>. </u>	<u> </u>		
VARIABL	.ES :			PREPARED BY:		
 	/ = 28	8 15 - 30	18 15	S. H. Johnson M. Twamoto		
1 1	K 20	0.15 50		H. L. Clever		
EXPERIM	ENTAL VA	LUES:				
	Tempe	rature	Ме	rcury Solubility		
	t/°C	т/к ^а	Concentration 10 [°] c ₁ /mol dm ⁻³	Mole Fraction ^a 10'x ₁	Molality ^a 10 [°] m ₁ /mol kg ⁻¹	
	15	288.15	1.7 <u>+</u> 0.1	6.8	2.1	
	20	293.15	2.1 <u>+</u> 0.1	8.5	2.7	
	25	298.15	2.94 + 0.09	12.0	3.74	

^aCalculated by compilers.

3.5 <u>+</u> 0.1

4.7 <u>+</u> 0.3

ا جو چو پرو هو جو پو هو جو پو چو خا ها ها ها ها ها ها ها ها هو پو پو جو جو جو جو چو چو چو چو چو چو

303.15

308.15

30

35

Professor Voigt provided the experimental molar solubility values from J. N. Spencer's research notebook that do not appear in the published paper.

14

19

4.5

6.0

The authors smoothed their data according to the equation: $\log x_1 = (15.76 \pm .66)\log(T/K) - 45.93$ for the 288.15 to 308.15 temperature interval.

AUXILIARY	INFORMATION			
METHOD/APPARATUS/PROCEDURE: The method and procedure are re- ported in an earlier paper (ref. 1). A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to metallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried. The mercury and solvent were sha- ken continuously in 25 ml glass stoppered volumetric flasks in a thermostat for 24 hours. Aliquots of the equilibrated solution were counted by a conventional single channel scintilation counter. The window width was set to count only the photopeak at 279 kev. The solu- bility values were the average of at least six determinations over a three day period. Studies were made to show the solubility of mercury in methanol was not changed by the presence of up to 5 % water. There was no evidence of mercury oxidation during the course of the experiment.	 SOURCE AND PURITY OF MATERIALS: (1) Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. (2) Methanol. Fisher Scientific Co. Stated to be 99.9 mol %. Fractionally distilled prior to use. ESTIMATED ERROR: & T/K = ±0.1; See random error reported by authors with concentration values above. REFERENCES: Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u>, 72, 464. 			
		-		
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COMPONENTS:			ORIGINAL MEASUREMEN	TS:
<pre>(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³Hg; [13982-78-0]</pre>			Spencer, J. N. J. Phys. Chem.	; Voigt, A. F. <u>1968</u> , 72, 1913 - 7.
(2) 2-Propanol or <i>Iso</i> propyl alcohol; C ₃ H ₈ O; [67-63-0]			Voigt, A. F. Personal commu	nication
VARIABLES:			PREPARED BY:	
T/K = 288.15 - 308.15		S. H. Johnson M. Iwamoto H. L. Clever		
EXPERIMENTAL V	ALUES:			
Tempe	rature	Mer	cury Solubility	
<i>t</i> /°C	<i>т</i> /к ^а	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a 10 ⁷ ¤1	Molality ^a 10°m ₁ /mol kg ⁻¹
15	288.15	1.6 <u>+</u> 0.1	1.2	2.0
20	293.15	2.1 <u>+</u> 0.3	1.6	2.7
25	298.15	2.65 <u>+</u> 0.07	2.04	3.39
30	303.15	3.4 <u>+</u> 0.2	2.6	4.4
35	308.15	4.3 <u>+</u> 0.3	3.3	5.6
The authors smoothed their data for the 288.15 to 308.15 temper			according to the $49)\log(T/K) - 44$, ature interval.	e equation: .61
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE: The method and procedure are re- ported in an earlier paper (ref. 1). A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to metallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried.			SOURCE AND PURITY O (1) Mercury and isotope dec beta partic 210 kev, ac ray of 279 half-life is (2) 2-Propanol. Co. State Fractionally	oF MATERIALS: d Mercury-203. The ays by emission of a cle at an energy of companied by a gamma kev. The isotope s 47 days. Fisher Scientific d to be 99 mol %. y distilled prior to
The mercury continuousl umetric fl 24 hours. brated sol conventiona lation cour was set to at 279 kev. were the a determinati	y and soly y in glass asks in a Aliquots ution we l single nter. Th count on . The so . Verage o ons over no evide	vent were shaken s stoppered vol- thermostat for of the equili- re counted by a channel scinti- ne window width by the photopeak lubility values f at least six a 3 day period.	use. ESTIMATED ERROR: δT/K = ±0.1; See ted by authors values above. REFERENCES: 1. Spencer, J. M J. Phys. Chem	e random error repor- with concentration N.; Voigt, A. F. m. <u>1968</u> , 72, 464.

COMPONENTS:		ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [74	39-97-6]	Okouchi, S.; Sasaki, S.
(2) Water; H ₂ O; [773	2-18-5]	Bull. Chem. Soc. Jpn. <u>1985</u> , 58, 3401-2.
(3) Octanol-1; C ₈ H ₁₈	0; [111-87-5]	
VARIABLES:		PREPARED BY:
T/K = 278.15 - 30 Water saturated 1	8.15 -octanol.	H. L. Clever M. Iwamoto
EXPERIMENTAL VALUES:		
Octa Wate Cont	nol-l Partition r Coefficie ent KOH	n Estimated Solubility ent in Water sat. Octanol-1
T/K wt %		10°c ₁ /mol dm ⁻³
278.15 3.7	4.80 ± 0.	.20 0.76
288.15 4.4	4.75 ± 0.	.20 1.01
298.15 4.6	$\pm 0.1 4.15 \pm 0.1$.20 1.18
308.15 4.9	3.80 <u>+</u> 0.	.20 1.45
Dr. S. Okouch cients that d	i provided the end of	experimental partion coeffi- the original paper.
Values of th "Alcohols in Series 1984 saturated wit The compiler with octanol pure water t water saturat	e water content water", Barton, , 15, 364 - 7. T h 0.054 <u>+</u> 0.005 assumed mercury -1 was the same o estimate the s ed octanol-1.	of octanol-1 were taken from A. F. M., Editor, Solubility the same source says water is wt % octanol-1 at 298 K. solubility in water saturated as the mercury solubility in solubility of mercury in the
	AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDUR Mercury was dissolv containing 0.001 mo as a reducing agent of octanol-1 + merc water were shaken t hours in a thermost trifuge tube. After then centrifugation, were separated and a of cold-vapor ato (ref. 2).	E: red in octanol-1 1 dm ⁻³ hydrazine (ref. 1). Two mL ury and 20 mL of cogether for 214 ated 25 mL cen- equilibration, the two phases analyzed by means mic absorption	 SOURCE AND PURITY OF MATERIALS: (1) Mercury. Analytical grade, source not given. Purified ac- cording to Glew and Hames (ref. 1). (2) Water. Doubly distilled. (3) Octanol-1. Analytical reagent grade. Distilled twice to re- move impurities.
		ESTIMATED ERROR:
		<pre>L. Glew, D. N.; Hames, D. A. Can. J. Chem. <u>1971</u>, 49, 3114.</pre>
		2. Okouchi, S.; Sasaki, S. Bull.Chem. Soc. Jpn. <u>1981</u> , 54, 2513.

COMPONENTS :	ORIGINAL MEASUREMENTS:	
(1) Mercury; Hg; [7439-97-6]	Okouchi, S.; Sasaki, S.	
(2) Octanol-1; C ₈ H ₁₈ O; [111-87-5]	Bull. Chem. Soc. Jpn. <u>1985</u> , 58, 3401–2.	
VARIABLES:	PREPARED BY:	
T/K = 298.15	H. L. Clever M. Iwamoto	
EXPERIMENTAL VALUES:	I	
Solubility Con	centration Mole Fraction	
T/K 10°c1/g cm ⁻³ 10°	$c_1/\text{mol dm}^{-3}$ 10 ⁷ x_1	
298.15 0.8	4 6	
lower limit to the solubili They are based on the author solution of mercury in 1-octa ing approximately 0.8 micro centimeter of the alcohol.	ty of mercury in 1-octanol. s statement that their stock nol was prepared by dissolv- grams of mercury per cubic	
AUXILIARY	INFORMATION	
METHOD/APPARATUS/PROCEDURE: Mercury was dissolved in octanol-1 containing 0.001 mol dm ⁻³ hydrazine as a reducing agent (ref. 1).	 SOURCE AND PURITY OF MATERIALS: (1) Mercury. Analytical grade, source not given. Purified ac- cording to Glew and Hames (ref. 1). (2) Octanol-1. Analytical reagent grade. Distilled twice to re- move impurities. 	
	ESTIMATED ERROR:	
	REFERENCES: 1. Glew, D. N.; Hames, D. A. <i>Can. J. Chem.</i> <u>1971</u> , 49, 3114.	

COMPONENTS:	EVALUATOR:
(l) Mercury; Hg; [7439-97-6] (2) Oxybisalkanes or Ethers	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA <u>1985</u> , August
CRITICAL EVALUATION:	
An Evaluation of the Solubilit	y of Mercury in Oxybisalkanes.
Spencer and Voigt (ref. 1) have	measured the solubility of mercury in

the two ethers, 2,2'-oxybispropane and 1,1'-oxybisbutane at six temperatures between 273.15 and 308.15 K by a radioactive tracer method. We know of no other data on the solubility of mercury in ethers.

Mercury + 2,2'-Oxybispropane; C₆H₁₄O; [108-20-3] + 1,1'-Oxybisbutane; C₈H₁₈O; [142-96-1]

The data of the two systems are classified as tentative. Both data set were treated by a linear regression to obtain a two constant equation in the units of concentration, mole fraction and molality in the form:

 $\ln(soly) = A(1) + A(2)/(T/100 \text{ K})$

Tentative values of smoothed data and thermodynamic changes for the transfer of one mole of mercury from the liquid metal to the hypothetical unit concentration solution were obtained from the equation.

Tables 1 and 2 contain information on the 2,2'-oxybispropane and Tables 3 and 4 on the 1,1'-oxybisbutane system.

Table 1. Mercury + 2,2'-Oxybispropane. Linear regression for the equation $\ln(soly) = A(1) + A(2)/(T/100 \text{ K})$.

Solubility	A(1) <u>+</u> Error	A(2) <u>+</u> Error	Std. Error about the Regression Line
	يري والا من حد مدر وي بين خط عنه عن وي وي	ہی جو سا سا سے سے سے ہے ہی سا جا ہم ہو ہو ہو ہے خا جا	هها «ک ننت شت هم هم هو «ک «۵ ننت هت هه هه چه «ک
$c_1/mol dm^{-3}$	$\begin{array}{r} 2.5672 \pm 0.4717 \\ 1.2221 \pm 0.4690 \end{array}$	-44.1825 <u>+</u> 1.3840 -45.9941 <u>+</u> 1.3761	2.2 x 10 ⁻⁷ 3.1 x 10 ⁻⁸
<i>m₁</i> /mol kg ⁻¹	3.4006 <u>+</u> 0.4416	-45.6728 <u>+</u> 1.2955	3.0 x 10 ⁻⁷

Table 2. The solubility of mercury in 2,2'-oxybispropane. Tentative values of the solubility in concentration, mole fraction and molality as a function of temperature at 0.1 MPa and thermodynamic changes.

Temperature		Mercury Solubility			
t/°C	T/K	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction 10'x ₁	Molality 10°m ₁ /mol kg ⁻¹	
0 5 10 15 20 25 30 35	273.15 278.15 283.15 288.15 293.15 298.15 303.15 308.15	1.2 1.6 2.2 2.9 3.7 4.8 6.1 7.7	1.7 2.2 3.0 4.1 5.2 6.8 8.7 11.2	1.6 2.2 3.0 4.0 5.1 6.7 8.6 11.0	
ΔH_1^{a} ΔS_1^{b}		36.7 <u>+</u> 1.2 21.3 <u>+</u> 3.9	$38.2 \pm 1.1 \\ 10.2 \pm 3.9$	$38.0 \pm 1.1 \\ 28.3 \pm 3.7$	

				ا المداخلي بلنا من حين بين من خلف من حيا الله وي الله عن من خلة الله عن من «
Solubilit	y A(1) <u>+</u>	Error	A(2) <u>+</u> Error	Std. Error about the Regression Line
c_1 /mol dm x_1 m_1 /mol kg	-3 3.0686 1.6691 -1 3.5306	± 0.5316 ± 0.5356 ± 0.4980	-44.5568 ± 1.5597 -45.6601 ± 1.5715 -45.1263 ± 1.4610	4.4 x 10 ⁻⁷ 7.6 x 10 ⁻⁸

Table 4. The solubility of mercury in 1,1'-oxybisbutane. Tentative values of the solubility in concentration, mole fraction, and molality as a function of temperature at 0.1 MPa and thermodynamic changes.

Temper	rature	Mercury Solubility		
t/°C	<i>T/</i> K	Concentration 10 [°] c ₁ /mol dm ⁻³	Mole Fraction	Molality 10°m ₁ /mol kg ⁻¹
0 5 10 15 20 25 30 35	273.15 278.15 283.15 288.15 293.15 298.15 303.15 308.15	1.8 2.4 3.2 4.1 5.4 7.0 8.9 11.3	2.9 3.9 5.3 7.0 9.1 11.9 15.3 19.5	2.3 3.1 4.1 5.4 7.0 9.1 11.7 14.9
$\frac{\Delta H_1^{a}}{\Delta S_1^{b}}$		37.0 ± 1.3 25.5 ± 4.4	38.0 ± 1.3 13.9 ± 4.5	37.5 ± 1.2 29.4 ± 4.1

a units kJ mol⁻¹ b units J K⁻¹ mol⁻¹

REFERENCES:

 Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u>, 72, 464; Spencer, J. N. <u>Dissertation</u>, Iowa State University, <u>1968</u>.

(1) Mercury 18, [7439-97-6]; Mercury-203; "'Hg; [13982-78-0] (2) 2,2'-Caybiepcopane or <i>I</i> repropyl ether; C ₆ H ₁₄ O; [108-20-3] VARIABLES: <i>T/K</i> = 273.15 - 308.15 <i>T/K</i> = 273.15 - 1.2 \pm 0.1 <i>Usercury</i> Solubility <i>t/°C T/K⁴</i> Concentration <i>Usercury</i> Solubility <i>t/°C T/K⁴</i> Concentration <i>Usercury Usercury U</i>	COMPONENTS:		ORIGINAL MEASUREMEN	TS:			
(2)2.2'-Oxybispropane or Tsopropyl ether, C ₆ H ₁₄ Oy [108-20-3]Spencer, J. N. Dissertation, Towa State University, 1957.VARIABLES: T/K = 273.15 - 308.15FREFARED BY: S. H. JOhnson H. L. CleverTemperatureMercury Solubility 10's ₁ /mol dm ⁻¹ 10's ₂ TemperatureMole Fraction 10's ₁ /mol dm ⁻¹ 10's ₂ 0273.151.2 \pm 0.11.61.61.5.5288.652.9 \pm 0.12.93.154.0 \pm 0.22.65.525298.152.65.525298.1530303.156.1 \pm 0.130303.156.1 \pm 0.1310.730303.156.1 \pm 0.13110.73210.733303.157.4 \pm 0.110.710.5	<pre>(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰²Hg; [13982-78-0]</pre>			99-97-6]; Ig; [13982-78-0]	Spencer, J. N. J. Phys. Chem.	; Voigt, A. F. <u>1968</u> , 72, 464 - 470.	
VARIABLES: $T/K = 273.15 - 308.15$ PREPARED BY: S. H. Johnson M. Iwamoto H. L. Clever $T/K = 273.15 - 308.15$ S. H. Johnson M. Iwamoto H. L. CleverEXPERIMENTAL VALUES:	(2) 2,2'-Oxybispropane or <i>Iso</i> propyl ether; C ₆ H ₁₄ O; [108-20-3]			ne or <i>Iso</i> propyl .08-20-3]	Spencer, J. N. <u>Dissertation</u> , <u>1967</u> .	Iowa State University,	
S. H. Johnson M. Iwamoto B. L. CleverEXPERIMENTAL VALUES:TemperatureMercury Solubility $t/^{\circ}C$ T/K° ConcentrationMole Fraction ² . Molality ² $t/^{\circ}C$ T/K° ConcentrationMole Fraction ² . Molality ² $t/^{\circ}C$ T/K° ConcentrationMole Fraction ² . Molality ² $t/^{\circ}C$ T/K° Concentration $t/^{\circ}C$ T/K° $t/^{\circ}C$ $T/K^{\circ}C$ <tr< td=""><td>VARIABLES:</td><td>:</td><td></td><td></td><td>PREPARED BY:</td><td></td></tr<>	VARIABLES:	:			PREPARED BY:		
EXPERIMENTAL VALUES:TemperatureMercury Solubility $t/^{\circ}C$ T/K° Concentration $10^{\circ} t_{1}'mol \text{ Molality}^{\circ}$ $10^{\circ} t_{1}'mol \text{ Molality}^{\circ}$ $10^{\circ} t_{1}'mol \text{ Molality}^{\circ}$ 0273.15 1.2 ± 0.1 Nole Fraction ^a . Molality ^a $10^{\circ} t_{1}'mol \text{ kg}^{-1}$ 0273.15 1.2 ± 0.1 1.6 1.6 15.5288.65 2.9 ± 0.1 4.1 4.0 20293.15 4.0 ± 0.2 5.6 5.5 25298.15 4.8 ± 0.1 6.8 6.7 30303.15 6.1 ± 0.1 8.7 8.6 35308.15 7.4 ± 0.1 10.7 10.5 $^{\circ}$ Calculated by compilers. 10.7 ± 10.5 The authors smoothed their data according to the equation: $10 \circ t_{1} = 15.633 \pm .5781 \log(7/K) - 44.855$ for the 273.15 to 308.15 temperature interval.AUXILLARY INFORMATIONMUXILLARY INFORMATIONMUXILLARY INFORMATIONAUXILLARY INFORMATIONMUXILLARY INFORMATIONMUXILLARY INFORMATIONAUXILLARY INFORMATIONMUXILLARY INFORMATIONMUXILLARY INFORMATIONMUXILLARY INFORMATIONAUXILLARY INFORMATIONAUXILLARY INFORMATIONAUXILLARY INFORMATIONAUXILLARY INFORMATIONAUXILLARY INFORMATIONAUXILLARY INFORMATION <th colsp<="" td=""><td colspan="3"><i>T/K</i> = 273.15 - 308.15</td><td>3.15</td><td>S. H. Johnson M. Iwamoto H. L. Clever</td><td></td></th>	<td colspan="3"><i>T/K</i> = 273.15 - 308.15</td> <td>3.15</td> <td>S. H. Johnson M. Iwamoto H. L. Clever</td> <td></td>	<i>T/K</i> = 273.15 - 308.15			3.15	S. H. Johnson M. Iwamoto H. L. Clever	
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$t/^{\circ}C$ T/R° Concentration $10^{\circ}c_{f}/mol \ M^{\circ}$ Mole Praction $10^{\circ}r_{f}$ Mole Mole Mark $10^{\circ}r_{f}$ Mark $10^{\circ}r_{f}$ Mark $10^{\circ}r_{f}$ Mark $10^{\circ}r_{f}$ MUXILIARY INFORMATIONMETHOD/APPARATUS/PROCEDURE: A radioactive tracer method was used. A high activity sample of mercury-203 mitrate was added to mercury-203 mitrate was added to mercury-203 mitrate was added to mercury and Solvent were sharken continuously in 25 ml glass stoppered flasks in a thermostat for 24 hours. Aliquots of the equili- brated solution were counted by a conventional single channel scinti- lation counter. The window width was set to count only the photopeak at 279 kev. The solubility values were larger than expected, not reproducible, and increased with time unless the hypophosphorous add was added. The solubility wa	Te	Temperature Mer			cury Solubility		
0 273.15 1.2 ± 0.1 1.6 1.6 15.5 288.65 2.9 ± 0.1 4.1 4.0 20 293.15 4.0 ± 0.2 5.6 5.5 25 298.15 4.8 ± 0.1 6.8 6.7 30 303.15 6.1 ± 0.1 8.7 8.6 35 308.15 7.4 ± 0.1 10.7 10.5 a Calculated by compilers. The authors smoothed their data according to the equation: $\log x_{1} = (15.633 \pm .578)\log(T/K) - 44.855$ for the 273.15 to 308.15 temperature interval. METHOD/APPARATUS/PROCEDURE: A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury and solvent were sha- tailic mercury and solvent were sha- ken continuously in 25 ml glass stoppered flasks in a thermostat for 27 kev. The solubility values were the average of at least six determinations over a three day at 279 kev. The solubility values were larger than expected, not reproducible, and increased with time unless the hypophosphorous acid was added. The solubility was not effected by smoother were day REFRENCES; NETHORY AND	t/ 	t/°C T/K ^a Concentration 10°c ₁ /mol dm ⁻³			Mole Fraction ^{a.} 10 ⁷ x ₁	Molality ^a 10° <i>m</i> 1/mol kg ⁻¹	
15.5288.65 2.9 ± 0.1 4.1 4.0 20293.15 4.0 ± 0.2 5.6 5.5 25298.15 4.8 ± 0.1 6.8 6.7 30303.15 6.1 ± 0.1 8.7 8.6 35308.15 7.4 ± 0.1 10.7 10.5		0	273.15	1.2 <u>+</u> 0.1	1.6	1.6	
20293.15 4.0 ± 0.2 5.6 5.5 25298.15 4.8 ± 0.1 6.8 6.7 30303.15 6.1 ± 0.1 8.7 8.6 35308.15 7.4 ± 0.1 10.7 10.5	19	5.5	288.65	2.9 <u>+</u> 0.1	4.1	4.0	
25 298.15 4.8 ± 0.1 6.8 6.7 30 303.15 6.1 ± 0.1 8.7 8.6 35 308.15 7.4 ± 0.1 10.7 10.5 	20	0	293.15	4.0 <u>+</u> 0.2	5.6	5.5	
30 303.15 6.1 ± 0.1 8.7 8.6 35 308.15 7.4 ± 0.1 10.7 10.5 ^a Calculated by compilers. The authors smoothed their data according to the equation: $\log x_1 = (15.633 \pm .578) \log (T/K) - 44.855$ for the 273.15 to 308.15 temperature interval. AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE: A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury-203 nitrate vas added to mercury 203 nitrate vas added to mercury 204 notices and the solution were sha- ken continuously in 25 ml glass stoppered flaks in a thermostat for 24 hours. Aliquets of the equili- lation counter. The window width was set to count only the photopeak at 279 kev. The solubility values were the average of at least six determinations over a three day period. The measured mercury concentra- tions were larger than expected, not reproducible, and increased with time unless the hypophosphorous acid was added. The solubility was not afforted by samul variations in the	25	5	298.15	4.8 <u>+</u> 0.1	6.8	6.7	
35 308.15 7.4 ± 0.1 10.7 10.5 ^a Calculated by compilers.	30	0	303.15	6.1 ± 0.1	8.7	8.6	
AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE: A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury-203 nitrate, reduced to me- tallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried. The mercury and solvent were sha- ken continuously in 25 ml glass stoppered flasks in a thermostat for 24 hours. Aliquots of the equili- brated solution were counted by a conventional single channel scinti- lation counter. The window width was set to count only the photopeak at 279 kev. The solubility values were the average of at least six teterminations over a three day period. The measured mercury concentra- tions were larger than expected, not reproducible, and increased with time unless the hypophosphorous acid was added. The solubility was not affected by compilers. AUXILIARY INFORMATION AUXILIARY INFORMATION A	35	5	308.15	7.4 <u>+</u> 0.1	10.7	10.5	
$\begin{array}{c} \mbox{AUXILIARY INFORMATION}\\ \hline \begin{tabular}{lllllllllllllllllllllllllllllllllll$	^a Calculated by compilers. The authors smoothed their data $\log x_1 = (15.633 \pm 100)$ for the 273.15 to 308.15 temper			compilers. bothed their data $x_1 = (15.633 \pm 100)$ to 308.15 temper	according to th .578)log(T/K) - d ature interval.	e equation: 44.855	
METHOD/APPARATUS/PROCEDURE: A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to me- tallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried. The mercury and solvent were sha- ken continuously in 25 ml glass stoppered flasks in a thermostat for 24 hours. Aliquots of the equili- brated solution were counted by a conventional single channel scinti- lation counter. The window width was set to count only the photopeak at 279 kev. The solubility values were the average of at least six determinations over a three day period.SOURCE AND PURITY OF MATERIALS: (1) Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days.(2) Isopropylether. Matheson, Cole- man and Bell. Stated to be no better than 99 mol %. Degassed, 0.1 % hypophosphorous acid ad- ded.ESTIMATED ERROR: tions were larger than expected, not reproducible, and increased with time unless the hypophosphorous acid was added. The solubility was not aeffected by small variations in the 	AUXILIARY			AUXILIARY	INFORMATION		
acid	METHOD/APPARATUS/PROCEDURE: A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to me- tallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried. The mercury and solvent were sha- ken continuously in 25 ml glass stoppered flasks in a thermostat for 24 hours. Aliquots of the equili- brated solution were counted by a conventional single channel scinti- lation counter. The window width was set to count only the photopeak at 279 kev. The solubility values were the average of at least six determinations over a three day period. The measured mercury concentra- tions were larger than expected, not reproducible, and increased with time unless the hypophosphorous acid was added. The solubility was not affected by small variations in the			S: Cer method was vity sample of e was added to reduced to me- hypophosphorous o a drop, washed olvent were sha- n 25 ml glass a thermostat for of the equili- ce counted by a channel scinti- e window width y the photopeak lubility values f at least six er a three day cury concentra- an expected, not increased with phosphorous acid ubility was not triations in the	<pre>SOURCE AND PURITY ((1) Mercury an isotope dec beta parti 210 kev, ac ray of 279 half-life i (2) Isopropylet man and Be better than 0.1 % hypop ded. ESTIMATED ERROR: &T/K = ±0.1; S ported by autho values above.</pre>	OF MATERIALS: and Mercury-203. The cays by emission of a cle at an energy of companied by a gamma kev. The isotope s 47 days. her. Matheson, Cole- ll. Stated to be no n 99 mol %. Degassed, bhosphorous acid ad- ee random error re- rs with concentration	

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]; Mercury-203; 203Hg; [13982-78-0]	Spencer, J. N.; Voigt, A. F. J. Phys. Chem. <u>1968</u> , 72, 464 - 470.
<pre>(2) 1,1'-Oxybisbutane or Dibutyl ether; C₈H₁₈O; [142-96-1]</pre>	Spencer, J. N. <u>Dissertation</u> , Iowa State University, <u>1967</u> .
VARIABLES: T/K = 273.15 - 308.15	PREPARED BY: S. H. Johnson M. Iwamoto H. L. Clever
EXPERIMENTAL VALUES:	
Temperature Me	rcury Solubility
t/°C T/K ^a Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a Molality ^a 10'x ₁ 10'm ₁ /mol kg ⁻¹
0 273.15 1.7 ± 0.1	2.8 2.2
15.5 288.65 4.4 ± 0.3	7.4 5.7
20 293.15 5.6 <u>+</u> 0.1	9.5 7.3
25 298.15 7.1 <u>+</u> 0.2	12.1 9.3
30 303.15 9.1 <u>+</u> 0.5	15.6 12.0
35 308.15 10.5 <u>+</u> 0.2	18.1 13.9
$\log x_{I} = (15.666 \pm 100)$ for the 273.15 to 308.15 tempe	.650)log(Ť/K) - 44.696 rature interval.
AUXILIAR	/ INFORMATION
METHOD/APPARATUS/PROCEDURE: A radioactive tracer method was used. A high activity sample of mercury-203 nitrate was added to mercury(II) nitrate, reduced to metallic mercury by hypophosphorous acid, coagulated into a drop, washed and dried. The mercury and solvent were shaken continuously in 25 ml glass stop- pered flasks in a thermostat for 24 hours. Aliquots of the equili- brated solution were counted by a conventional single channel scinti- lation counter. The window width was set to count only the photopeak at 279 kev. The solubility values were the average of at least six determinations over a three day period.	 SOURCE AND PURITY OF MATERIALS: (1) Mercury and Mercury-203. The isotope decays by emission of a beta particle at an energy of 210 kev, accompanied by a gamma ray of 279 kev. The isotope half-life is 47 days. (2) Dibutyl ether. Matheson, Coleman and Bell. Stated to be better than 99 mol %. Washed with acidified solution of FeSO4, dried and distilled. Hydroquinone (10 ppm) added to pervent peroxide formation. ESTIMATED ERROR: &T/K = ±0.1; See random error reported by authors with concentration values above.

COMPONENTS :	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] Mercury-203: 203Hg: [13982-78-0]	Hursh, J. B.
(2) Sunflower Seed Oil	JAT, J. Appl. Toxicol. <u>1985</u> , 5, 327 — 32.
VARIABLES:	PREPARED BY:
T/K = 295	H. L. Clever
EXPERIMENTAL VALUES:	
Temperature Carrier Ostw	ald Concentration ^b
t/°C T/K Av.	$\frac{+}{2} SE (no.) \qquad 10^{7} c_{1} / mol dm^{-3}$
22 295.15 Air 80.8	<u>+</u> 0.8(5) 65.5
^a The Ostwald coefficient is air)). Given above is the (number of determinations).	((ng Hg/mL fluid)/(ng Hg/mL average <u>+</u> standard error
^b The concentrations were calmercury vapor in equilibriu from the vapor pressure e Sprake (ref. 1). At 295, pressure is 19.90 Pa, and t 16.27 ng Hg/mL air.	culated by the compiler for im with pure liquid mercury evaluation of Ambrose and 15 K, the mercury vapor the vapor concentration is
The author states that the me between sunflower seed oil a The compiler estimates this coefficient of 2.89 for water Sunflower seed oil is a semi % oleic acid, 66.2 % linoleic of several other acids. (Mer	rcury partition coefficient nd water is 28 at 295.15 K. implies a mercury Ostwald at 295.15 K -drying oil containing 21.3 acid, and smaller amounts ck Index, 10th Ed., 1983.)
AUXILIARY	INFORMATION
METHOD /APPARATUS / PROCEDURE :	SOURCE AND PURITY OF MATERIALS:
The equilibrium cell is a 50 mL syringe thermostated in a Dewar flask. A 10 mL liquid sample and a 40 mL carrier gas with Hg vapor sample are drawn into the cell. The cell is turned and rolled on the cylinder axis for 120 to 300 sec. Equilibrium is rapidly attained through the large contact area be- tween liquid and vapor phases. Both	 Mercury. Prepared by reduction of ²³ HgCl₂. The Hg vapor is swept into a leak-proof Saran bag. Sunflower seed oil. Purchased at local grocery store. Hand- book value of 0.923 specific gravity used.
the liquid and vapor phases are sampled. The liquid phase is aer-	
lite. The Hg radioactivity is meas- ured on a liquid scintillation coun-	ESTIMATED ERROR:
ter. Corrections are applied for the counter efficiency, and for	
radioactive decay of the Hg.	REFERENCES: 1. Ambrose, D.; Sprake, C. H. S. <i>J. Chem. Thermodynam.</i> <u>1972</u> , 4, 603.

COMPONENTS:	EVALUATOR:
(l) Mercury; Hg; [7439-97-6] (2) Halocarbons	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA
	<u>1985</u> , August

An Evaluation of the Solubility of Mercury in Halocarbons.

The solubility of mercury in four halocarbons is reported in five papers. Three of the papers are from the laboratory of Professor A. F. Voigt of Iowa State University. A fourth paper referenced their data to a solubility value from one of the Voigt papers. Thus, the data are not as independent as one would like for a good evaluation. The halocarbons include one cyclic perfluoronated compound, tetrachloromethane, and two monohalo benzenes. Each system is discussed briefly below.

Mercury + Hexafluorobis(trifluoromethyl)cyclobutane; C₆F₁₂; [28677-00-1]

Kuntz and Mains (ref. 3) report one solubility value at 298.15 K and Spencer and Voigt (ref. 4) report five solubility values between 273.15 and 298.15 K. At 298.15 K the Kuntz and Mains value is 10 percent smaller than the Spencer and Voigt value. Considering the difference in methods, the difficulty of the measurement, and possible differences in the isomer composition, the agreement is considered satisfactory. The tentative values for all of the data were treated by a linear regression in the solubility units of concentration, mole fraction and molality. The regression constants are in Table 1 and the smoothed data and thermodynamic changes are in Table 2. The solvent is a mixture of at least two isomers. The four possible isomers are *cis-* and *trans-*perfluoro-1,2-dimethylcyclobutane and *cis-* and *trans-*perfluoro-1,3-dimethylcyclobutane (ref. 6).

Table 1. Mercury + Hexafluorobis(trifluoromethyl)cyclobutane. Linear regression constants for the equation ln(soly) = A(1) + A(2)/(T/100 K).

Solubility	A(l) <u>+</u> Error	A(2) <u>+</u> Error	Std. Error about the Regression Line
	منه خط هذا هذا هو هي 40 الله في 10 الله عن خط هي من هي عن ا		
$c_1/mol dm^{-3}$	9.4968 <u>+</u> 1.2713	-72.3371 <u>+</u> 3.6912	2.8 x 10 ^{-*}
x_{7}^{1}	8.0555 ± 1.2545	-73.1675 ± 3.6422	5.0 x 10 ⁻
$m_1/mol kg^{-1}$	11.0061 ± 1.4985	-78.3298 ± 4.3509	2.0 x 10 ^{-*}

Table 2. The solubility of mercury in hexafluorobis(trifluoromethyl)cyclobutane. Tentative values of the solubility in concentration, mole fraction and molality as a function of temperature at 0.1 MPa and thermodynamic changes.

Temper	ature	Mercury Solubility		
t/°C	<i>T/</i> K	Concentration 10 ⁷ c ₁ /mol dm ⁻³	Mole Fraction 10* <i>x</i> 1	Molality 10 ⁷ m ₁ /mol kg ⁻¹
0 5 10 15 20 25	273.15 278.15 283.15 288.15 293.15 293.15 298.15	0.42 0.68 1.08 1.7 2.6 3.9	0.73 1.2 1.9 3.0 4.6 6.9	0.21 0.35 0.58 0.94 1.5 2.3
ΔH_1^{a} ΔS_1^{b}		60.1 <u>+</u> 3.1 79.0 <u>+</u> 10.6	60.8 ± 3.0 67.0 ± 10.4	65.1 ± 3.6 91.5 ± 12.5

a units kJ mol⁻¹ b units J K⁻¹ mol⁻¹

Mercury + Tetrachloromethane; CCl₄; [56-23-5]

Three papers report mercury solubility values in tetrachloromethane at 298.15 K. Moser and Voigt (ref. 1) and Klehr and Voigt (ref. 2) both used a radioactive tracer method. Klehr and Voigt also obtained the same value by a distribution method. Vogel and Gjaldbaek (ref. 5) used an atomic absorption spectroscopy method and found a solubility that increased with time.

The results are below.

т/к	Saturation Time, t/days	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction 10' <i>x₁</i>	Molality 10°m ₁ /mol kg ⁻¹	ref.
298.15	3+ up to 10 2 9	$7.5 \pm 0.37.5 \pm 0.1930$	7.3 7.3 9 29	4.7 4.7 6 19	1 2 5 5

Both Moser and Voigt (ref. 1) and Klehr and Voigt (ref. 2) treated the tetrachloromethane with aqueous bisulfite solution to remove any traces of chlorine, then dried and distilled the solvent. Vogel and Gjaldbaek (ref. 5) apparently used no purification procedure. Vogel and Gjaldbaek point out a slow reaction between mercury and tetrachloromethane is known at 670 K; however, the purification of the tetrachloromethane appears important. The possibility of reaction of mercury and tetrachlor romethane is important, but until the reaction is better characterized the data from the Voigt laboratory is classed as tentative.

Mercury + Bromobenzene; C₆H₅Br; [108-86-1]

Klehr and Voigt (ref. 2) measured the solubility by a radioactive tracer technique at 298.15 K. The value is classed as tentative and is given below in units of concentration, mole fraction and molality.

Temper	ature	Mercury Solubility		
t/°C	т/к	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction 10'x ₁	Molality 10 ^{°m} 1/mol kg ⁻¹
25	298.15	16.0 <u>+</u> 0.3	16.9	10.8

COMPONENTS:	EVALUATOR:
<pre>(1) Mercury; Hg; [7439-97-6] (2) Halocarbons</pre>	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA
	<u>1985</u> , August

Mercury + Chlorobenzene; C₆H₅Cl; [108-90-7]

Klehr and Voigt (ref. 2) measured the solubility of free mercury in chlorobenzene as a function of temperature from 273.15 to 308.15 K. Their data are classed as tentative. The data were treated by a linear regression in each of the solubility units of concentration, mole fraction, and molality. the regression constants are in Table 3 and the smooth solubility values at five degree intervals are in Table 4.

Mercury + Chlorobenzene. Linear regression constants for the Table 3. equation $\ln(soly) = A(1) + A(2)/(T/100 \text{ K})$.

Solubility	A(1) <u>+</u> Error	A(2) <u>+</u> Error	Std. Error about the Regression Line
$\frac{c_1/\text{mol dm}^{-3}}{\frac{x_1}{m_1/\text{mol kg}^{-1}}}$	4.4111 ± 0.5013	-47.0116 ± 1.4539	5.0 x 10 ⁻⁷
	2.3982 ± 0.5378	-47.8134 ± 1.5596	5.3 x 10 ⁻⁸
	4.5404 ± 0.5160	-47.6801 ± 1.4966	4.7 x 10 ⁻⁷

Solubility of mercury in chlorobenzene. Tentative values of the Table 4. solubility in concentration, mole fraction, and molality as a function of temperature at 0.1 MPa and thermodyanmic changes.

Tempe	rature	Mercury Solubility		Y
t/°C	<i>T/</i> K	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction 10'x ₁	Molality 10°m ₁ /mol kg ⁻¹
0 5 10 15 20 25 30 35	273.15 278.15 283.15 288.15 293.15 298.15 303.15 308.15	2.8 3.8 5.1 6.8 8.9 11.7 15.2 19.5	2.8 3.8 5.1 6.8 9.1 11.9 15.6 20.1	2.5 3.4 4.6 6.1 8.1 10.6 13.8 17.9
$\frac{\Delta H_1^{a}}{\Delta S_1^{b}}$		39.1 <u>+</u> 1.2 36.7 <u>+</u> 4.2	$39.8 \pm 1.3 \\ 19.9 \pm 4.5$	$39.6 \pm 1.2 \\ 37.8 \pm 4.3$

^a units kJ mol⁻¹ b units J K⁻¹ mol⁻¹

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- Moser, H. C.; Voigt, A. F. USAEC Report <u>1957</u>, ISC-892, 65 pp.
 Klehr, E. H.; Voigt, A. F. Radioisot. Phys. Sci. Ind., Proc. Conf.,

- Klenr, E. H.; Volgt, A. F. Matterson, Phys. Lett. 1996, 1997.
 Copenhagen <u>1960</u>, 1, 517 (pub. <u>1962</u>).
 Kuntz, R. R.; Mains, G. J. J. Phys. Chem. <u>1964</u>, 68, 408.
 Spencer, J. N.; Volgt, A. F. J. Phys. Chem. <u>1968</u>, 72, 464.
 Vogel, A.; Gjaldbaek, J. C. Arch. Pharm. Chemi Sci. Ed. <u>1974</u>, 2, 25.
 Hauptshein, M.; Fainberg, A.; Braid, M. J. Am. Chem. Soc. <u>1958</u>, 80, 000 842.

COMPONENTS:	ORI	GINAL MEASUREMENT	'S:
(1) Mercury; Hg; [7439-97-6]		untz, R. R.; M	lains, G. J.
<pre>(2) Hexafluorobis(trifluoromethyl)- cyclobutane or Perfluorodi- methylcyclobutane; C₆F₁₂; [28677-00-1]</pre>		. Phys. Chem.	<u>1964</u> , <i>68</i> , 408 - 10.
VARIABLES:	PRE	PARED BY:	
<i>T/</i> K = 298.15	S M H	. H. Johnson . Iwamoto . L. Clever	
EXPERIMENTAL VALUES:	<u></u>		
Temperature	Mercury	Solubility	
t/°C T/K ^a Concent 10'c ₁ /r	ration Mo nol dm ⁻³ 10	le Fraction ^a	Molality ^a 10 ⁷ m ₁ /mol kg ⁻¹
25 298.15 3.	.4	6.1	2.0
^a Calculated by compile	ers.		
	AUXILIARY INFO	ORMATION	
AUXILIARY METHOD/APPARATUS/PROCEDURE: Spectrophotometric method. It was assumed that the optical density at 2560 A is a reliable measure of the solubility. It was further assumed that the extinction coefficient of mercury was the same in all hydro- carbon solvents. The optical den- sity of a saturated solution of Hg in hexane was measured and, when combined with the solubility mea- sured by Moser and Voigt (ref. 1), gives an extinction coefficient		JRCE AND PURITY OF .) Mercury. No 2) Perfluorodim Phillips Po Grade hydroo ified by pa gel until op sed and dist	F MATERIALS: o information given. methylcyclobutane. etroleum Co. Pure carbon solvent. Pur- ssage through silica otically pure, degas- tilled.
$s_{2550} = 7.35 \times 10^3 \text{ dm}^3 \text{ mol}^{-1}$ 25°C. The value was used t late the solubility in the solvents.	cm ⁻¹ at EST o calcu- ne other	TIMATED ERROR:	
The Hg and solvent were equators for 20 minutes and the optisity was measured by a Be Spectrophotometer.	ilibrated cal den- ckman DU	FERENCES: Moser, H. C.; USAEC Report 65 pp.	Voigt, A. F. <u>1957</u> , <i>ISC-892</i> ,
The reliability of the respends on the Moser and Voi bility value in hexane.	ults de- gt solu-		

COMPONENTS -	Instativity instanting	
(1) Moreury Has [7439-97-6]	ORIGINAL MEASUREMENTS:	
Mercury-203; ²⁰³ Hg; [13982-78-0]	<i>J. Phys. Chem.</i> <u>1968</u> , 72, 464 - 470.	
(2) Hexafluorobis(trifluoromethyl)-	Spencer, J. N.	
methylcyclobutane; C ₆ F ₁₂ ; [28677-00-1]	<u>1967</u> .	
VARIABLES :	PREPARED BY	
	S. H. Johnson	
T/K = 2/3.15 - 298.15	M. Iwamoto H. L. Clever	
EXPERIMENTAL VALUES:		
Temperature Mercur	y Solubility	
t/°C T/K ^a Concentration Mo	le Fraction ^a Molality ^a	
	$\frac{10^{m} m_1}{10^{m} m_1}$	
0 273.15 0.4 <u>+</u> 0.1	0.7 0.2	
16.5 289.65 2.1 <u>+</u> 0.3	3.7 1.2	
18 291.15 2.2 ± 0.2	3.9 1.3	
21 294.15 3.0 <u>+</u> 0.1	5.4 1.8	
25 298.15 3.8 ± 0.1	6.8 2.3	
a		
"Calculated by compilers.		
The authors smoothed their data ac $\log x_1 = (26.921 \pm .347)$	cording to the equation: log(T/K) - 73.746	
for the 273.15 to 298.15 temperature interval.		
AUXILIARY	INFORMATION	
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:	
A radioactive tracer method was used. A high activity sample of	(1) Mercury and Mercury-203. The isotope decays by emission of a	
mercury-203 nitrate was added to	beta particle at an energy of	
tallic mercury by hypophosphorous	ray of 279 kev. The isotope	
acid, coagulated into a drop, washed and dried.	half-life is 47 days.	
The mercury and solvent were sha-	(2) Perfluorodimethylcyclobutane.	
stoppered flasks in a thermostat for	Pont. Mixture of isomers; used	
24 hours. Aliquots of the equili-	as received.	
conventional single channel scinti-	ESTIMATED ERROR:	
lation counter. The window width	$\delta T/K = \pm 0.1$; See random error re-	
at 279 kev. The solubility values	ported by authors with concentration values above.	
determinations over a three day	REFERENCES	
The solvent density at 298.15 was	1. Hauptschein, M.; Fainberg, A. H.;	
taken from Hauptschein <i>et al.</i> (ref. 1). For the other temperatures, it	Braid, M. J. Am. Chem. Soc. <u>195</u> 8, 80, 842.	
was assumed the temperature coeffi- cient of density was the same as	2. Clever, H. L., Savlor, J. H.	
that observed for perfluoromethyl-	Gross, P. M.	
cyclohexane (ref. 2).	J. Phys. Chem. <u>1958</u> , 62, 89.	

COMPONENTS:		URIGINAL MEASUREMEN	ITS:
 (1) Mercury, Hg; [7439-97-61] Mercury-203; ²⁰³Hg; [13982-78-0] (2) Tetrachloromethane or Carbon totrachloroido; CCl : [56-23-5] 		Moser, H. C.;	volgt, A. F.
		USAEC Report Chem. Abstr.	<u>1957</u> , ISC-892. <u>1958</u> , 52, 10691h.
tetrachioride; CCI_4 ; $[56-23-5]$			
VARIABLES:		PREPARED BY:	
T/K = 298.15		M. Iwamoto	
EXPERIMENTAL VALUES:	****		,
 Temperature	Merc	ury Solubility	
t/°C T/K ^a	Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a 10'x ₁	Molality ^a 10 [°] m ₁ /mol kg ⁻¹
25 298.1	5 7.5 <u>+</u> 0.3	7.3	4.7
aCalculated	by compilers.		
	AUXILIARY		
METHOD/APPARATUS/PROCE	DURE:	SOURCE AND PURITY	OF MATERIALS:
A globule of Hg m radioactive merc	etal prepared from urv(II) nitrate by	(1) Mercury an Ridge Nati	nd Mercury-203. Oak onal Lab; recieved as
reduction with hy	pophosphorous acid	0.31 M Hg	(NO3)2 in 1.56 HNO3
was equilibrated liquid by shaking	with 5 - 10 ml of a in a thermostat.	millicurie	es q^{-1} ; half-life 48
Aliquotes of the	liquid were with-	days. Red	uced to Hg by hypo-
drawn periodical weeks and the	ly for up to two. Hg concentration	a Hq drop	let by addition of
determined radioc	hemically.	concentrate	ed HI.
The aliquot was	diluted with ace-	(2) Carbon tet	rachloride. Eastman
tone and equilibr	ated with Hg(NO ₃) ₂	Co. Spectr aqueous Na-	o-grade; shaken with SO ₂ , passed through a
mercury. The mer	rcury was precipi-	column of	dry silica gel and
steel planchet a	nd counted with a	redistilled	
Geiger-Mueller tu	be.	ESTIMATED ERROR:	
		δ <i>T</i> /K =	= <u>+</u> 0.1

COMPONENTS:	ORIGINAL MEASUREMENTS:
<pre>(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³Hg; [13982-78-0]</pre>	Klehr, E. H.; Voigt, A. F.
(2) Tetrachloromethane or Carbon tetrachloride; CCl ₄ ; [56-23-5]	Radioisot. Phys. Sci. Ind., Proc. Conf., Copenhagen <u>1960</u> , 1, 517 - 29 (Pub. <u>1962</u>).
VARIABLES:	PREPARED BY:
T/K = 298.15	M. Iwamoto H. L. Clever
EXPERIMENTAL VALUES:	
Temperature Mercur	y Solubility
t/°C T/K ^a Concentration Mo 10 [°] c ₁ /mol dm ⁻³ 10	le Fraction ^a Molality ^a x_1 10 ^s m_1 /mol kg ⁻¹
25 298.15 7.5 <u>+</u> 0.1	7.3 4.7
^a Calculated by compilers.	
indirect measurement result is 7 K. Obtained by multiplying the m 3.0 x 10 ⁻⁷ mol dm ⁻³ , times the dis	.5 x 10 ⁻⁵ mol dm ⁻³ at 298.15 mercury solubility in water, tribution coefficient.
AUXILIARY	INFORMATION
METHOD /APPARATUS / PROCEDURE :	SOURCE AND PURITY OF MATERIALS:
Direct Method. A globule of mer- cury containing 203-Hg was placed in 50 ml of solvent in a 100 ml flask and agitated in a thermostated bath. Samples were taken until the solu- tion appeared to be at equilibrium. Analyses were made by GM-counting by one of two techniques: (i) Solid precipitate counting. The Hg in a 0.5 ml aliquot was ex- changed and reprecipitated on a stainless steel panchet as the sul- fide was dried and counted. Details in Moser and Voigt (ref. 1). (ii) Liquid aliquot scintillation- counting. A 0.5 ml aliquot of the saturated solution was diluted and	 Mercury and Mercury-203. Reduced from a mercury nitrate sample. Half-life is 47 days. Carbon tetrachloride. Shaken with an aqueous solution of sodium sulfate, dried by passing it through a silica gel column, and redistilled. ESTIMATED ERROR: See random error reported by authors withthe concentration value above.
transferred to the counting tube with a known volume of benzene. The 0.28 MeV gamma radiation was counted. Errorduetoradiation ad- sorbed by the benzene and water was shown to be less than one percent. Indirect Method. The distribution coefficient between solvent and wa- ter was measured.	REFERENCES: 1. Moser, H. C.; Voigt, A. F. <i>USAEC Report</i> <u>1957</u> , <i>ISC-892</i> , 65 pp.

COMPONENTS :	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6];	Vogel, A.; Gjaldbaek, J. Chr.
(2) Tetrachloromethane of Carbon tetrachloride; CCl ₄ ; [56-23-5]	Arch. Pharm. Chem. Sci. Ed. <u>1974</u> , 2, 25 - 9.
VARIABLES:	PREPARED BY:
<i>T</i> /K = 298.15	H. L. Clever M. Iwamoto

EXPERIMENTAL VALUES:

Temperature		Mercury Solubility				
t∕°C	<i>T</i> /K ^a	Time t/day	Concentration 10°c1/mol dm ⁻³	Mole Fraction ^a 10'x ₁	Molality ^a 10° <i>m</i> 1/mol kg ⁻¹	
25	298.15	2	9	9	5	
		9	30	29	19	

^aCalculated by compilers.

ADDITIONAL COMMENTS:

The authors' suspect a slow reaction between mercury and carbon tetrachloride, but they were unable to characterized the reaction.

The authors took special care to see that the glassware surface of the sampling pipet was equilibrated with the saturated solution of mercury. Special care was taken to see that colloidal mercury did not form in the solution.

AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:		
The mercury was analyzed by cold vapor atomic absorption spectroscopy (ref. 1). The solvent was saturated with Hg in a special glass container in which a few grams of mercury was kept in a cellulose extraction thim- ble. The container was shaken at least 48 hours at 25°C. A 10.00 cm ³ sample of the satu- rated solution was taken. It was treated to convert the Hg to Hg ² and extracted into an aqueous phase. An aliquot of the aqueous phase was diluted, treated with tin(II) chloride to reduce the mercury, and the solution analyzed by cold vapor atomic absorption spectroscopy. The apparatus allowed measurements down to one part per billion of Hg. Similtaneous measurements were made under the same conditions of samples containing a known amount of	 (1) Mercury. Source not given, purified by distillation. (2) Carbon tetrachloride. Merck, Uvasol grade spectroscopic quality, used without further purification. ESTIMATED ERROR: REFERENCES: 1. Hatch, W. R.; Ott, W. L. Anal. Chem. <u>1968</u>, 10, 2085. 		
merourl.			

COMPONENTS:	ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³ Hg; [13982-78-0]	Klehr, E. H.; Voigt, A. F.		
(2) Chlorobenzene; C ₆ H ₅ Cl; [108-90-7]	Radioisot. Phys. Sci. Ind., Proc. Conf., Copenhagen <u>1960</u> , 1, 517 - 29 (Pub. <u>1962</u>).		
VARIABLES:	PREPARED BY:		
T/K = 273.15 - 308.15	S. H. Johnson M. Iwamoto H. L. Clever		
EXPERIMENTAL VALUES:			
Temperature Mer	cury Solubility		
<pre>t/°C T/K^a Concentration 10^e c₁/mol dm⁻³</pre>	Mole Fraction ^a Molality ^a $10^{7}x_{1}$ $10^{6}m_{1}/mol kg^{-1}$		
$0 273.15 2.8 \pm 0.1$	2.8 2.5		
10 283.15 5.0 <u>+</u> 0.1	5.0 4.5		
15 288.15 6.8 <u>+</u> 0.1	6.9 6.1		
	8.5 7.6		
25 298.15 12.5 ± 0.1	12.8 11.4		
35 308-15 19-3 + 0-1	19.9 17.7		
55 500125 2000 2001			
AUXILIARY	INFORMATION		
METHOD / APPARATUS / PROCEDURE :	SOURCE AND PURITY OF MATERIALS:		
Direct Method. A globule of mer- cury containing 203-Hg was placed in 50 ml of solvent in a 100 ml flask and agitated in a thermostated bath.	(1) Mercury and Mercury-203. Reduced from a mercury nitrate sample. Half-life is 47 days.		
Samples were taken until the solu- tion appeared to be at equilibrium. Analyses were made by GM-counting by one of two techniques: (i) Solid precipitate counting. The Hg in a 0.5 ml aliquot was ex- changed and reprecipitated on a stainless steel panchet as the sul-	(2) Chlorobenzene. Used without further purification.		
fide was dried and counted. Details in Moser and Voigt (ref. 1). (ii) Liquid aliquot scintillation- counting. A 0.5 ml aliquot of the saturated solution was diluted and transferred to the counting tube	ESTIMATED ERROR: See random error reported by authors with concentration values above.		
The 0.28 MeV gamma radiation was counted. Errorduetoradiation ad- sorbed by the benzene and water was shown to be less than one percent.	1. Moser, H. C.; Voigt, A. F. <i>USAEC Report</i> <u>1957</u> , <i>ISC-892</i> , 65 pp.		

COMPONENTS :	ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6]; Mercury-203; ²⁰³ Hg; [13982-78-0]	Klehr, E. H.; Voigt, A. F.		
<pre>(2) Bromobenzene; C₆H₅Br; [108-86-1]</pre>	Radioisot. Phys. Sci. Ind., Proc. Conf., Copenhagen <u>1960</u> , 1, 517 - 29 (Pub. <u>1962</u>).		
VARIABLES: T/K = 298.15	PREPARED BY: S. H. Johnson M. Iwamoto H. L. Clever		
EXPERIMENTAL VALUES:			
Temperature Mer	cury Solubility		
t/°C T/K ^a Concentration 10°c ₁ /mol dm ⁻³	Mole Fraction ^a Molality ^a $10^{r}x_{1}$ $10^{6}m_{1}/mol kg^{-1}$		
25 298.15 16.0 <u>+</u> 0.3	16.9 10.8		
^a Calculated by compilers.			
AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE: Direct Method. A globule of mer- cury containing 203-Hg was placed in 50 ml of solvent in a 100 ml flask and agitated in a thermostated bath. Samples were taken until the solu- tion appeared to be at equilibrium. Analyses were made by GM-counting by one of two techniques: (i) Solid precipitate counting. The Hg in a 0.5 ml aliquot was ex- changed and reprecipitated on a stainless steel panchet as the sul- fide was dried and counted. Details in Moser and Voigt (ref. 1). (ii) Liquid aliquot scintillation- counting. A 0.5 ml aliquot of the saturated solution was diluted and transferred to the counting tube with a known volume of benzene. The 0.28 MeV gamma radiation was counted. Error duetoradiation ad- sorbed by the benzene and water was shown to be less than one percent.	 SOURCE AND PURITY OF MATERIALS: (1) Mercury and Mercury-203. Reduced from a mercury nitrate sample. Half-life is 47 days. (2) Bromobenzene. Repurified by shaking with stannous chloride and redistilling. ESTIMATED ERROR: See random error reported by authors with the concentration value above. REFERENCES: 1. Moser, H. C.; Voigt, A. F. USAEC Report 1957, ISC-892, 65 pp. 		

COMPONENTS:	EVALUATOR:
(1) Mercury; Hg; [7439-97-6]	H. Lawrence Clever Chemistry Department
(2) Nitrobenzene; C ₆ H ₅ NO ₂ ; [98-95-3]	Emory University Atlanta, Georgia 30322 USA <u>1985</u> , August

An Evaluation of the Solubility of Mercury in Nitrobenzene at 298.15 K and 0.1 MPa.

In 1908 Christoff (ref. 1) showed that dissolved mercury could be detected in nitrobenzene. There are two modern reports of the solubility of mercury in nitrobenzene at 298.15 K. Both (ref. 2 and 3) are from the laboratory of A. F. Voigt. One value (ref. 2) was determined directly by a radioactive tracer method, the other (ref. 3) was by a distribution method. The two results are within experimental error of each other. Arguments can be made that the distribution method is more uncertain than the direct radioactive tracer method, but here we treat the two equal and average the results to obtain a tentative value of solubility.

T/K	м	Method/		
	Concentration 10 [°] c ₁ /mol dm ⁻³	Mole Fraction	Molality 10°m ₁ /mol kg ⁻¹	Reference
298.15	9.3 <u>+</u> 0.7	9.6	7.8	Tracer/ref. 2
	8.8	9.0	7.3	Distribution/ ref. 3
	9.1	9.3	7.6	Average (tenta- tive value)

REFERENCES:

1. Christoff, A. Z. Phys. Chem. 1908, 63, 346.

- Moser, H. C.; Voigt, A. F. USAEC Report <u>1957</u>, ISC-892, 65 pp; Chem. Abstr. <u>1958</u>, 52, 10691h.
- 3. Klehr, E. H.; Voigt, A. F. Radioisot. Phys. Sci. Ind., Proc. Conf., Copenhagen <u>1960</u>, 1, 517 (Pub. <u>1962</u>); Chem. Abstr. <u>1962</u>, 57, 6681b.

COMPONENTS :	ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6] Mercury-203; ²⁰³ Hg; [13982-78-0]	Moser, H. C.; Voigt, A. F.		
(2) Nitrobenzene; C ₆ H ₅ NO ₂ ; [98-95-3]	USAEC Report <u>1957</u> , ISC-892. Chem. Abstr. <u>1958</u> , 52, 10691h.		
VARIABLES:	PREPARED BY:		
<i>T/K</i> = 298.15	M. Iwamoto		
EXPERIMENTAL VALUES:			
Temperature Merc	ury Solubility		
t/°C T/K ^a Concentration 10 [°] c ₁ /mol dm ⁻³	Mole Fraction ^a Molality ^a $10^{7}x_{1}$ $10^{6}m_{1}/mol kg^{-1}$		
25 298.15 9.3 <u>+</u> 0.7	9.6 7.8		
^a Calculated by compilers.			
AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:		
A globule of Hg metal prepared from radioactive mercury(II) nitrate by reduction with hypophosphorous acid was equilibrated with 5 - 10 ml of liquid by shaking in a thermostat. Aliquotes of the liquid were with- drawn periodically for up to two weeks and the Hg concentration determined radiochemically.	(1) Mercury and Mercury-203. Oak Ridge National Lab; recieved as 0.31 M Hg(NO ₃) ₂ in 1.56 HNO ₃ solution. Initial activity 50 millicuries g ⁻¹ ; half-life 48 days. Reduced to Hg by hypo- phosphorous acid; coagulated to a Hg droplet by addition of concentrated HI.		
The aliquot was diluted with ace- tone and equilibrated with Hg(NO ₃) ₂ carrier to exchange the radioactive mercury. The mercury was precipi-	(2) Nitrobenzene. Baker Chemical Co. Purified Grade; used without further purification.		
tated as HgS, mounted on a stainless steel planchet and counted with a Geiger-Mueller tube.	ESTIMATED ERROR: $\delta T/K = \pm 0.1$		

						
COMPONENT	TS:			ORIGINAL MEASUREMENTS:		
(l) Me Me	rcury	; Hg; [74] -203; ²⁰³	39-97-6]; Hg; [13982-78-0]	Klehr, E. H.; Voigt, A. F.		
(2) Nitrobenzene; C ₆ H ₅ NO ₂ ; [98-95-3]			H ₅ NO ₂ ; [98-95-3]	Radioisot. Phy Proc. Conf., (<u>1960</u> , 1, 517 -	s. Sci. Ind. Copenhagen 29 (Pub. <u>196</u>	, 5 <u>2</u>).
VARTABLE	S:			DEFDADED BY.		· · · · · ·
				S. H. Johnson		
T/K	= 298	3.15		M. Iwamoto H. L. Clever		
EXPERIME	NTAL VA	LUES:				
	 Temper	ature	Mer	cury Solubility	ت ختا خلا حل هم هي يو جو جو بيو هم هذ ه	
	t/°C	<i>т/</i> к ^а	Concentration 10 [°] c ₁ /mol dm ⁻¹	Mole Fraction ^a	Molality ^a 10°m ₁ /mol kg	
	25	298.15	8.8	9.0	7.3	
	aCalcu	lated by	compilers.			
			AUXILIARY	INFORMATION		
METHOD/A	PPARATI	US/PROCEDUR	E:	SOURCE AND PURITY	OF MATERIALS:	
METHOD/APPARATUS/PROCEDURE: Indirect Method. The distribution coefficient between nitrobenzene and water was measured by a radioactive tracer method. The solubility in nitrobenzene was obtained by multi- plying the mercury solubility in water, 3.0 x 10 ⁻⁷ mol dm ⁻³ , times the distribution coefficient. Solutions were analyzed by one of			he distribution nitrobenzene and by a radioactive solubility in ained by multi- solubility in ol dm ⁻² , times fficient. yzed by one of ues. Either the	 Mercury and from a mere Half-life i Nitrobenzes from dilute solution an 	Mercury-203. cury nitrate s 47 days. ne. Steam-d: sulfuric-ni d redistilled	Reduced sample. istilled tic acid d.
Hg in	an a	liquot	was exchanged,	ESTIMATED EDDOD.		
precipitated as HgS on a stainless steel panchet, and counted, or a liquid aliquot was diluted and placed in a scintillation tube for counting.			on a stainless counted, or a as diluted and lation tube for	LOTINITED LAROA.		
				REFERENCES :		
				1. Moser, H. C. USAEC Repor 65 pp.	; Voigt, A. F t <u>1957</u> , <i>ISC</i> -	892,
1				1		

COMPONENTS:	EVALUATOR:	
(1) Mercury; Hg; [7439-97-6](2) Compressed Gases	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA	
	<u>1986</u> , June	

The Solubility of Mercury in Compressed Gases.

The equilibrium concentration of mercury vapor above liquid mercury is affected by the presence of a second component gas in several ways:

- i) The mercury vapor pressure is enhanced by the hydrostatic pressure of the gas on the liquid (Poynting effect).ii) The mercury vapor pressure is influenced by interaction between the
- ii) The mercury vapor pressure is influenced by interaction between the mercury vapor and added gas molecules. Although both attractive and repulsive interactions are involved the net effect may be either an attraction or repulsion depending on the properties of the added gas.
- iii) The non-ideal nature of the gas phase mixture.
- iv) The solubility of the gas in liquid mercury.

Factor iv is considered negligable. Factors i, ii, and iii have been taken into account by several theoretical approaches. Rowlinson and coworkers (ref. 1, 2, 3 and references within) have derived expressions for the enhancement of the liquid phase component in the gas phase by another gas using a virial equation of state. Haar and Sengers (ref. 4) Have derived an analytic relation in terms of molecular interactions for the density dependence of the solubility of a liquid or solid in a dense gas using a modified van der Waals equation.

Although Haar and Sengers consider the virial equation the more fundamental equation they point out it has short comings in this application. The virial equation is an expansion around the low density limit while the experimental data that show the effects of enhanced vapor concentration are most significant at high density. The pressure correction arising from the virial equation approach has the mixed third virial coefficient in the lead term. There are few good data for the term.

The equation of Haar and Sengers from the van der Waals approach explains qualitatively many of the results observed in the study of mercury + gas systems. These results are:

- The mercury vapor concentration decreases with increasing gas density for helium, hydrogen and neon, but increases for argon, nitrogen and krypton.
- ii) The initial slope of the concentration ratio, n_1/n_1^o , vs. gas density curves tends to decrease with increasing temperature.
- iii) In the cases of nitrogen and argon there are indications the enhancement levels off at the higher densities. In the case of nitrogen the curve goes through a maximum.

In general Haar and Sengers find the enhancement of mercury solubility is less than suggested by the earlier work of Rowlinson and coworkers.

Five papers from three laboratories report data on the enhancement of mercury concentration in the gas phase over liquid mercury. Rowlinson and co-workers (ref. 1, 2, 3) and Rosenberg and Kay (ref. 5) report results of direct experimental studies on the vapor concentration as a function of gas density. Haar and Sengers (ref. 4) calculate the concentration enhancement from literature data of the total absorption resonance of mercury at 253.7 nm as a function of foreign gas density. Jepson, Richardson and Rowlinson (ref. 1), Stubley and Rowlinson (ref. 3), and Rosenberg and Kay (ref. 5) used a tracer method with mercury-203 at pressures up to about 30 bar. They determined directly the concentration of mercury in the gas phase in a sealed tube with a counter outside the tube. They used times of saturation of three times those calculated from diffusion properties to obtain equilibrium. Rosenberg and Kay modified the method by placing the mercury reservoir at the top of the tube and adding

an efficient stirring system.

Richardson and Rowlinson (ref. 2) and Stubley and Rowlinson (ref. 3) used a weight loss method at gas pressures over 30 bar. A small reservoir containing a known weight of mercury was introduced into a known volume of gas. The systems was sealed and maintained at a fixed temperature until the equilibrium amount of mercury had dissolved. The system was cooled, opened and the mercury reweighed to give the amount of mercury transferred to the gas phase.

Haar and Sengers (ref. 4) calculated the mercury vapor concentration enhancement from the total absorption of the 253.7 nm resonance line of mercury as a function of the added gas density. The experiment effectively measures the enhancement of the mercury vapor concentration if the absorption per mercury atom is independent of the gas density. That was assumed, and small scale graphs of log (n_1/n_1^o) vs. gas number density were prepared for a number of gases from literature absorption data referenced on the data sheets. There were consistent data for helium, argon, hydrogen and nitrogen. Data for other gases showed more scatter with some results varying up to 25 percent. Only small scale graphs are given in Haar and Sengers' paper. There are no numerical results. The graphs are reproduced on the data sheets. Stubley and Rowlinson (ref. 3) calculated enhancement in the mercury + argon system from literature data by a similar method.

Only the mercury + argon system was studied by all three methods. The mercury + butane system was studied by the two direct methods. Unfortunately the methods give only fair agreement. All of the data are classed tentative. For some of the systems, especially neon and krypton, the uncertainities are quite large.

The figure below is from Haar and Sengers (ref. 4). Shown is the mercury enhancement in nine mercury + gas systems at temperatures of 323, 423, 523, and 673 K as defined by their van der Waals based equation using literature van der Waals constants for the pure materials and mixing rules discussed in the paper. The sharply reduced enhancement at high gas density for over one-half of the systems is confirmed experimentally for the mercury + nitrogen system.



COMPONENTS:EVALUATOR:(1) Mercury; Hg; [7439-97-6]H. Lawrence Clever
Chemistry Department(2) Compressed GasesEmory University
Atlanta, Georgia 30322 USA
1986, June

CRITICAL EVALUATION:

The mixed second virial coefficients for the five systems studied by direct analysis are given in the table below.

Table 1. Mixed second virial coefficients for some mercury + gas systems.

Temperature		Second Virial Coefficients, B ₁₂ /cm³ mol ⁻¹					
t∕°C	T/K	Hg + Ar (ref. 3)	$\begin{array}{c} \text{Hg + } \text{C}_{3}\text{H}_{8} \\ \text{(ref. 1)} \end{array}$	$\begin{array}{c} \text{Hg + } C_4 \text{H}_{10} \\ \text{(ref. 1)} \end{array}$	$\begin{array}{c} Hg + CH_3OH \\ (ref. 5) \end{array}$	Hg + CH_3COCH_3 (ref. 5)	
مدة مدة جد خدر			مت من من من من بين بين من من بي				
184.0	457.2	-47	-125	-197			
218.0	491.2	-45	-107	-176			
220.0	493.2				-126	-156	
240.0	513.2				-120	-154	
256.0	529.2	-19	-85	-158			
260.0	533.2				-112	-146	
280.0	553.2				-114	-136	
300.0	573.2				-110	-123	
305.0	578.2	-11					

Values of the mercury vapor second virial coefficient are given in Appendix V.

REFERENCES:

- Jepson, W. B.; Richardson, M. J.; Rowlinson, J. S. Trans. Faraday Soc. 1957, 53, 1586.
- 2. Richardson, M. J.; Rowlinson, J. S. Trans. Faraday Soc. <u>1959</u>, 55, 1333.
- 3. Stubley, D.; Rowlinson, J. S. Trans. Faraday Soc. 1961, 57, 1275.
- 4. Haar, L.; Levelt Sengers, J. M. H. J. Chem. Phys. 1970, 52, 5069.
- 5. Rosenberg, H. S.; Kay, W. B. J. Phys. Chem. <u>1974</u>, 78, 186.

Figure 1 on page 191 reprinted from *J. Chem. Phys.* by permission of the copyright owner, The American Institute of Physics, and the authors (ref. 4).

COMPONENTS :	ORIGINAL MEASUREMENTS:			
(1) Mercury; Hg; [7439-97-6]	Haar, L.; Levelt Sengers, J. M. H.			
(2) Helium; He; [7440-59-7]	J. Chem. Phys. <u>1970</u> , 52, 5069 - 79.			
VARIABLES: T/K = 318.15 - 388.15	PREPARED BY:			
$\rho_2/mol \ dm^{-3} = 0 - 30$	H. L. Clever			
EXPERIMENTAL VALUES:				
n_1/n_1^0 i THEORETICAL AT 2 NANAASSYAND 3T 3 SZIVEK, INCLUDE: FROM 40-100°C 0,1 0 10	He r 50°C RYLAND AT 45°C S DATA POINTS UDES DATA POINTS 1 20 30			
n_1/n_1^g Concentration enhancement for mercury vapor in the gas. $p_2/mol \ dm^{-3}$ Number density of the gas, component 2. The figure reprinted from the J. Chem. Phys. by permission of the copy- right owner, The American Institute of Physics.				
AUXILIARY	INFORMATION			
ME THOD / APPARATUS / PROCEDURE :	REFERENCES :			
The mercury vapor concentration en- hancement was calculated from the total absorption of the 253.7 nm resonance line of mercury as a func- tion of foreign gas density.	 Styrland, J. C.; Nanassy, A. J. <i>Physica</i> <u>1958</u>, 24, 935. Nanassy, A. J. Ph.D. dissertation, <u>1959</u>, Toron- 			
If the absorption per mercury atom is taken to be independent of den- sity, the experiment effectively measures the enhancement of mercury vapor concentration in the gas phase. For the figure above the experimental data were reduced as if the absorption (oscillator strength) per mercury atom remained constant. For this system the experimental data were taken from Stryland and Nanassy (ref. 1), Nanassy (ref. 2), De Kluiver (ref. 3), and Szivek	 De Kluiver, H. Ph.D. dissertation, <u>1959</u>, Amsterdam. Szivek, J. M.S. dissertation, <u>1961</u>, Toronto. Michels, A.; De Kluiver, H. Physica <u>1956</u>, 22, 919. Michels, A.; De Kluiver, H.; Castle, B. Physica <u>1957</u>, 23, 1131. 			
(ref. 4). Additional information will be found in Michels and De Kluiver (ref. 5), Michels, De Klui- ver and Castle (ref. 6), and Mi- chels, De Kluiver, and Middelkoop (ref. 7ab).	 7. Michels, A.; DeKluiver, H.; Middelkoop, D. (a) Physica <u>1958</u>, 24, 543; (b) Physica <u>1959</u>, 25, 163. 			



COMPONENTS :		ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6]		Stubley, D.; Rowlinson, J. S.		
(2) Argon; Ar; [7440-37-1]		Trans. Faraday Soc. <u>1961</u> , 57, 1275 - 80.		
VARIABLES:		DEDADED DV.		
T/K = 457.15 - 578.15 P/MPa = 0.000 - 3.108		H. L. Clever M. Iwamoto		
EXPERIMENTAL VALUES:				
Temperature Pressu	ire	Gas Solubility		
t/°C T/K P/atm	P/MPa	a $c_2/\text{mol dm}^{-3}$ c_1/c_1^{2}		
184.0 457.15 0.000 8.975 18.24 24.16	0.000	0 0.000 1.000 93 0.239 1.032 8 0.485 1.049 8 0.642 1.058		
218.0 491.15 0.000 9.646 19.62 25.99	0.000 0.977 1.988 2.633	0 0.000 1.000 73 0.239 1.030 8 0.485 1.049 9 0.642 1.058		
256.0 529.15 0.000 10.39 21.16 28.04	0.000 1.053 2.144 2.841	0 0.000 1.000 3 0.239 1.010 4 0.485 1.023 1 0.642 1.030		
305.0 578.15 0.000 11.36 23.16 30.67	0.000 1.151 2.346 3.108	0 0.000 1.000 0.239 1.010 5 0.485 1.012 8 0.642 1.036		
Pressures were estimated by S.; Armstrong, B. <u>International</u> <u>Argon</u> . Butterworths, <u>1972</u> . Addi 300°C up to densities of 10 mol dm	the <u>Ther</u> tiona n ⁻³ wh	compilers from the tables of Angus, modynamic <u>Tables of the Fluid State</u> , Il measurements were made at 215 and hich were reported graphically.		
AUXIL	IARY I	INFORMATION		
METHOD / APPARATUS / PROCEDURE :	I	SOURCE AND PURITY OF MATERIALS:		
Below 30 atm -	_	(1) Mercury. No information given.		
Radioactive tracer method (r l). Irradiated Hg and gas a equilibrated with stirring ir 0.5 x 40 cm tube until a count at the top indicates equilibriu	ef. are n a ter m.	(2) Argon. British Oxygen Company, Limited. 99.8 percent pure.		
Above 30 atm - Weight loss method (ref. 2). weight loss of a liquid mercu sample was determined when a kno volume of qas had been brought	The ury own to			
equilibrium by diffusion of the vapor in an autoclave, over period of two weeks.	Hg a	ESTIMATED ERROR: $\delta T/K = \pm 0.2$ $\delta (c_1/c_1^2) / (c_1/c_1^2) = \pm 0.01$		
	 REFERENCES: 1. Jepson, W. B.; Richardson, M. J.; Rowlinson, J. S. Trans. Faraday Soc. <u>1957</u>, 53, 1586. 2. Richardson, M. J.; Rowlinson, J. S. Trans. Faraday Soc. <u>1959</u>, 55, 1333. 			



COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]	Haar, L.; Levelt Sengers, J. M. H.
(2) Krypton; Kr; [7439-90-9]	J. Chem. Phys. <u>1970</u> , 52, 5069 - 79.
VARIABLES:	PREPARED BY:
<i>T/K</i> = 340.15	H. L. Clever
EXPERIMENTAL VALUES:	

AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE:	REFERENCES :
The mercury vapor concentration en- hancement was calculated from the total absorption of the 253.7 nm resonance line of mercury as a func- tion of foreign gas density. If the absorption per mercury atom is taken to be independent of den- sity, the experiment effectively measures the enhancement of mercury vapor concentration in the gas phase. The experimental data were reduced as if the absorption (oscil- lator strength) per mercury atom remained constant. De Kluiver (ref. 1) and Michels <i>et</i> <i>a1.</i> (ref. 2) report a study of the mercury 253.652 nm line in the pre- sence of krypton. However, the study was carried out with unsatu- rated mercury vapor	 De Kluiver, H. Ph.D. dissertation, <u>1959</u>, Amster- dam. Michels, A.; De Kluiver, H.; Middelkoop, D. (a) Physica <u>1958</u>, 24, 543; (b) Physica <u>1959</u>, 25, 163.





COMPONENTS:			ORIGINAL MEASUREMENTS:			
<pre>(1) Mercury; Hg; [7439-97-6] Mercury-203; ²⁰³Hg; [13982-78-0]</pre>			Jepson, W. B.; Richardson, M. J.; Rowlinson, J. S.			
(2) Propane; C ₃ H ₈ ; [74-98-6]			<i>Tra</i> 158	ans. Faraday So 36 - 91.	oc. <u>1957</u> , 53,	
VARIABLES: <i>T</i> /K = 457.15, 491.15, 529.15 P/MPa = 0.00135 - 3.29			PREPA H. M.	RED BY: L. Clever Iwamoto		
EXPERIMENTAL VALUES	5:		1		·····	····
Temperatu	ure	Press	ure		Gas Density	Solubility Ratio
t/°C	<i>T/</i> K	P/atm	P/M	Pa	c ₂ /mol dm ⁻³	c ₁ /c ₁
184.0 4	457.15	0.0133 9.8 18.9	0.00 0.99 1.92	135	0.000 0.273 0.549	1.000 1.076 1.156
218.0 4	491.15	0.0398 10.6 20.6 29.4	0.00 1.07 2.09 2.98	403	0.000 0.273 0.549 0.815	1.000 1.066 1.133 1.180
256.0 5	529.15	0.1144 11.6 22.5 32.5	0.01 1.17 2.28 3.29	159	0.000 0.273 0.549 0.815	1.000 1.050 1.104 1.145
		AUXI	LIARY	INFOR	MATION	
METHOD/APPARATUS/P	ROCEDURE :			SOURC	E AND PURITY OF M	ATERIALS:
Solubility ratio measured by a tra- cer technique. A 25 mg sample of irradiated Hg is placed in a 5.00 mm ID pressure bore tube 40 cm long. A spacer and stirrer are put in place then a measured amount of gas in added. The tube is thermostated by a vapor bath of boiling liquid. Samples are stirred for seven hours. The radio- activity is measured at the top of the tube by a Geiger counter. The count was corrected for decay and background. The count ratio with and without the gas is equivalent to the molar mer- cury ratio with and without gas. c ² ₁ represents the concentration of pure mercury at its equilibrium vapor pressure.		(1)	Mercury and Me irradiated at '''Hg t 2 - decay, activi of isotope '' Propane. Chem Teddington. than 99.5 perc	ercury-203. Sample Harwell. Isotope 7 days allowed to ty 1.6 curie mol ¹ ³ Hg t ₁₂ 47.9 days. dical Research Lab, Purity not less cent.		
		ESTIMATED ERROR:				
		δ(c;	/c ₁)/(c ₁ /c ₁) =	±0.01		
		REFE	RENCES :			

UNIT NOT THE PARATUS / PROCEDURE:UNIT NAME AND DEPARTUS / PROCEDURE:UNIT NAME AND PROVIDE STATE AND PROVIDED AN	00000000000				ODTO			
Trans. Faraday Soc. 1957, 53, 1586 - 91. Temperature Temperature Temperature Temperature Gas Solubility Advantus/Photeburg Gas Solubility Colspan="2">Solubility Advantus/Photeburg Advantus/Photeburg Solubility ratio measured by a tra- cer technique, A 25 mg sample of irradiated ig is placed in a 5.00 m. The tube is thermostated by a tra- cer technique, A 25 mg sample of irradiated ig is placed amount of gas in added. Source AND PURITY OF MATERIALS: Advantus/Photeburg Advantus/Photeburg The tube is thermostated by a vapor the tube is thermostated by a vapor feeresents the concentration of purp ergeners. Source Chemical Research Lab, feeriesent the concentration of purp ressure. Thetube is thermostated by a vapor	COMPONENTS: (1) Mercury; Hg; [7439-97-6] Mercury-203: 203Hg: [13982-78-0]			ORIGINAL MEASUREMENTS: Jepson, W. B.; Richardson, M. J.; Rowlinson, J. S				
VARIABLES: T/X = 457.15, 491.15, 529.15 PMPA = 0.00135 - 3.10PERARED BY: H. L. Clever M. IwamotoEXPERIMENTAL VALUES:TemperaturePressureGasSolubility RatioTemperaturePressureTemperaturePressureTemperaturePressureTemperaturePressureCaseSolubility Ratio184.0457.150.01330.00011.000 1.000104.00.5621.234218.0491.150.03980.004030.0001.0001.011.50.1140.01521.247256.0529.150.1140.01550.0001.000Intert colspan="2">Intert colspan="2"AUXILIARY INFORMATIONMETHOD/APPARATUS/PROCEDURE:Solubility ratio measured by a tra- cer technique, A 25 mg sample of tradiated Bj s placed in a 5.00 mm TD pressure bore tube 40 cm long. A pacer and stirrer are put in place than a measured amount of gas in addd.The tube is thermostated by a vapor bath of boiling liquid. Samples are core retube with and without the ges is equivalent to th	(2) Butane; C ₄ H ₁₀ ; [106-97-8]			<i>Tr</i> 15	ans. Faraday Sc 86 - 91.	oc. <u>1957</u> , 53,		
VARIALES: T/K = 457.15, 491.15, 529.15 P/MPa = 0.00135 - 3.10 EXPERIMENTAL VALUES: Temperature Pressure Gas Solubility $t^{2}C$ T/K $P/Atm P/MPa - c_2/m01 dm^{-2} c_1/c_1^{2}$ 184.0 457.15 0.0133 0.00135 0.000 $1.0009.6$ 0.97 0.277 $1.11517.6$ 1.60 0.552 $1.23424.1$ 2.44 0.838 $1.350218.0$ 491.15 0.0238 0.00403 0.0001 $1.00019.6$ 1.99 0.562 $1.23427.2$ 2.76 0.838 $1.297256.0$ 529.15 0.1144 0.0159 0.2077 $1.08821.9$ 2.72 0.562 $1.761.9$ 2.72 2.76 0.838 $1.24521.9$ 2.72 0.562 $1.761.9$ 2.72 2.76 0.838 $1.24530.6$ 3.10 0.838 $1.2451.77$ 0.277 $1.0881.245256.0$ 529.15 0.1144 0.0159 0.000 $1.0001.0001.027$ $1.08821.9$ 2.72 0.562 $1.761.76$ 30.6 3.10 0.838 $1.2451.77$ $1.0281.2451.77$ 1.028 $1.2451.77$ 1.028 $1.2451.77$ 1.028 $1.2451.78$ 30.6 3.10 0.838 $1.2451.79$ 1.74	-							
EXPERIMENTAL VALUES:TemperaturePressureGasSolubility $t^{2}C^{2}$ DefityRatio $t^{2}C^{2}$ $t^{2}C^{2}$ $t^{2}C^{2}$ $t^{2}C^{2}$ $t^{2}C^{2}$ $t^{2}C^{2}$ $t^{2}C^{2}$ $t^{2}C^{2}C^{2}$ $t^{2}C^{2}C^{2}$ $t^{2}C^{2}C^{2}$ $t^{2}C^{2}C^{2}C^{2}C^{2}C^{2}C^{2}C^{2}C$	VARIABLES: T/K = 457. P/MPa = 0.	15, 491. 00135 - 3	15, 529.15 3.10		PREP. H. M.	ARED BY: L. Clever Iwamoto		
TemperaturePressureGasSolubility Ratio $t''C_{\rm C}$ T/K P/Atm P/MPa $c_2/r0$ $r_1/r0$ $r_1/r0$ 184.0457.150.01330.001350.0001.00017.81.800.5621.234218.0491.150.03980.004030.0001.00010.51.060.2771.10119.61.990.5621.24127.22.760.6381.297256.0529.150.11440.01590.0001.00011.51.170.2771.08821.92.220.5621.276256.0529.150.11440.01590.0001.00011.51.060.2771.08821.92.220.5621.27630.63.100.8381.245SOURCE AND PURITY OF MATERIALS:SOURCE AND PURITY OF MATERIALS:Soure are the state by a tra- car etchique. A 25 mg sample of irradiated Hg is placed in a 5.00 mm ID pressure bore tube 40 cm long. A spacer and stirrer are put in place then a measured at the top of that of boiling liqid. Samples are stirred for seven hours. The radio- activity is measured at the top of the sube state dot measured at the top of the sube state dot doc are and background.ESTIMATED ERROR: toount was corrected for decay and background.REFERENCES:ESTIMATED ERROR: toount was corrected for decay and background. </td <td>EXPERIMENTAL VALU</td> <td>IES:</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	EXPERIMENTAL VALU	IES:						
$\frac{1}{124.0} \frac{1}{127.1} \frac{1}{124.0} \frac{1}{127.1} \frac{1}{127.1} \frac{1}{127.1} \frac{1}{127.1} \frac{1}{127.1} \frac{1}{127.1} \frac{1}{127.1} \frac{1}{127.1} \frac{1}{127.2} \frac{1}{17.2} \frac{1}{127.2} \frac{1}{17.2} \frac{1}{$	Tempera	ture	Press	ure		Gas	Solubility	
Image: Second state in the second	t/°C	<i>т/</i> к	P/atm	P/M	Pa	$c_2/mol dm^{-3}$	c ₁ /c ₁	
218.0 491.15 0.0398 0.00403 0.000 1.000 10.5 1.06 0.277 1.101 19.6 1.99 0.562 1.281 27.2 2.76 0.838 1.297 256.0 529.15 0.1144 0.0159 0.000 1.000 21.9 2.22 0.562 1.176 21.9 2.22 0.562 1.176 30.6 3.10 0.838 1.245 METHOD/APPARATUS/PROCEDURE: Solubility ratio measured by a tra- cer technique. A 25 mg sample of irradiated Hg is placed in a 5.00 mm ID pressure bore tube 40 cm long. A spacer and stirrer are put in place then a measured amount of gas in added. The tube is thermostated by a vapor bath of boiling liquid. Samples are there there a measured at the top of bath of boiling liquid. Samples are curry ratio with and without the gas is equivalent to the molar mer- cury ratio with and without the gas is equivalent to the molar mer- cury ratio with and without the gas is equivalent to the molar mer- cury ratio with and without the gas is equivalent to the molar mer- cury ratio with and without the gas is equivalent to the molar mer- cury ratio with and without the gas is equivalent to the molar mer- cury ratio with and without the gas is equivalent to the molar mer- cury ratio with and without the gas is equivalent to the molar mer- cury ratio with and without the gas is equivalent to the molar mer- cury ratio with and without the gas is equivalent to the molar mer- cury ratio with and without the gas is equivalent to the molar mer- cury ratio with and without the mercury at its equilibrium vapor	184.0	457.15	0.0133 9.6 17.8 24.1	0.00 0.97 1.80 2.44	135	0.000 0.277 0.562 0.838	1.000 1.115 1.234 1.350	
$\begin{array}{c} 256.0 529.15 0.1144 0.0159 0.000 1.000 \\ 11.5 1.17 0.277 1.088 \\ 21.9 2.22 0.562 1.176 \\ 30.6 3.10 0.838 1.245 \end{array}$	218.0	491.15	0.0398 10.5 19.6 27.2	0.00 1.06 1.99 2.76	403	0.000 0.277 0.562 0.838	1.000 1.101 1.201 1.297	
AUXILIARY INFORMATIONMETHOD/APPARATUS/PROCEDURE:SOURCE AND PURITY OF MATERIALS:Solubility ratio measured by a traccer technique. A 25 mg sample of irradiated Hg is placed in a 5.00 mm ID pressure bore tube 40 cm long. A spacer and stirrer are put in place then a measured amount of gas in added.SOURCE AND PURITY OF MATERIALS:The tube is thermostated by a vapor bath of boiling liquid. Samples are stirred for seven hours. The radio- activity is measured at the top of the tube by a Geiger counter. The count was corrected for decay and background.SOURCE AND PURITY OF MATERIALS:The count ratio with and without the gas is equivalent to the molar mer- cury at its equilibrium vapor pressure.SOURCE AND PURITY OF MATERIALS:EFFERENCES:SOURCE AND PURITY OF MATERIALS:Source AND PURITY of MATERIALS:(1) Mercury and Mercury-203. Sample irradiated at Harwell. Isotope irradiated at Harwell. Isotope isotope ***Hg t 1 47.9 days.The tube is thermostated by a vapor bath of boiling liquid. Samples are stirred for seven hours. The radio- activity is measured at the top of the tube by a Geiger counter. The goar is equivalent to the molar mer- cury at its equilibrium vapor pressure.EFFERENCES:	256.0	529.15	0.1144 11.5 21.9 30.6	0.01 1.17 2.22 3.10	59	0.000 0.277 0.562 0.838	1.000 1.088 1.176 1.245	
AUXILIARY INFORMATIONMETHOD/APPARATUS/PROCEDURE:SOURCE AND PURITY OF MATERIALS:Solubility ratio measured by a tracer technique. A 25 mg sample of irradiated Hg is placed in a 5.00 mm ID pressure bore tube 40 cm long. A spacer and stirrer are put in place then a measured amount of gas in added.SOURCE AND PURITY OF MATERIALS:The tube is thermostated by a vapor bath of boiling liquid. Samples are stirred for seven hours. The radio- activity is measured at the top of the tube by a Geiger counter. The count was corrected for decay and background.Source and without the gas is equivalent to the molar mer- cury ratio with and without the gas is equivalent to the molar mer- cury ratio with and without gas. c_1° represents the concentration of pure mercury at its equilibrium vapor pressure.Source and PURITY OF MATERIALS: Source and Mercury-203. Sample irradiated at Harwell. Isotope 1*7Hg t, 2 - 7 days allowed to decay, activity 1.6 curie mol 1 of isotope ***Hg t, 47.9 days. (2) Butane. Chemical Research Lab, Teddington. Purity not less than 99.5 percent.ESTIMATED ERROR: ($c_1/c_1^\circ) = \pm 0.01$								
METHOD/APPARATUS/PROCEDURE:SOURCE AND PURITY OF MATERIALS:Solubility ratio measured by a tra- cer technique. A 25 mg sample of irradiated Hg is placed in a 5.00 mm ID pressure bore tube 40 cm long. A spacer and stirrer are put in place then a measured amount of gas in added.(1) Mercury and Mercury-203. Sample irradiated at Harwell. Isotope 1°7Hg t, 2 - 7 days allowed to decay, activity 1.6 curie mol 1 of isotope 2°3'Hg t, 47.9 days.The tube is thermostated by a vapor bath of boiling liquid. Samples are stirred for seven hours. The radio- activity is measured at the top of the tube by a Geiger counter. The count was corrected for decay and background.Source AND PURITY OF MATERIALS: (1) Mercury and Mercury-203. Sample irradiated at Harwell. Isotope 1°7Hg t, 2 - 7 days allowed to decay, activity 1.6 curie mol 1 of isotope 2°3'Hg t, 47.9 days.(2) Butane. Chemical Research Lab, Teddington. Purity not less than 99.5 percent.(2) Butane. Chemical Research Lab, Teddington. Purity not less than 99.5 percent.(3) Cr_1/c_1^2) = \pm0.01The count ratio with and without the gas is equivalent to the molar mer- cury ratio with and without gas. c_1^2 represents the concentration of pure mercury at its equilibrium vapor pressure.REFERENCES:			AUX	ILIARY	INFOF	RMATION		
Solubility ratio measured by a tra- cer technique. A 25 mg sample of irradiated Hg is placed in a 5.00 mm ID pressure bore tube 40 cm long. A spacer and stirrer are put in place then a measured amount of gas in added. The tube is thermostated by a vapor bath of boiling liquid. Samples are stirred for seven hours. The radio- activity is measured at the top of the tube by a Geiger counter. The count was corrected for decay and background. The count ratio with and without the gas is equivalent to the molar mer- cury ratio with and without gas. c_1° represents the concentration of pure mercury at its equilibrium vapor pressure.	METHOD/APPARATUS	PROCEDURE	:		SOUR	CE AND PURITY OF N	ATERIALS:	
the tube by a Geiger counter. The count was corrected for decay and background. The count ratio with and without the gas is equivalent to the molar mer- cury ratio with and without gas. c_1^{γ} represents the concentration of pure mercury at its equilibrium vapor pressure. ESTIMATED ERROR: $\delta(c_1/c_1^{\gamma})/(c_1/c_1^{\gamma}) = \pm 0.01$	Solubility ratio measured by a tra- cer technique. A 25 mg sample of irradiated Hg is placed in a 5.00 mm ID pressure bore tube 40 cm long. A spacer and stirrer are put in place then a measured amount of gas in added. The tube is thermostated by a vapor bath of boiling liquid. Samples are stirred for seven hours. The radio- activity is measured at the top of the tube by a Geiger counter. The count was corrected for decay and background.			(1) (2)	Mercury and Me irradiated at ${}^{197}Hgt_{12} 2 -$ decay, activi of isotope 20 Butane. Chem. Teddington. than 99.5 perc	ercury-203. Sam Harwell. Isot 7 days allowed ty 1.6 curie mo ⁹ Hg t ₂ 47.9 days ical Research L Purity not 10 cent.	ple ope to 1 ¹ ab, ess	
background. The count ratio with and without the gas is equivalent to the molar mer- cury ratio with and without gas. c_1^2 represents the concentration of pure mercury at its equilibrium vapor pressure. $\delta(c_1/c_1^2)/(c_1/c_1^2) = \pm 0.01$ REFERENCES:				ESTI	MATED ERROR:			
The count ratio with and without the gas is equivalent to the molar mer- cury ratio with and without gas. c_1° represents the concentration of pure mercury at its equilibrium vapor pressure.				δ(c	1/c ₁)/(c ₁ /c ₁) =	: <u>+</u> 0.01		
	The count ratio with and without the gas is equivalent to the molar mer- cury ratio with and without gas. c_1° represents the concentration of pure mercury at its equilibrium vapor pressure.		REFE	RENCES :	<u></u>			
	L				<u>i</u>			

CONTONENTED -			OPTOTNAL MELO	IDENENITO -			
(1) Mercury, Ha.	-61	Dichardco	ORIGINAL MEASUREMENTS:				
(1) Mercury; Hg; $(/439-9/-6)$				Richardson, M. J.; Rowlinson, J. S.			
(2) Butane; C_4H_{10}); [106-9]	/-81	<i>Trans. Fa:</i> 1333 - 7.	raday Soc.	<u>1959</u> , 55,		
VARIABLES:		5	PREPARED BY:	10.2			
P/MPa = 7.1 -	38.5	5	M. Iwamoto	D			
EVDEDIMENTAL VALUES.			<u> </u>				
EAFERIMENTAL VALUES;							
Temperature	Pres	sure	Gas	Weight of	Solubility		
t/°C T/K	P/atm	P/MPa	c ₂ /mol dm ⁻³	mercury m ₁ /mg	c ₁ /c ₁		
215.5 488.65	70	7.1	2.728	14.6	1.86		
215.3 488.45	90	9.1	4.617	20.3	2.67		
	200 200	20.3	6.910	23.2	3.52		
215.1 488.25	220	22.3	7.112	27.7	3.70		
257.6 530.75	80	8.1	2.678	44.4	1.75		
254.5 527.65	130 270	13.2 27.4	4.726	51.6 67.2	2.35		
200 0 570 05	100	10.3	0.705	07 0	3 54		
299.8 572.95	170	17.2	2.725 4.636	8/.U 105.8	1.54 2.02		
293.5 566.65	380	38.5	6.905	121.3	2.37		
		AUXILIAR	Y INFORMATION				
METHOD/APPARATUS/PRO	CEDURE:		SOURCE AND PU	RITY OF MATERIA	ALS:		
Weight loss meth	od. A sm	all reser-	(1) Mercury	y. No infor	mation given.		
mercury is plac	a known ed in an	all-glass	(2) Butane.	Prepared	from 1-bromo-		
bulb containing	a known	volume of	butane	Grignard r	eagent and 1-		
gas. The glass home for the glass home for the glass has been as the glass home for the glass has been as the	oulb fits ure is e	in a steel stablished	butano	times to insure absence of air			
and maintained for	or up to	three weeks	and sto	and stored in sealed bulbs.			
which is three t	imes to t	ime calcu-					
to reach 98% satu	iration.	The system	i				
jis cooled to roo	om temper	ature, the					
servoir weighed to determine mercury			ESTIMATED ERI	ROR:			
designed that mer	cury reser	voir is so densed from	$\delta T/K = +0.$.2			
cooling does not enter.				-			
			DEFEDENCIA				
			REFERENCES:				

COMPONENTS:			OR	ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg; [7439-97-6]			1	Rosenberg, H. S.; Kay, W. B.		
(2) Methanol or Methyl alcohol; CH ₄ O; [67-56-1]			e	J. Phys. Chem.	<u>1974</u> , 78, 186 — 9.	
VARIABLES:		·······	PR	EPARED BY:		
T/K = 493 $P/MPa = 0.0$.15 - 57 0429 - 3	3.15 .16	H	H. L. Clever M. Iwamoto		
EXPERIMENTAL VALUE						
Temperat t/°C	Temperature Pressure 		ure P/MPa	Gas - Density c ₂ /mol dm ⁻ 3	Solubility Ratio c ₁ /c ₁	
220.0	493.15	0.0423 10.1 13.8 17.4 21.6 24.5	0.0042 1.02 1.40 1.76 2.19 2.48	9 0.000 0.267 0.374 0.479 0.634 0.744	1.000 1.063 1.087 1.109 1.132 1.143	
240.0	513.15	0.0748 10.7 14.5 18.1 23.0 26.3	0.0075 1.08 1.47 1.83 2.33 2.66	8 0.000 0.267 0.374 0.479 0.634 0.744	1.000 1.059 1.083 1.105 1.125 1.136	
260.0	533.15	0.1267 11.2 15.3 19.1 24.4 27.9	0.0128 1.13 1.55 1.94 2.47 2.83	4 0.000 0.267 0.374 0.479 0.634 0.744	1.000 1.056 1.080 1.100 1.126 1.135	
280.0	553.15	0.2064 11.8 16.1 20.1 25.8 29.6	0.0209 1.20 1.63 2.04 2.61 3.00	1 0.000 0.267 0.374 0.479 0.634 0.744	1.000 1.055 1.081 1.099 1.120 1.131	
300.0	573.15	0.3247 12.4 16.9 21.1 27.1 31.2	0.0329 1.26 1.71 2.14 2.75 3.16	0 0.000 0.267 0.374 0.479 0.634 0.744	1.000 1.055 1.075 1.098 1.114 1.125	

The data above appeared only in the microfilm edition of the Journal.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]	Rosenberg, H. S.; Kay, W. B.
(2) Methanol or Methyl alcohol; CH ₄ O; [67-56-1]	J. Phys. Chem. <u>1974</u> , 78, 186 - 9.
VARIABLES: T/K = 493.15 - 573.15 P/MPa = 0.00429 - 3.16	PREPARED BY: H. L. Clever M. Iwamoto
EXPERIMENTAL VALUES:	1

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AUXILIARY	INFORMATION						
METHOD / APPARATUS / PROCEDURE :	SOURCE AND PURITY OF MATERIALS:						
A modification of the radioactive tracer technique of Jepson, <i>et al</i> . (ref. 1), was used.	(1) Mercury. Liquid Hg sample tag- ged with $2^{\circ 3}$ Hg $\#_{J_1} = 46.59$ days) at initial specific activity of 7.5 mCi/g.						
A 0.500 x 40 cm Pyrex precision-bore tube was used. The 27 mg sample of radioactive Hg was held in a cup at the top of the tube. A magnetically driven stirrer reciprocated the length of the tube. The tube was thermostated by refluxing vapor. The gas was distilled into the tube and its mass determined from the	(2) Methanol. Source not given. Described as ultra-high-purity and distilled <i>in vacuo</i> into the apparatus before use.						
	REFERENCES :						
viral coefficient (ref. 2).	 Jepson, W. B.; Richardson, M. J.; Rowlinson, J. S. 						
Temperature was established and the equilibrium cell stirred continu- ously until successive readings at	Trans. Faraday Soc. <u>1957</u> , 53, 1586.						
four hour intervals differed by no more than 0.3 percent in 100,000 accumulated counts (usually two days).	2. Lambert, J. D.; Roberts, G. A. H.; Rowlinson, J. S.; Wilkinson, V. J. Proc. Royal Soc., Ser A <u>1949</u> , 196, 113.						
Components :				ORIGINAL MEASUREMENTS:			
------------------------------	----------------------	--------------------------------------	--------------------------------------	---	---	--	--
(1) Mercury; Hg	;; [7439-9	7-6]	1	Rosenberg, H. S	.; Kay, W. B.		
(2) 2-Propanone [67-64-1]	or Aceton	ne; C ₃ H ₆ C	ن ;C	J. Phys. Chem.	<u>1974</u> , 78, 186 -	9.	
WADTARIES .		<u> </u>		nalanah nu.			
T/K = 493. P/MPa = 0.89	15 - 573.: - 2.82	15	H	EPARED BI: H. L. Clever M. Iwamoto			
EXPERIMENTAL VALUES	::					,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
 Temper	ature	Pres	sure	Gas	Solubility		
 t/°C	т/к	P/atm	P/MPa	Density c ₂ /mol dm ⁻²	Ratio c ₁ /c ₁		
220.0	493.15	8.8 12.8 16.1 19.1 21.0	0.89 1.30 1.63 1.94 2.13	0.241 0.371 0.492 0.631 0.730	1.077 1.115 1.154 1.191 1.216		
240.0	513.15	9.3 13.6 17.1 20.6 22.7	0.94 1.38 1.73 2.09 2.30	0.241 0.371 0.492 0.631 0.730	1.073 1.110 1.147 1.172 1.196		
260.0	533.15	9.8 14.4 18.2 22.0 24.5	0.99 1.46 1.84 2.23 2.48	0.241 0.371 0.492 0.631 0.730	1.068 1.104 1.140 1.165 1.185		
280.0	553.15	10.3 15.2 19.3 23.4 26.1	1.04 1.54 1.96 2.37 2.64	0.241 0.371 0.492 0.631 0.730	1.065 1.097 1.130 1.152 1.174		
300.0	573.15	10.9 16.0 20.4 24.9 27.8	1.10 1.62 2.07 2.52 2.82	0.241 0.371 0.492 0.631 0.730	1.058 1.089 1.123 1.146 1.164		

The raw data above appreared only in the microfilm edition of the Journal.

The mercury vapor pressure at each temperature is given in the mercury + methanol data sheet, p. 203.

COMPONENTS :	ORIGINAL MEASUREMENTS:				
(1) Mercury; Hg; [7439-97-6]	Rosenberg, H. S.; Kay, W. B.				
(2) 2-Propanone or Acetone; C ₃ H ₆ O; [67-64-1]	J. Phys. Chem. <u>1974</u> , 78, 186 - 9.				
VARIABLES: <i>T</i> /K = 493.15 - 573.15 P/MPa = 0.89 - 2.82	PREPARED BY: H. L. Clever M. Iwamoto				
EXPERIMENTAL VALUES:					

AUXILIARY	INFORMATION		
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:		
A modification of the radioactive tracer technique of Jepson, <i>et al</i> . (ref. 1), was used.	(1) Mercury. Liquid Hg sample tag- ged with ² ⁹ Hg (t ₁ = 46.59 days) at initial specific activity of 7.5 mCi/g.		
A 0.500 x 40 cm Pyrex precision-bore tube was used. The 27 mg sample of radioactive Hg was held in a cup at the top of the tube. A magnetically driven stirrer reciprocated the length of the tube. The tube was thermostated by refluxing vapor.	(2) Acetone. Source not given. Described as ultra-high-purity and distilled in vacuo into the apparatus before use.		
and its mass determined from the	REFERENCES :		
equation of state up to the second viral coefficient (ref. 2). Temperature was established and the equilibrium cell stirred continu-	 Jepson, W. B.; Richardson, M. J.; Rowlinson, J. S. 		
	Trans. Faraday Soc. <u>1957</u> , 53, 1586.		
four hour intervals differed by no more than 0.3 percent in 100,000 accumulated counts (usually two days).	2. Lambert, J. D.; Roberts, G. A. H.; Rowlinson, J. S.; Wilkinson, V. J. Proc. Royal Soc., Ser A <u>1949</u> , 196, 113.		

COMPONENTS:	EVALUATOR:
(l) Mercury; Hg; [7439-97-6] (2) Molten and Solid Salt Systems	H. Lawrence Clever Chemistry Department Emory University Atlanta, Georgia 30322 USA
	<u>1986</u> , June

The Solubility of Mercury in Some Molten and Solid Salt Systems.

There are several papers reporting the solubility of metallic mercury in molten salts. Most, if not all, of these systems involves a chemical reaction. Also included in this section is a paper on emulsification of mercury by freshly precipitated oxides and a paper on the retrograde solubility of mercury in solid mercury telluride. There are no confirming data for any of the systems. All of the data are classed tentative. The individual systems are discussed below.

Mercury + Sodium chloride; [7647-14-5] + Aluminum chloride; [7446-70-0]

Plotnikov and Fortunatov (ref. 1) report the solubility of mercury in a melt of 0.680 mole fraction sodium chloride. The mercury solubility increases from 0.065 weight percent at 491 K to 1.521 weight percent at 623 K. The authors state that the solubility of mercury obeys Henry's law and there is no chemical reaction between mercury and the molten salt components. In view of the reactions in other mercury + molten salt systems the last statement is of doubtful validity.

Mercury + Iron; [7439-89-6] + Iron (II) sulfide; [1317-37-9]

Vogel (ref. 2) studied 24 elements as additives to the Fe + FeS system. The paper contains a small scale figure of the Hg-Fe S system at an undefined high temperature. He implies the reaction Hg + FeS = Fe + HgS takes place and the equilibrium lies well to the left. There are no quantitative data for the system. No data sheet was prepared.

Mercury + Mercury (II) chloride; [7487-94-7]

Yosim and Mayer (ref. 3) report the solubility of mercury in mercury (II) chloride by a freezing point depression method. The mercury solubility increases from 0 to 0.0485 mole fraction as the temperature decreases from 552.65 K (the mp of pure HgCl_2) to 545.61 K. The authors present evidence that the reaction

$$Hg + HgCl_2 = Hg_2Cl_2$$

takes place, and that the dissolved species in not mono-atomic Hg, but the disproportionation product Hg_2Cl_2 .

Mercury + Lithium chloride; [7447-41-8] + Potassium chloride; [7447-40-7]

Delmaskii *et al.* (ref. 4) report a mercury solubility of 0.113 mass percent at 673 K in the eutectic salt mixture of 0.583 mole fraction LiCl. The dissolution of mercury is accompanied by the reaction

 $2 \text{ Hg} + 2 \text{ LiCl} = \text{Hg}_2\text{Cl}_2 + 2 \text{ Li}$

Mercury + Lead (IV) oxide; [1309-60-0] Mercury + Mercury (II) oxide; [21908-53-2]

Pichugina (ref. 5) reports that active PbO₂ and HgO precipitates are good emulsifiers for metallic mercury. No data sheet was prepared.

Mercury + Mercury telluride; [12068-90-5]

Levitskaya at al. (ref. 6) studied solid HgTe between 477 and 873 K

in the presence of excess Hg and Te. The systems has a retrograde solidus curve. At the mercury boundry, mercury is soluble in HgTe between 553 and 673 K. The maximum solubility of mercury in HgTe is 1.7×10^{-5} percent at 626.7 K.

REFERENCES:

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- 2. Vogel, R. Chalmers teka Hogskolas Handl. <u>1943</u>, No. 18, 24 pp.
- Yosim, S. J.; Mayer, S. W. J. Phys. Chem. <u>1960</u>, 64, 909; USAEC Report <u>1960</u>, NAA-SR-5094.
- Delimarskii, Yu. K.; Tumanova, N. Kh.; Prikhod'ko, M. U. Zh. Neorg. Khim. <u>1971</u>, 16, 559; Russ. J. Inorg. Chem. (Engl. Transl.) <u>1971</u>, 16, 298.
- Pichugina, A. Acta Univ. Voronegienis <u>1935</u>, 8(2), 18 20; Chem. Abstr. <u>1938</u>, 32, 5680.
- 6. Levitskaya, T. D.; Vanyukov, A. V.; Krestovikov, A. N.; Bykharov, I. M. Izv. Akad. Nauk SSSR, Neorg. Mater. <u>1970</u>, 6(5), 849; Inorg. Mater. (Engl. Transl.) <u>1970</u>, 6, 747.

COMPONENTS :			ORIGINAL	MEASUREME	NTS:			
(1) Mercury; Hg; [7439-97-6];			Plotn.	ikov, V.	A.;	Fortu	inatov,	N. S.
<pre>(2) Sodium chloride; NaCl; [7647-14-5]</pre>			Mem <u>1936</u> ,	Inst. Ch 3, 123	<i>em.,</i> - 8.	Ukr.	Acad.	Sci.
(3) Aluminum chloride [7446-70-0]	; AlCl	31						
VARIABLES:			PREPARED	BY:				
T/K = 491.15 - 623 solvent, NaCl, $x_2 = 1$.15 0.680		H. L. M. Iwa	Clever amoto				
EXPERIMENTAL VALUES:			L					
	Tempe t/°C	rature <i>T/K^a</i>	Mercury Percent	Weight				
	218	491.15	0.066 0.066 0.064					
			0.065	avg.				
	223	496.15	0.074					
			0.076	avg.				
	268	541.15	0.880	[S1C.]				
	302	575.15	0.559 0.560 0.561					
			0.560	avg.				
	307	580.15	0.560					
	350	623.15	1.521					
a	Calcul	ated by co	ompilers	•				
		AUXILIARY	INFORMATI	ON				
METHOD/APPARATUS/PROCEDURE:			SOURCE A	ND PURITY	OF MA	TERIAL	S:	
The solubility of meron mined in a NaCl + Ale was 48.3 wt % NaCl, AlCl ₃ . This corresp fraction of 0.680 NaC	cury wa Cl ₃ me and 5 onds t l.	as deter- lt which 1.7 wt % co a mole						
The authors state the mercury obeys Henry's is no chemical reacti Hg and solvent.	e solul law a ion bet	bility of and there tween the						
			ESTIMATE	D ERROR:				
			REFERENC	ES:				

COMPONENTS:	ORIGINAL MEASUREMENTS:				
(1) Mercury; Hg; [7439-97-6]	Delimarskii, Yu. K.; Tumanova, N. Kh.; Prikhod'ko, M. U.				
<pre>(2) Lithium chloride; LiCl; [7447-41-8]</pre>	Zh. Neorg. Khim. <u>1971</u> , 16, 559 -				
<pre>(3) Potassium chloride; KCl; [7447-40-7]</pre>	Russ. J. Inorg. Chem. (Eng. Trans.) <u>1971</u> , 16, 298 - 9.				
VARIABLES:	PREPARED BY:				
T/K = 673.15	H. L. Clever				
EXPERIMENTAL VALUES:	······································				
Temperature Potassium chloride Mole fraction	Mercury as Hg ₂ Cl ₂ Mercury as Hg Mole fraction				
t/°C T/K x3	mass % 10*x1				
400 673.15 0.417	0.113 2.8				
The system is liquid mercury i eutectic mixture at 673.15 K. The LiCl + KCl is accompanied by the re	in equilibrium with the LiCl + KCl dissolution of the mercury in the eaction:				
2Hg + 2LiCl =	Hg ₂ Cl ₂ + 2Li.				
The mass $%$ Hg ₂ Cl ₂ was read from a small graph in the paper. The value with respect to mercury was given in the paper. From the 2.8 x 10 ⁻⁴ mole fraction value, we calculated a Hg ₂ Cl ₂ mass $%$ of 0.118, which is five percent larger than the graph value. The authors did not state the LiCl + KCl eutectic composition. The eutectic mixture is 0.417 mole fraction KCl and 0.583 mole fraction LiCl (ref. 1 - 3).					
AUXILIARY	INFORMATION				
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:				
The mercury and the LiCl + KCl salt eutectic were added to a special cell. The system was heated at 2 deg min ⁻¹ to a temperature of $(400 \pm$ 5)°C. The system was maintained at the temperature for 3 hours, with periodic agitation. The solubility experiment was carried out in a atmosphere of argon and also under vacuum conditions.	No information on the source or purity of the compounds.				
The saturated solution was analyzed by polarography with solid platinum wires as electrodes. The mercury ion was reduced in a single wave with n = 1. A calibration wave was prepared using known amounts of	ESTIMATED ERROR: $\delta T/K = \pm 5$ $\delta x_1/x_1 = \pm 0.05$ (compiler) REFERENCES:				
Hg2C12.	 Reitel, H. <i>Kali</i> <u>1923</u>, 17, 248, 261. Richards, T. W.; Meldrum, W. B. <i>J. Am. Chem. Soc.</i> <u>1917</u>, 39, 1816 - 28. Elchardus, E.; Laffitte, P. <i>Bull. Soc. Chim. France</i> <u>1932</u> <i>51</i>, 1572 - 9. 				

COMPONENTS:	ORIGINAL MEASUREMENTS:			
(1) Mercury; Hg; [7439-97-6];	YOSIM, S. J.; Mayer, S. W.			
(2) Mercury(II) chloride; HgCl ₂ ;	J. Phys. Chem. <u>1960</u> , 64, 909 - 11.			
[/40/-94-/]	USAEC Report <u>1960</u> , NAA-SR-5094,			
	9 pp.			
VARIABLES:	PREPARED BY:			
T/K = 545.61 - 551.60	H. L. Clever			
EXPERIMENTAL VALUES:				
Temperature Fre	ezing Point Mole Fraction			
	ression			
272.4 ₆ 545.6 ₁	7.04 4.85			
273.1 ₆ 546.3 ₁	6.34 4.27			
274.4 ₆ 547.6 ₁	5.04 3.16			
276.1 ₀ 549.3 ₄	3.31 2.15			
277.7 ₇ 550.9 ₂	1.73 1.09			
278.4 ₅ 551.6 ₀	1.05 0.69			
279.5 ^b 552.6 ₅	0 0			
^a Calculated by compi builting	ler.			
	ie nyciz.			
The authors present species is not mono portionation product	evidence that the dissolved atomic Hg, but the dispro- Hg ₂ Cl ₂ .			
Hg + Hg	Cl ₂ → Hg ₂ Cl ₂ .			
AUXIL	TARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
Freezing point depression meth	od. (1) Mercury. Source not given; tri- in ple distilled.			
a 18 mm Pyrex or Vycor tube wh	ich			
sealed in the bottem of the tu	be. not given. Reagent grade; dried			
Temperatures were measured wit	h a under a vacuum at 110°C for 24 no- hours.			
couple. The samples were heated	in			
by a regulator-pyrometer operat.	ing			
through a variable transformer.				
The paper contains data on the H	g + ESTIMATED ERROR:			
sition range and temperatures up 825 K.	to $\delta x_1 = \pm 0.0005$ (compiler)			
The AEC Report is identical to	the REFERENCES:			
published paper.				

COMPONENTS:			ORIGINAL MEAS	UREMENTS:		
(1) Mercury; Hg;	[7439-97	7-6]	Levitskaya, T. D.; Vanyukov, A. V.; Krestovnikov, A. N.;Bykbarov, T. M.			
(2) Mercury telluride; HgTe [12068-90-5]			<i>Izv. Akad. Nauk SSSR, Neorg. Mater.</i> <u>1970</u> , 6(5), 849 - 54; Inorg. Mater. (Engl. Transl.) <u>1970</u> , 6(5), 747 - 51.			
VARIABLES:			PREPARED BY:	<u> </u>		
T/K = 553 - 6	53		H. L. Cle	ver		
EXPERIMENTAL VALUES:						
Temperature	Type		Mercury	Boundry		
t/°C T/K	Excess	c/atom c	m ⁻³ Excess Component, atom %			
204 477	p	-8 x 10 ¹⁵	~	1.4 x 10 ⁻⁵	(Te)	
300 573 353.5 626.7	n n	3 x 10 ¹⁵ 9.9 x 10 ¹⁵		5.1 x 10 ⁻⁶ 1.68 x 10 ⁻⁵	(Hg) (Hg)	
400 673 451 724 505 778 600 873	р р р	(0.8 - 1.9) -3 x 10 ¹⁶ 2.3 x 10 ¹⁸	x 10 ¹⁸ (1.4 - 3) x 10 ⁻⁵ 5 x 10 ⁻⁵ 3.9 x 10 ⁻³ -	" (Te) (Te) (Te)	
Data for the t the maximum so The melting po sition toward	ellurium olubility oint maxin tellurium	of telluriur num is displa M.	lso in the n is 1.9 x 1 ced from th	paper. At tha 0 ⁻² atom %. e stoichiomet:	ric compo-	
		AUXILIARY	INFORMATION			
METHOD/APPARATUS/PRO	OCEDURE :		SOURCE AND P ESTIMATED ER REFERENCES:	URITY OF MATERIAI	.S :	

COMPONENTS:	EVALUATOR:			
(1) Mercury; Hg; [7439-97-6](2) Other Elements	H. Lawrence Clever Chemistry Department Emory University Atlanta, Geogia 30322 USA <u>1986</u> , June			

The Solubility of Mercury in Other Elements.

The solubility data in this section includes both mercury(1) + element(1) and mercury(1) + element(s) systems. In only one case, mercury + gallium (ref. 8), was phase equilibrium measured and the solubility of the element in mercury determined too. The liquid + liquid systems are mercury + phosphorous and mercury + gallium. The other systems are liquid solute + solid solution systems. The mercury + zinc and the mercury + tin systems were studied by emf methods at room temperature with the solid an electrode in contact with aqueous solution. The mercury + sodium and mercury + potassium systems were studied by an electrical resistance technique. The other systems were studied by an x-ray method. In the x-ray method various amounts of mercury are heated with the element. If the lattice parameter is measured before and after the treatment. If the lattice parameter changes by less than 0.001 x 10^{-10} m the solubility of mercury in the solid is considered negligible. If the lattice parameter changes by less than 0.001 x 10^{-10} m these studies except for the mercury + silver and mercury + gold systems. The data are classed tentative.

The papers in this section were found by a *Chem. Abstr.* search under the heading "Mercury, properties, soly of". Papers listed under "Mercury, properties, systems", which may contain additional data, were not covered. Papers from this heading can be found in *Solubility Series Vol. 25 Metals in Mercury* edited by Galus, Guminski and Hirayama.

The table below lists the systems for which data are known from our literature search. Given in the table is the element in order of its atomic number, the temperature and mole fraction solubility of mercury in the element, and the reference number.

Element	Temperature T/K	Mercury Solubility Mole Fraction, x_1	Reference	
Liquid + Liquid Systems				
Phosphorus; P	298	0.000176	7	
Gallium; Ga	308 373	0.032	8	
Liquid + Solid Systems				
Sodium; Na	296 333	0.00045	13	
Silicon; Si +	1473	-	12	
Potassium; K	270 318	-	13	
Manganese, Mn	773	0.004	11	
Zinc: Zn	293	0.020	10	
Silver; Ag	373	0.364	3	
Tin: Sn	298	0.075	4	
Tellurium; Te	573 713	0.014 0.003	9	
Platinum; Pt	493 528	0.01 0.153	11	
	713	0.183		
Gold: Au	477	0.168	6	
····	583 693	0.182 0.195		

Jangg and Lugscheider (ref. 11) found negligible mercury solubility in ninteen solid elements by the x-ray method. A small solubility below their limit of detection may exist. The elements are aluminum, titanium, vanadium, chromium, iron, cobalt, nickel, zirconium, niobium, molybdenum, ruthenium, rhodium, tantalum, tungsten, rhenium, osmium, iridium, thorium, and uranium. More information is summarized on a data sheet.

Some further comments about the systems above.

Mercury + Gallium (ref. 8). The mercury rich phase in equilibrium with the gallium rich phase contains 0.036 and 0.039 mole fraction gallium at 308 and 373 K, respectively.

Mercury + Silicon + Phosphorous (ref. 12). Silicon at 1473 K was doped with phosphorus. The mercury solubility is a function of the phosphorus concentration. We estimate from the abstract data that the mole fraction of mercury increases from 1×10^{-9} to 2×10^{-9} as the phosphorous mole fraction increases from 4×10^{-10} to 8×10^{-5} .

Mercury + Potassium (ref. 13). The authors were unable to obtain reproducible data. The solubility is less than in sodium. There were indications the solubility decreased as the temperature increased from 270 to 318 K.

Mercury + Silver. Earlier studies (ref. 1, 14, 15) give appreciably lower results than the results of Day and Mathewson (ref. 3) presented here. It is likely the earlier studies were carried out without proper precautions to prevent loss of the volatile mercury.

Mercury + Platinum (ref. 11). An abrupt increase in the solubility at about 523 K corresponds to a peritechtic reaction in the system.

Mercury + Gold. Mercury + gold solubility data are reported in at least five papers (ref. 1, 2, 3, 5, and 6). Data sheets were prepared from references 3 and 6. The data in the table above are from ref. 6. The papers agree that an alpha + beta = alpha + liquid transformation occurs at 693 K, which is the temperature of the maximum mercury solubility.

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1. Stenbeck, S. Z. anorg. Chem. 1933, 45, 16.

2. Zakharova, M. I. Zh. Tekhn. Fiz. 1937, 7, 171.

- 3. Day, H. M.; Mathewson, C. H. Trans. Am. Inst. Min. Metall. Pet. Eng. <u>1938</u>, 128, 261.
- 4. Haring, M. M.; White, J. C. Trans. Electrochem. Soc. 1938, 73, 211.
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COMPONENTS			ODICINAL ACTACUDENCE			
(1) Mercury; Hg; [7439-97-6]			Rotatiu. G. J.: Schramke. E.:			
(2) Phosphore		-	Gilman, T. S.; Hildebrand, J. H.			
			J. Am. Chem. Soc. <u>1951</u> , 73, 2527 - 8.			
VADTARI ES.						
VARIABLES.			H. L. Clever			
T/K = 298.	.15		M. Iwamoto			
EXPERIMENTAL VALU	UES:		I			
T	emperature	Equilibra	tion Solubility			
t	/°C T/K	Time t∕m	mg Hg in 2 cm³ P ₄			
W	ater saturated	phosphoru	s			
2	5.0 298.15	12	0.8			
		10 15	1.0			
		20	1.0			
		10	1.11 ^a			
_		10	0.90~			
D	ry phosphorus					
2	5.0 298.15	17 17	1.45 1.25			
		17 17	0.74 1.28			
^a These two runs were mad Their average was used density of 1.761 g cm ⁻ the solubility in the fo 0.285 mg g ⁻¹ (1.42 x 1.76 x 10 ⁻⁴ mol mol ⁻¹		were mad was used 61 g cm ⁻³ in the fo (1.42 x mol mol ⁻¹ :m ³ cm ⁻³ .	e using a microbalance. along with a phosphorus ⁹ (ref. 1) to calculate llowing units: 10 ⁻³ mol kg ⁻¹) (mole fraction, x ₁)			
<u> </u>	<u></u>	AUXILIARY	INFORMATION			
METHOD/APPARATUS/	PROCEDURE :	<u></u>	SOURCE AND PURITY OF MATERIALS:			
About 2 - 4 g	of carefully	weighed	(1) Mercury. No information.			
cm tube. Air	free water wa	as added	(2) Phosphorus. Commercial c.p.			
pipetted was	s in under th	ospnorus e water	melting under a dilute H ₂ SO ₄ -			
surface at 4 rocked slowly	4°C. The tub at 25.0°C.	es were	K ₂ CrO ₄ mixture; allowed to stand several days in the dark. The			
The water and phosphorus saturated with Hg were poured out. Last amounts were removed by several			clear colorless liquid phos- phorus was used.			
and CH_3OH . The Hg was dried and			ESTIMATED ERROR:			
reweighed.			$\delta T/K = \pm 0.1$			
the water was	removed by alt	ernately	$3c_1/c_1 = \pm 0.25$			
melting the p tion.	nosphorus and o	evapora-	REFERENCES:			
The solubility of water in phos- phorus was reported in a later paper (ref. 2).			2. Potariu, G. J., Havcock F. W.			
Experiments to 373 K indicated only a slight increase in solubility with temperature.			 KOTATIU, G. J.; HAYCOCK, E. W.; Hildebrand, J. H. J. Am. Chem. Soc. <u>1952</u>, 74, 3165. 			

COMPONENTS:	COMPONENTS:				ORIGINAL MEASUREMENTS:			
(1) Mercury; Hg; [7439-97-6]			Spicer, W. M.; Bartholomay, H. W.					
(2) Gallium; Ga; [7440-55-3]			J. Am. Chem. Soc. <u>1951</u> , 73, 868 — 9.					
VARIABLES:				PREPARED	BY:			
T/1	K = 308.15,	373.15		H. L.	Clever			
EXPERIMENTA	L VALUES:							
Temp	erature	Mercury	Rich L	ayer	Gallium 1	Rich Layer		
<i>t</i> ∕°C	<i>T/</i> K	Mercury weight %	Galli weigh	um t %	Mercury weight %	Gallium weight %		
35	308.15	98.8	1.2		6.0	94.0		
		98.8	1.4 1.2 ^a		6.6	93.4 ^a		
		98.7	1.3~		0./			
		98./ avg.	(3.6	atom %)	6.5 avg. (2.0 atom 9	\$)		
100	373.15	98.6 98.6	1.4		8.5 8.5	91.5 91.5		
		98.6	1.4		8.8	91.2		
		98.6 avg.	(3.9	atom %)	8.6 avg. (3.2 atom ⁴	٤)		
 ^aEquilibtated for two months. ADDED NOTE: See Hirayama, C.; Galus, Z.; Guminski, C. Metals in Mercury Solubility Series Volume 25, Pergamon Press Ltd., Oxford and Nev York, 1986, pp. 93 - 102 for a complete set of data and evaluation o the Hg + Ga system. 					etals in Mercury, , Oxford and New and evaluation of			
	· · · · · · · · · · · · · · · · · · ·	Al	JXILIARY	INFORMATIO	N			
METHOD/APPA	RATUS/PROCED	URE:		SOURCE AND PURITY OF MATERIALS:				
Weighed 3.5 g Ga in a gl gallium	portions o and 7.0 g ass tube chloride so	of the metal Hg) were p under acid olution to p	s (ca. blaced ified rotect	 Mercury. Purified by washing with nitric acid and water, and then dried and distilled. Colling Aluging Co. of here 				
the gallium surface from oxidation. Samples were equilibrated by fre- quent shaking in a thermostat. The two phases were sampled, weighed and the gallium was removed by dissolu- tion in HCL. The remaining mercury			(2) Gal ica and ana	. Stated p confirmed b lysis.	num CO. of Amer- ourity of 99.95% by spectrographic			
was dried and weighed.			ESTIMATEI	ERROR:				
for two months before analysis to show separation was complete.								
				REFERENCI	ŝs:			

COMPONENTS :					ORIGINAL MEASUREMENTS:					
(1) Mer(cury; Hg;	[743	9-97-6]	1		Jε	Jangg, G.; Lugscheider, E.			
(2) Meta	als listed	belo	ow.			<i>Mo</i> 12	Monatsh. Chem. <u>1973</u> , 104, 1269 - 75.			
EXPERIMENT	AL VALUES:				+	+ho	+ omr		-f boot tr	-t
the met	als below.	gro-	.e sviu.	DITTCI	/ aı	Line	Cemp	Platur	9 OI Neat ti	Batment in
Atomic	Name		Symbol	Reg	jisti	ry Nu	ımber	Heat	Treatment T	emperature
Number					~~~~				<i>t/°</i> C	т/к
13	Aluminiur	 .n	Al	(7429	-90-	·5]	260		533.15
22	Titanium		Ti	l' r	7440)-32-	6] 11	280, 800	400 to 500	553.15
25	Vanaurum Chromium		v Cr	ť	7440)-02 1-47-	-31	400		673.15
25	Iron		Fe	Ē	7439)-89-	6]	800		1073.15
27	Cobalt		Co	ì	[744]	0-48-	-4]	800		1073.15
28	Nickel	-	Ni 7-	L r	744u)-02- ^-67-	0]	260 280,	400 to 500	533.15 553.15
40 41	Nichium	A	ND	ៃ	7440	1-07 1-03-	-1]	800	400 10 300	1073.15
42	Molybdenv	ım	Mo	Ī.	7439	98-	71	800		1073.15
44	Rutheniur	n	Ru	[ר	7440)-18-	8]	800		1073.15
45	Rhodium		Rh	L	7440)-16- \-?5-	6] 71	800 800		10/3.15
73	Tantalum		Ta W	ť	7440	J=∠5 1-33-	/] .7]	800		1073.15
75	Rhenium		Re	Ē	7440)-15-	51	(100	to 500) ^a	373.15
76	Osmium		Os	Ľ	7440)-04-	2]	800		1073.15
77	Iridium		Ir Th	L.	7439)-88-	5]	800		1073.15 1073.15
90 92	Thorium Uranium		U	i	7440)-61-	·1]	800		1073.15
a _{No} evi	dence of (Format		wit	h me	rcury	over the te	mperature
interval.										
The elements above, which showed a negligible solubility for mercury, are shown below in an abbreviated periodic table.										
BIIOWII ~	STOM TH	u	LGYL	200 F -	-	*~			13	
									Al	
	22	23	24	,	26	27	28 Ni			
	Tl	V	Cr		re		N×			
	40 Zr	41 ND	42 Mo		44 Ru	45 Rh				
	,	73 Ta	74 W	75 [.] Re	76 08	77 Ir				
	90 Th		92 U							
The auth number :	nors observ 25, and pla	'ed m atinu	neasura um, atc	wble so omic n	olub iumbo	ilit er 7{	y of : 3. 5	mercruy See fol	y in manganes lowing data	se, atomic sheets.
METHOD/A	DPARATUS/PI	ROCE	DURE:							
Between was head diamete paramet	0.2 and 0. ted with 5 er quartz t er of each	3 g to ube met	of hig 10 perc for pe tal was	ih pur cent o ≥riods s meas	ity of it s of sured	powd ts we up t d by	lered eight :o 35(an x·	sample of mer) hours -ray me	s of each me cury in a 2 . The meta thod before	etal above mm inside al lattice and after
the heating with mercury. If the lattice parameter changed less than 0.001 Angstrom the authors assumed negligible solubility of mercury in the										

metal.

COMPONENTS :			T	DRIGINAL MEASUREMENTS:	
(1) Mercury; Hg; [7439-97-6]				Aleksandrov, B. N.; Dalakova, N. V.	
(2) Sodium; Potassiu	Na; [7440-23- m; K; [7440-09	5] 9-7]		Izv. Akad. Nauk SSSR, Met. <u>1982</u> , (1), 133 - 40; Russ. Metall. (Engl. Transl.) <u>1982</u> , (1), 117 - 21.	
VARIABLES:			-+	PREPARED BY:	
T/K = 270	- 333			H. L. Clever	
EXPERIMENTAL VA	LUES:				
	Element Temperature		ure	e Mercury Solubility	
		t/°C	T/R	Atom %	
	Sodium	23 60	296 333	0.045 0.006	
	Potassium	-3 45	270 318	Non-reproducible results. Evidence solubility de- creased at T in- creased.	
	and 600°C (87 gible solubi	/3 K) for j lity.	pot	assium indicated negli-	
		AUXILIA	RY	INFORMATION	
METHOD/APPARATU	IS/PROCEDURE:	·,··-·		SOURCE AND PURITY OF MATERIALS:	
Solubilitie residual ele od. Sample were prepar under a he were anneale The alloy we to 150 - 40 wire. The at room and tures. Deta an earlier p	es were deter ectrical resis s of 7 to 8 of ed in steel lium atmosphe d for a numbe as extruded wi 0 mm by 3 mm resistance wa liquid heliu ils of the met paper (ref. 1)	mined by tance meth of allo container ere. The r of days. th a pres n diamete s measure m tempera thod are i	a Ysy srd n	ESTIMATED ERROR:	
The solubil elements was	ity of about determined.	another 1	2		
				REFERENCES: 1. Aleksandrov, B. N. et al. Fiz. Nizk. Temp. (Kiev) <u>1976</u> , 2, 1432.	

Mercury in Other Elements

COMPONENTS:	ORIGINAL MEASUREMENTS:				
(1) Mercury; Hg; [7439-97-6]	Arifov, A. A.; Rakhimbaev, D.; Islamov, D. U.				
(2) Phosphorous; P; [7723-14-0]	Lagin Polynnanady 1075 62 - 4				
(3) Silicon; Si; [7440-21-3]	<i>Chem. Abstr.</i> <u>1975</u> , 83, 121536b.				
VARIABLES:	PREPARED BY:				
T/K = 1473	H. L. Clever				
EXPERIMENTAL VALUES:					
The paper was not available. abstract. Silicon at 1200 ° with 2 x 10^{13} to 4 x 10^{19} at mercury concentration (soluh phosphorus concentration and 10^{15} atom cm ⁻³ .	The information is from the C and 1 x 10^{-4} torr was doped om cm ⁻³ of phosphorous. The bility) is a function of the varies from 5 x 10^{13} to 1 x				
The compiler estimated a silicon density of 2.3 g cm ⁻³ at 1473 K from crytallographic data (R. O. A. Hall Acta Cryt1. <u>1961</u> , 14, 1004) to calculate mole fractions. Thus, as the phosphorus mole fraction increases from 4×10^{-1} ° to 8×10^{-5} the mercury mole fraction (solubility) increases from 1×10^{-3} to 2×10^{-5} .					
AUXILIARY	INFORMATION				
METHOD /APPARATUS / PROCEDURE :	SOURCE AND PURITY OF MATERIALS:				
	ESTIMATED ERROR:				
	REFERENCES:				

COMPONENTS :			ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [743	9-97-6]	I	Jangg, G.; Lugscheider, E.
(2) Manganese; Mn; [7	439-96-	-5]	Monateh. Chem. <u>1973</u> , 104, 1269 - 75.
VARIABLES:			PREPARED BY:
<i>T/</i> K = 773.15			H. L. Clever
EXPERIMENTAL VALUES:			······································
	Temper	ature	Solubility ^a
	t/°C	K	Atom % Hg
	500	773.15	0.3 - 0.5
	a _{Compi} same	iler assun as 10 [°] x ₁ ,	mes this is the mole fraction.
		AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE	:		SOURCE AND PURITY OF MATERIALS:
Between 0.2 and 0.3 purified metal powder a 2 mm inside diamete Mercury was added. evacuated, sealed an for up to 350 hours temperature.	g of was p er quar The t d heat at the	highly laced in tz tube. ube was treated e stated	Stated to be high purity metals.
The metal lattice parameter was determined by x-ray before and after heating with mercury. A change in lattice parameter of 0.001 or less was interpreted as a negligible solubility of mercury in the metal. There was a direct relationship between the mercury solubility and			ESTIMATED ERROR:
the lattice parameter	•	-	REFERENCES:
1			

.

COMPONENTS:		ORIGINAL MEASUREMENTS:
(1) Mercury; Hg;	[7439-97-6]	Bianchini, A.; Pozzoli, S.
(2) Zinc; Zn; [74	40-66-6]	Metall. Ital. <u>1968</u> , 60, 495 - 500.
VARIABLES:		PREPARED BY:
T/K = 293		H. L. Clever
EXPERIMENTAL VALUES:		
	Temperature	Mercury Solubility
	t/°C T/K	veight % atom %
	20 293	6.0 2.0
	ه مید دو بی با ها من برد بن به بی به بی من این این این این این این این این این ای	
	The compiler calc solubility and add perature.	ulated the atom % led the Kelvin tem-
	The results were in be read to within () graphs which could).2 weight %.
	AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCE	DURE:	SOURCE AND PURITY OF MATERIALS:
The electrolytic b mated zinc was	studied in seven	(1) Mercury.
aqueous electrol content was varr	ytes. The mercury ied up to 10 wt %.	(2) Zinc. Impurities were Cd 15, Pd 0.8, Cu 0.9, and Fe 0.5 parts
The potential bec	came more negative	per million. Some tests were made on 99,9999 & zinc.
mercury the poten	tial remained con-	
mercury solubil	ity in zinc is 6	
weight percent w ment with an (u	hich is in agree npublished) x-ray	
study.		ESTIMATED ERROR.
		REFERENCES :
•		

COMPONENTS :			ORIGINAL MEAS	UREMENTS:
(1) Mercury; He	g; [7439	9-97-6]	Day, H. M	1.; Mathewson, C. H.
(2) Silver; Ag;	[7440-2	22-4]	Trans. Am <u>1938</u> , 128	. Inst. Min. Metall. Eng. , 261 - 81.
VARIABLES:			PREPARED BY:	
T/K = 373.15	- 549.1	15	H. L. Cle	ver
EXPERIMENTAL VALUES	:	<u></u>	L	
	Temper		Mercury So	Dubility
	t/°C	<i>T/</i> K	Weight %	Atom %
	100	373.15	51.6	36.4
	186	459.15	-	-
	245	513.15	-	-
	276	549.15	52.4	37.2
	The c	ompiler calcul and added the F	ated the at Celvin tempo	com % mer- eratures.
		AUXILIARY	INFORMATION	
METHOD/APPARATUS/PF The system was reflection meth Particular at sample preparat avoid loss of t	COCEDURE: s studi nod of x tention tion and the vola	ed by a back- -ray analysis. was paid to annealing to tile mercury.	SOURCE AND F (1) Mercu to sh 0.001 (2) Silve Analy ple t Bi, S Resul	PURITY OF MATERIALS: ry. Redistilled. Tested ow it contained less than % total Ag and Au. r. US Metals Refining Co. Sed 99.993 % silver. Sam- ested for Au, Cu, Fe, Pb, e, Te, Sn, Ni, Mn, and Mg. ts in table in paper.
			ESTIMATED E	RROR:
			REFERENCES:	

COMPONENTS:	<u></u>		ORIGINAL MEASUREMENTS:		
(1) Mercury; Hg;	[7439-9	7-6]	Haring, M. M.; White, J. C.		
(2) Tin; Sn; [74	40-31-5]		Trans. Electrochem. Soc. <u>1938</u> , 73, 211 - 21.		
VARIABLES:			PREPARED BY:		
T/K = 298.15			H. L. Clever		
EXPERIMENTAL VALUES:		······································	L		
	Tempe	rature M	ercury Mole Fraction		
	t/°C	T/K	<i>x</i> 1		
	25.00	298.15	0.075		
		س س س به به بو یو یو یو به ما ما مرب			
	The aut be 0.92	hors report f 5 mole fracti	the Sn + Hg solid to Ion tin.		
l					
		AUXILIARY	INFORMATION		
METHOD/APPARATUS/PRO	CEDURE :		SOURCE AND PURITY OF MATERIALS:		
A careful emf st The solubility of calculated assum tion was valid f difference obser	udy of t of mercur ing the or the 1 ved betw algam	in amalgams. y in tin was Nernst equa- .0 millivolt ween tin and			
			ESTIMATED ERROR:		
			$\delta T/K = \pm 0.02$		
			REFERENCES:		
ļ					
1					

COMPONENTS:		-	ORIGINAL	MEASUREMENTS:	
(1) Mercury	; Hg; [7439-97-6]	Abdullaev, G. B.; Movlanov, Sh.; Shakhtaktinskii, M. G.; Kuliev, A. A. Izv. Akad. Nauk Tadzh. SSR, Otd. Geol Khim. i Tekhn. Nauk <u>1963</u> , (2), 13 - 22. Chem. Abstr. 1964, 61, 1345e.		
(2) Teiluri	um; Te; [15454-0	10-91			
VARIABLES:	<u> </u>		PREPARED	BY:	
T/K = 54	3 - 713		H. L.	Clever	
EXPERIMENTAL V	ALUES:		L		
	 Temperature	 M	ercury S	Solubility	
	t/°C T/K	<i>c</i> 1/ato	m cm ⁻³	Atom Fraction	
	270 543	-		-	
	300 573	4 x	1020	0.014	
	440 713	lx	1020	0.003	
	400 400 500 500 500 500 500 500 500 500	یے بین چیا سار نظا سار کہ ہے جو جی د	و چې چې جه مه مه مه ده د		
	The atom fract piler using tl lurium.	tions were he 293 K H	calculated by the com- andbook density of tel-		
	at 573 K and given in the HgTe is forme of mercury is selenium whic There is a st saturation at would represe	the minimu abstract. d in the s smaller th is also atement in 77 K is 0. nt an atom	Im valu The aut ystem. than the reported the ab the ab 1 % merc fractio	e at 713 K were thors state that The solubility e solubility of ed in the paper. stract that the sury. The value on of 0.0006.	
		AUXILIARY	INFORMAT	ION	
METHOD/APPARAT	IUS / PROCEDURE :		SOURCE A	AND PURITY OF MATERIALS:	
			ESTIMAT	ED ERROR:	
			REFEREN	CES :	

COMPONENTS:		ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-	-97-6]	Jangg, G.; Lugscheider, E.
(2) Platinum; Pt; [744()-06-4]	Monatsh. Chem. <u>1973</u> , 104, 1269 - 75.
VARIABLES:		PREPARED BY:
T/K = 373.15 - 903.1	15	H. L. Clever
EXPERIMENTAL VALUES:		
	[emperature	Solubility ^a
t	¢/°C <i>T</i> /K	Atom % Hg
1	LOO 373.15	0
	200 473.15	0.2
	493.15 255 528 15	15-3
	307 580 . 15	16.1
	640.15	16.5
	668.15	18.5
4		
	540 813-15	18.9
	530 903.15	22.6
	AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE:	· · · · · · · · · · · · · · · · · · ·	SOURCE AND PURITY OF MATERIALS:
Between 0.2 and 0.3 purified metal powder a 2 mm inside diameter Mercury was added. evacuated, sealed and for up to 350 hours a temperature.	g of highly was placed in c quartz tube. The tube was heat treated at the stated	Stated to be high purity metals.
The metal lattice p determined by x-ray be heating with mercury.	arameter was fore and after	
lattice parameter of was interpreted as	A change in	
solubility of mercury There was a direct between the mercury s	A change in 0.001 or less a negligible in the metal. relationship olubility and	ESTIMATED ERROR:
solubility of mercury There was a direct between the mercury s the lattice parameter.	A change in 0.001 or less a negligible in the metal. relationship olubility and	ESTIMATED ERROR: REFERENCES:
solubility of mercury There was a direct between the mercury s the lattice parameter.	A change in 0.001 or less a negligible in the metal. relationship olubility and	ESTIMATED ERROR: REFERENCES:

•

COMDONENTS .	ORIGINAL MEASUREMENTS.			
(1) Mercury, Ha. $[7439-97-6]$	Day H M : Mathewson C H			
(2) Gold; Au; [7440-57-5]	Trans. Am. Inst. Min. Metall. Eng. <u>1938</u> , 128, 261 - 81.			
VARIABLES:	PREPARED BY:			
T/K = 373.15 - 689.15	H. L. Clever			
EXPERIMENTAL VALUES:				
Temperature M	Mercury Solubility			
t/°C T/K We	eight % Atom %			
100 373.15	17.2 16.9			
186 459.15	16.1 15.8			
245 518.15	16.0 15.7			
300 573.15	16.3 16.0			
320 593.15	17.1 16.8			
390 663.15	18.5 18.1			
416 689.15	18.7 18.4			
The authors believe the the solubility curve real. The compiler calculat cury and added the Kel	e inflection in the at about 603 K is ed the atom % mer- vin temperatures.			
AUXILIA	ARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
The system was studied by a back reflection method of x-ray analysi	 (1) Mercury. Redistilled. Tested s. to show it contained less than 0.001 % total Ag and Au. 			
sample preparation and annealing a avoid loss of the volatile mercury	 (2) Gold. Source not given. Con- tained unmeasurable trace of silver. No other impurities detected. 			
	ESTIMATED ERROR:			
	REFERENCES :			

	Weredry III Or	
COMPONENTS :		ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]	Owen, E. A.; Roberts, E. A. O.
(2) Gold; Au; [744	0-57-5]	J. Inst. Metals <u>1945</u> , 71, 213 - 53.
VARIABLES:		PREPARED BY:
T/K = 477 - 693		H. L. Clever
EXPERIMENTAL VALUES:		·····
	Temperature	Mercury Solubility
	t/°C T/K	Atom %
	204 477	16.8
	310 583	18.2
	420 693	19.5 (max)
occ max	(alpha + beta) = urs at 693 K, the imum solubility.	(alpha + liquid) temperature of the
	AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCE The alpha phase bo Au system was deto ray method.	DURE: Dundry of the Hg + ermined by the x-	SOURCE AND FURITY OF MATERIALS: (1) Mercury. Source not given. Stated to be 99.99 %. (2) Gold. Source not given. Stated
Alloys of 17.45 a were prepared by samples in evacua Melts were shaken then either slow o quenched. They homgeneity. Lump seven weeks, powde	nd 19.5 atom % Hg heating weighed ted silica tubes. for up to 15 min, cooled or rapidly were tested for annealed for up to r annealed for up	to be 99.99 %.
12 hours at the temperature of the solubility measurement.		ESTIMATED ERROR: $\delta T/K = \pm (2 - 5)$ ± 1 atom % (authors).
		REFERENCES:
1		

COMPONENTS:	EVALUATOR:		
<pre>(1) Copper; cu; [7440-50-8] Zinc; Zn; [7440-66-6] Silver; Ag; [7440-22-4] Lead; Pb; [7439-92-1]</pre> (2) Water; H ₂ O; [7732-18-5]	Appendix I The Solubility of Some Metallic Elements in Water		

Those interested in the solubility of metallic mercury in water may want to compare the solubility of mercury with other metals in water. There are only a few papers that report studies of the solubility of unionized metallic elements in water. The results of two of these studies are given here (ref. 1, 2).

The determination of the solubility of an oxide-free pure metal in distilled, degassed, neutral water is a difficult experiment. The following data sheets report metallic element solubiliies in water of silver, copper, zinc, and lead. From the experiments of Krepelka and Toul (ref. 1), we conclude that when oxygen and carbon dioxide are rigoroursly excluded in experiments carried out in metallic vessels (which avoids alkali contamination from glass) the solubility of unionized silver in water is below the limit of detection of about 0.00002 g dm⁻³ used by the authors. We believe that the solubility values on the following data sheets are upper limits and the true metal atom solubility in water may be much smaller.

Reliable values of the solubility of the metallic elements in water would be of interest. New studies using modern analytical methods along with techniques to prepare ultra-pure oxide-free metals and bring them in contact with pure degassed neutral water would be desirable.

There are a number of papers in the literature that report metal solubilities in natural systems. Many of these are summarized in the Seidell-Linke Handbook (ref. 3), or can be found in *Chemical Abstracts*. These papers usually report the total metal in solution from a variety of sources after reaction with oxygen, carbon dioxide, and/or electrolyte. The reactions result in the metal surface coated with a mixture of solid oxides, hydroxides, and carbonates. The total metal concentration is the sum of the metal atom, metal ion, and metal ion complexes in solution. Various models are proposed to explain the total metal ion concentration relationship to the multiple equilibriums among the surface solids and the solution components. These studies are of great practical use for corrosion and environmental problems. However, they take us to far from the scope of the present volume to consider further.

REFERENCES:

- 1. Krepelka, H.; Toul, F. Coll. Czech. Chem. Comm. 1929, 1, 155.
- 2. Pariaud, J.; Archinard, P. Bull. Soc. Chim. France <u>1952</u>, 454; J. Chim. Phys. <u>1956</u>, 53, 765.
- Seidell, A.; Linke, W. F. Solubilities of Inorganic and Metal Organic Compounds, American Chemical Society, Washington, DC, Vol. I. 1958, Vol. II. 1965.

COMPONENTS :	<u> </u>	ORIGINAL MEASUREMENTS:			
(1) Copper; Cu; [7440	-50-8]	Pariaud, J.; Archinard, P.			
(2) Water; H ₂ O; [7732	2-18-5]	Bull. Soc. Chim. France <u>1952</u> , 454 - 6.			
		J. Chim. Phys. <u>1956</u> , 53, 765 - 9.			
VARIABLES:		PREPARED BY:			
<i>m/v - 303 15</i>		M. Iwamoto			
17K = 505.15		n. b. clevel			
EXPERIMENTAL VALUES:					
Time of Temperature Mixing	Mercury in ^a Solution -	Copper Solubility			
t/°C T/K ^b t/days	10° <i>c₁/</i> g dm ⁻³ 1	oncentration Mole Molality Fraction 0°c1/mol dm ⁻³ 10°x1 10°m1/mol kg ⁻¹			
30 303.15 6	170 160 165 170				
29	175 180 180				
	170 <u>+</u> 12 ^C	1.89 3.42 1.90			
· · · · · · · · · · · · · · · · · · ·	AUXILIARY	INFORMATION			
METHOD / APPARATUS / PROCEDURI	R •	SOURCE AND PURITY OF MATERIALS.			
		(1) Copport Block roopolytically			
Copper and triply dis	stilled degassed	pure.			
water were equilibrated ays to insure satur.	ted for up to 24 ation.	(2) Water. Triply distilled and degassed.			
The copper was oxid (II) and complexed The silver dithizona sorption was measure	ized to copper with dithizone. ate complex ab- d at 490 nm.				
		ESTIMATED ERROR:			
		See uncertainty in table above.			
		REFERENCES:			
1					

MIL-P

COMPONENTS :			ORIGINAL MEASUREMENTS:				
(l) Zinc; Zn	; [7440-6	6-6]	Pariaud, J.; Archinard, P.				
(2) Water; H	2 ^{0;} [7732	-18-5]	Bull. Soc. Chim. France <u>1952</u> , 454 - 6.				
			J. Chim. Phys. <u>1956</u> , 53, 765 - 9.				
VARIABLES:			PREPARED BY:				
T/K = 305	.15		M. Iwamoto H. L. Clever				
EXPERIMENTAL VAL	LUES:		I				
Temperature	Time of Mixing	Mercury in ^a Solution	Zinc Solubility				
t/°C T/K ^b	t/days	10°c ₁ /g dm ⁻³	Concentration ^D Mole ^D Molality ^D Fraction $10^{5}c_{1}/mol dm^{-3} 10^{7}x_{1} 10^{5}m_{1}/mol kg^{-1}$				
25 298.15	17	710 725 715					
24 297.15	32	700 710 710					
32 ^d 305.15	32	700 <u>+</u> 50 ^C	1.07 1.94 1.08				
^C The solubil ^d [sic.]	ity and i	ts uncertainty (given in the authors' second paper.				
		AUXILIAR	INFORMATION				
METHOD/APPARATU	S/PROCEDURE	:	SOURCE AND PURITY OF MATERIALS:				
Colorimetric method with dithizone. Zinc and triply distilled degassed water were equilibrated for up to 24 days to insure saturation. The zinc was oxidized to zinc(II)			 Zinc. Electroanalytically pure. Water. Triply distilled and degassed. 				
and complex mercury dit tion was mea	ed with o hizonate o asured at	ithizone. The complex absorp- 490 nm.					
			ESTIMATED ERROR:				
			See uncertainty in table above.				
			REFERENCES:				

			IODICT			
COMPONENTS:			URIGI	NAL MEASURE	MENTS:	
(1) Silve	r; Ag; [/440-22-4	1]	Kre	ереіка, н	.; Toul, i	•
(2) Water	; H ₂ O; [7732-18-5	5]	<i>Co</i> 155	ll. Czech 5 - 64.	. Chem. Co	omm. <u>1929</u> , 1,
EXPERIMENTAL	VALUES:					
Temperatu	 re	Time	Mass	of Silve	r Found	Method
t∕°C	<i>T/</i> K	t/days	Exp. I	Exp. II	Avg.	
I. Thi wate top trac at 1 neph	silver leaves wer in heavy walle with water and ses of air and car 8 to 20°C for the elometry.	vere broug ed, hard o sealed wi cbon diox: e days st	ght integlass, ith paraide. The ated be	c contact Erlenmey afin. The flasks low, the	with fre er flasks were shak n analyzed	eshly distilled filled to the contained only cen in the dark for silver by
18 - 20	291.15 - 293.15	7	15	9	12	Nephelometry
		14	22	20	21	- # H
		180	37	35	36	n
II. The meth	water in contac od. The cell use	t with s d was	silver	was anal	yzed for	Ag ⁺ by an emf
	Ag/H ₂ O//KO	21 (sat.)/	//KCl (]	mol dm-	3) (Hg ₂ Cl ₂)	/Hg.
The the The betw give	Nernst equation Ag/H ₂ O electrode atmosphere was ween the silver a n below, the comp	was used . The w carbon d and water plete set	to cal ater wa ioxide r was no of emf	culate t s freshl free air ot state data are	he Ag ⁺ con y distill . The ti d. Avera given in	ncentration at ed before use. me of contact ge results are the paper.
18.95	292.10				6.3(4)	i Emf
18.22	291.37				6.0(9)	1 n
18.95	292.10				5.3(4)	n E
18.85	292.00				15. (7) ⁸	1 n
III. Expe with by s alka rigo foll silv tion	eriments similar silver powder pr ulfur dioxide. li leached from prously excluded owed by reducti er surface. The of the nephelom	to I abo repared by The exper glass sur All si on with silver d etry meth	ove, buy y reduct iments faces. lver su hydroge issolve od.	t carrie ion of a were done Oxygen Irfaces v en gas t d was be	d out in a mmonical a e to avoid and carbo vere treat o insure low the l	Silver vessels silver solution the effect of n dioxide were ted with steam an oxide free imit of detec-
18 - 20 ^b	291.15 - 293.15	7	-	-	-	Nephelometry
		21	-	-	-	n
IV. Same sure	e as III above, b silver surface	ut witho is oxide	ut the free.	hydrogen	reductio	n step to make
18 - 20 ^b	291.15 - 293.15	7 14 21	10 21 34	10 20 33	10 20 33	Nephelometry "
^a Numbers 0, 0.1,	in () are the nu 0.7, and 1. inter	imber of o	determi	nations.	Standard	deviations are
b _{Temperat}	ure not stated by	y authors	. Value	es assume	ed by comp	iler because of
L cemperat	ATED ADEA TH TIT!	or cubert	******			

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Silver; Ag; [7440-22-4]	Krepelka, H.; Toul, F.
(2) Water; H ₂ O; [7732-18-5]	Coll. Czech. Chem. Comm. <u>1929</u> , 1, 155 - 64.
VARIABLES:	PREPARED BY:
T/K = 291.15 - 293.15	H. L. Clever
EXPERIMENTAL VALUES:	
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
METHOD/APPARATUS/PROCEDURE: See comments above each set of ex- periments reported on the previous page.	SOURCE AND PURITY OF MATERIALS: (1) Silver. Standard sample (ref. 1) prepared for atomic weight work. Melted again on pure CaO
METHOD/APPARATUS/PROCEDURE: See comments above each set of ex- periments reported on the previous page. Nephelometry. The water, separated	SOURCE AND PURITY OF MATERIALS: (1) Silver. Standard sample (ref. 1) prepared for atomic weight work. Melted again on pure CaO in an atmosphere of dry, pure hydrogen. Silver etched with
METHOD/APPARATUS/PROCEDURE: See comments above each set of ex- periments reported on the previous page. Nephelometry. The water, separated from the silver leaves, was evapor- ated from a quartz dish to a volume	 SOURCE AND PURITY OF MATERIALS: (1) Silver. Standard sample (ref. prepared for atomic weight work. Melted again on pure CaO in an atmosphere of dry, pure hydrogen. Silver etched with HNO3, H2O, and NH3 to increase surface area. Thoroughly washed
METHOD/APPARATUS/PROCEDURE: See comments above each set of ex- periments reported on the previous page. Nephelometry. The water, separated from the silver leaves, was evapor- ated from a quartz dish to a volume of 60 - 80 cm ³ , made up to a volume of 100 cm ³ , then compared with a	 SOURCE AND PURITY OF MATERIALS: (1) Silver. Standard sample (ref. prepared for atomic weight work. Melted again on pure CaO in an atmosphere of dry, pure hydrogen. Silver etched with HNO3, H2O, and NH3 to increase surface area. Thoroughly washed with H2O, and dried at 110°C. Then rolled into thin leaves
METHOD/APPARATUS/PROCEDURE: See comments above each set of ex- periments reported on the previous page. Nephelometry. The water, separated from the silver leaves, was evapor- ated from a quartz dish to a volume of 60 - 80 cm ³ , made up to a volume of 100 cm ³ , then compared with a known standard containing a similar amount of silver in the presence of	 SOURCE AND PURITY OF MATERIALS: (1) Silver. Standard sample (ref. prepared for atomic weight work. Melted again on pure CaO in an atmosphere of dry, pure hydrogen. Silver etched with HNO₃, H₂O, and NH₃ to increase surface area. Thoroughly washed with H₂O, and dried at 110°C. Then rolled into thin leaves between well cleaned steel rol- lers. Surface etched again af-
METHOD/APPARATUS/PROCEDURE: See comments above each set of ex- periments reported on the previous page. Nephelometry. The water, separated from the silver leaves, was evapor- ated from a quartz dish to a volume of 60 - 80 cm ³ , made up to a volume of 100 cm ³ , then compared with a known standard containing a similar amount of silver in the presence of KBr.	 SOURCE AND PURITY OF MATERIALS: (1) Silver. Standard sample (ref. prepared for atomic weight work. Melted again on pure CaO in an atmosphere of dry, pure hydrogen. Silver etched with HNO3, H2O, and NH3 to increase surface area. Thoroughly washed with H2O, and dried at 110°C. Then rolled into thin leaves between well cleaned steel rol- lers. Surface etched again af- ter each rolling.
METHOD/APPARATUS/PROCEDURE: See comments above each set of ex- periments reported on the previous page. Nephelometry. The water, separated from the silver leaves, was evapor- ated from a quartz dish to a volume of 60 - 80 cm ³ , made up to a volume of 100 cm ³ , then compared with a known standard containing a similar amount of silver in the presence of KBr. Emf. Method of Beans and Oakes (ref. 2).	 SOURCE AND PURITY OF MATERIALS: (1) Silver. Standard sample (ref. prepared for atomic weight work. Melted again on pure CaO in an atmosphere of dry, pure hydrogen. Silver etched with HNO3, H2O, and NH3 to increase surface area. Thoroughly washed with H2O, and dried at 110°C. Then rolled into thin leaves between well cleaned steel rol- lers. Surface etched again af- ter each rolling. (2) Water. Distilled water freed from organic material by action
 METHOD/APPARATUS/PROCEDURE: See comments above each set of experiments reported on the previous page. Nephelometry. The water, separated from the silver leaves, was evaporated from a quartz dish to a volume of 60 - 80 cm³, made up to a volume of 100 cm³, then compared with a known standard containing a similar amount of silver in the presence of KBr. Emf. Method of Beans and Oakes (ref. 2). 	 SOURCE AND PURITY OF MATERIALS: (1) Silver. Standard sample (ref. prepared for atomic weight work. Melted again on pure CaO in an atmosphere of dry, pure hydrogen. Silver etched with HNO3, H2O, and NH3 to increase surface area. Thoroughly washed with H2O, and dried at 110°C. Then rolled into thin leaves between well cleaned steel rol- lers. Surface etched again after each rolling. (2) Water. Distilled water freed from organic material by action of KMnO4, then twice distilled, the second time in Pt directly
METHOD/APPARATUS/PROCEDURE: See comments above each set of experiments reported on the previous page. Nephelometry. The water, separated from the silver leaves, was evaporated from a quartz dish to a volume of 60 - 80 cm ³ , made up to a volume of 100 cm ³ , then compared with a known standard containing a similar amount of silver in the presence of KBr. Emf. Method of Beans and Oakes (ref. 2).	 SOURCE AND PURITY OF MATERIALS: (1) Silver. Standard sample (ref. prepared for atomic weight work. Melted again on pure CaO in an atmosphere of dry, pure hydrogen. Silver etched with HNO3, H2O, and NH3 to increase surface area. Thoroughly washed with H2O, and dried at 110°C. Then rolled into thin leaves between well cleaned steel rol- lers. Surface etched again after each rolling. (2) Water. Distilled water freed <pre>from organic material by action of KMnO4, then twice distilled, the second time in Pt directly into the container used in the experiment.</pre>
 METHOD/APPARATUS/PROCEDURE: See comments above each set of experiments reported on the previous page. Nephelometry. The water, separated from the silver leaves, was evaporated from a quartz dish to a volume of 60 - 80 cm³, made up to a volume of 100 cm³, then compared with a known standard containing a similar amount of silver in the presence of KBr. Emf. Method of Beans and Oakes (ref. 2). 	 SOURCE AND PURITY OF MATERIALS: (1) Silver. Standard sample (ref. prepared for atomic weight work. Melted again on pure CaO in an atmosphere of dry, pure hydrogen. Silver etched with HNO₃, H₂O, and NH₃ to increase surface area. Thoroughly washed with H₂O, and dried at 110°C. Then rolled into thin leaves between well cleaned steel rol- lers. Surface etched again after each rolling. (2) Water. Distilled water freed from organic material by action of KMnO₄, then twice distilled, the second time in Pt directly into the container used in the experiment.
METHOD/APPARATUS/PROCEDURE: See comments above each set of ex- periments reported on the previous page. Nephelometry. The water, separated from the silver leaves, was evapor- ated from a quartz dish to a volume of 60 - 80 cm ³ , made up to a volume of 100 cm ³ , then compared with a known standard containing a similar amount of silver in the presence of KBr. Emf. Method of Beans and Oakes (ref. 2).	 SOURCE AND PURITY OF MATERIALS: (1) Silver. Standard sample (ref. prepared for atomic weight work. Melted again on pure CaO in an atmosphere of dry, pure hydrogen. Silver etched with HNO3, H2O, and NH3 to increase surface area. Thoroughly washed with H2O, and dried at 110°C. Then rolled into thin leaves between well cleaned steel rol- lers. Surface etched again after each rolling. (2) Water. Distilled water freed <pre>from organic material by action of KMnO4, then twice distilled, the second time in Pt directly into the container used in the experiment. </pre> ESTIMATED ERROR: The lower limit of detection by nephelometry is about 10 x 10 ⁻⁶ g
METHOD/APPARATUS/PROCEDURE: See comments above each set of ex- periments reported on the previous page. Nephelometry. The water, separated from the silver leaves, was evapor- ated from a quartz dish to a volume of 60 - 80 cm ³ , made up to a volume of 100 cm ³ , then compared with a known standard containing a similar amount of silver in the presence of KBr. Emf. Method of Beans and Oakes (ref. 2).	 SOURCE AND PURITY OF MATERIALS: (1) Silver. Standard sample (ref. prepared for atomic weight work. Melted again on pure CaO in an atmosphere of dry, pure hydrogen. Silver etched with HNO3, H2O, and NH3 to increase surface area. Thoroughly washed with H2O, and dried at 110°C. Then rolled into thin leaves between well cleaned steel rol- lers. Surface etched again after each rolling. (2) Water. Distilled water freed from organic material by action of KMnO4, then twice distilled, the second time in Pt directly into the container used in the experiment. ESTIMATED ERROR: The lower limit of detection by nephelometry is about 10 x 10 ⁻⁶ g dm ⁻³ .
METHOD/APPARATUS/PROCEDURE: See comments above each set of ex- periments reported on the previous page. Nephelometry. The water, separated from the silver leaves, was evapor- ated from a quartz dish to a volume of 60 - 80 cm ³ , made up to a volume of 100 cm ³ , then compared with a known standard containing a similar amount of silver in the presence of KBr. Emf. Method of Beans and Oakes (ref. 2).	 SOURCE AND PURITY OF MATERIALS: (1) Silver. Standard sample (ref. prepared for atomic weight work. Melted again on pure CaO in an atmosphere of dry, pure hydrogen. Silver etched with HNO3, H2O, and NH3 to increase surface area. Thoroughly washed with H2O, and dried at 110°C. Then rolled into thin leaves between well cleaned steel rol- lers. Surface etched again after each rolling. (2) Water. Distilled water freed from organic material by action of KMNO4, then twice distilled, the second time in Pt directly into the container used in the experiment. ESTIMATED ERROR: The lower limit of detection by nephelometry is about 10 x 10 ⁻⁶ g dm ⁻³ . REFERENCES: 1. Krepelke, H. J. Am. Chem. Soc. 1920, 42, 925.

	, the				
COMPONENTS :		ORIGINAL MEASUREMENTS:			
(l) Silver; Ag; [7440	-22-4]	Pariaud, J.; Archinard, P.			
(2) Water; H ₂ O; [7732	-18-5]	Bull. Soc. Chim. France <u>1952</u> , 454 - 6.			
		J. Chim. Phys. <u>1956</u> , 53, 765 - 9.			
VARIABLES:		PREPARED BY:			
<i>T</i> /K = 301.15		M. Iwamoto H. L. Clever			
EXPERIMENTAL VALUES:					
Time of	Mercurv in ^a	Silver Solubility			
Temperature Mixing	Solution	Concentration ^b Mola ^b Molality ^b			
t/°C T/K ^b t/days	10°c ₁ /g dm ⁻³	Fraction $10^{\circ}c_1/\text{mol dm}^{-3}$ $10^{\circ}x_1$ $10^{\circ}m_1/\text{mol kg}^{-1}$			
25 298.15 1 3 8	0 10, 15, 10 25, 20, 20				
28 301.15 18 24	28, 25, 25 28, 30				
	26 <u>+</u> 7 ^C	2.41 4.36 2.42			
	AUXILIARY	INFORMATION			
METHOD/APPARATUS/PROCEDURE	:	SOURCE AND PURITY OF MATERIALS:			
Colorimetric method Silver and triply dis	with dithizone. tilled degassed	(1) Silver. Electroanalytically pure.			
water were equilibrated for up to 24 days to insure saturation. The silver was oxidized to silver(I) and complexed with dithizone. The silver dithizonate complex absorp- tion was measured at 490 nm.		(2) Water. Triply distilled and degassed.			
		ESTIMATED ERROR:			
		See uncertainty in table above.			
		REFERENCES :			

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COMPONENTS :			ORIGINAL MEASUREMENTS:			
(1) Lead; Pb	; [7439-9	2-1]	Pariaud, J.; Archinard, P.			
(2) Water; H	2 ⁰ ; [7732	-18-5]	Bull. Soc. Chim. France <u>1952</u> , 454 - 6.			
			J. Chim. Phys. <u>1956</u> , 53, 765 - 9.			
VARIABLES:			PREPARED BY:			
<i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i>	15		M. Iwamoto			
178 - 257	•10		R. D. Clevel			
EXPERIMENTAL VAL	LUES:					
	Time of	Mercury in ^a	Lead Solubility			
Temperature	Mixing	Solution -	Concentration ^b Molab Molality ^b			
t/°C T/K ^b	t/days	10°c ₁ /g dm ⁻³	Fraction $mole molality$ Fraction $0^{7}c_{1}/\text{mol dm}^{-3} 10^{8}x_{1} = 10^{7}m_{1}/\text{mol kg}^{-1}$			
24 297.15	15	310 310				
	30	310 315				
		310 <u>+</u> 18 ^C	1.50 2.71 1.50			
^a All of the	experimen	tal values are o	viven with an uncertainty of +18.			
bcalaulated	hy compil	~~~~				
Carcuraceu	by compri	CLD.				
		AUXILIARY	INFORMATION			
METHOD/APPARATU	S/PROCEDURE	:	SOURCE AND PURITY OF MATERIALS:			
Colorimetric	method	with dithizone.	(1) Lead. Electroanalytically pure.			
Lead and tr	iply dis	tilled degassed	(2) Water, Triply distilled and			
days to insu	ire satura	ation.	degassed.			
The lead was complexed wi cury dithizo was measure	oxidized ith dithi nate com d at 490 m	to lead(V) and zone. The mer- plex absorption M.				
			ESTIMATED ERROR:			
			See uncertainty in table above.			
			REFERENCES:			
L						

COMPON	ENTS:				EVALUA	TOR:	
1	Mercury; H	Ig; [74:	39-97-6]	:	Appe	ndix II	
					of M	ercury	I Properties
CRITIC	AL EVALUATIO)N :					
I.	Atomic w isotopic	eight. compos:	The ato ition of	mic weig terrestr	ght of ial me	mercury is 200 ercury, ::Hg, is	.59 <u>+</u> 0.03. The
	N	lass Nui	mber	Repres	entati	ve Isotopic Com	position
	-	196			0.15	(5)	
		198			10.1	(5)	
		200			23.1	(6)	
		201			13.2	(4)	
		202 204			29.65	(75)	
	The uncer of the ma	taintie terials	es listed s as well	in pare as expe	nthese riment	s cover the ran al errors.	ge of variations
	REFERENCE	s:					
	Holden Holden <u>1983</u> ,	, N. E.; , N. E.; 55, 11	; Martin, ; Martin, 119 - 36.	R. L. R. L.;	<i>Pure A</i> Barnes	ppl.Chem. <u>19</u> 5, I.L. Pure A	<u>83,55,1101-18.</u> ppl. Chem.
II.	Some enth	alpy, e	entropy,	and heat	capac	ity values.	
							1
	Mercury		Valu	es for 2	98.15	K and 1 bar (0.	l MPa)
	State	Δ _f H°/k	J mol-1	 ∆ _f G°/kJ	mol ⁻¹	S°/J K ⁻¹ mol ⁻¹	$C_D^{\circ}/J K^{-1} mol^{-1}$
	Liquid	0				76.02	27.983
	Gas	61.3	317	31.82	0	174.96	20.786
	Soln.	37.1	/	39.3		/1	-
	hyp 1 m						
	Mercury Transitio	n ^a	T/K	 P/mm	 Hg	ΔH/kJ mol ⁻¹	$\Delta S/J K^{-1} mol^{-1}$
	Sublimati	on	234.39	2.5 x	10-*	63.60	271.5
	Fusion		234.39	2.5 x	10-5	2.33	9.92
	Vaporizat	ion	298.15	0.002	09	60.84 ^a 58.12	204.1^{a} 92.30
	aValues checked.	from 1	952 eval	uation.	More	e recent liter	ature should be
	b _{Better v} and 205.	values 7 J K ⁻¹	from entl mol ⁻¹ .	nalpy of	forma	tions above are	e 61.317 kJ mol ⁻¹
	The valu National	es abo Burea	ve are i u of Sta	from 195 ndards j	2 and public	1982 evaluat: ations. The	ions of the U.S. review paper of
	REFERENCE			14 50 00	ilburee		
	Rocein	 i. F D	Warmer	n. D. D.	Fuar	S. W. H . Towir	a. S.+ Jaffa T
	Selec Table	ted Va	lues of ional Bu	Chemical reau of	Thern Standa	nodynamic Prope rds Circular 5	rties, Part I. 00, U.S. Govern-
	Wagman T.: P	, D. D. ailev	; Evans, S. M.: C	W. H.;] hurnev.	Parker	, V. B.; Schum Nuttall, R. 1	n, R. H.; Halow, NBS Tables of
	Chema	cal T	hermodyn	amic Pro	perti	es, J. Phys.	Chem. Ref. Data

<u>1982</u>, 11, Supplement 2, 392 pp. Hepler, L. G.; Olofsson, F. Chem. Rev. <u>1975</u>, 75, 585 - 602.

COMPON	IENTS :		EVALUATOR:			
	Mercury; Hg; [7439-97-6]		Appendix	: II		
			Some Phy of Mercu	rsicochemical Properties Try		
CRITIC	CAL EVALUATION:		1			
111.	Melting point, properties of m	triple point, ercury.	normal bo	iling point, and critical		
	Compared below and of Vargafti	are values from k.	the evalua	ations of Ambrose and Sprake		
	Value	Ambrose and S	prake	'Vargaftik		
	Melting point Triple point Boiling point	234.53 K at 3	x 10°' Pa	$-38.83^{\circ}C$ 234.32 K		
	Critical Properties					
	Temperature Pressure Density	1765 к 151 МРа		1490°C 1763 K 151 MPa 1510 Bar 5.500 Mg m ⁻³		
	REFERENCES:					
	Ambrose, D.; - 20. Vargaftik, 1 <i>Liquids and</i> 1975. <i>Chem.</i>	Sprake, C. H. S. N. B. Tables Gases, Hemisphe	J. Chem. on the The ere Pub. Co	Thermodynam. <u>1972</u> , 4, 603 rmophysical Properties of rp., Washington and London, 1976 84 355554		
IV.	Other Properties	s of Mercury.	/ == ·	<u> </u>		
	Density of liqu: Vapor pressure (Second Virial co	id mercury of liquid mercur oefficients of m	y mercury vapo	Appendix III Appendix IV or Appendix V		
	The N. B. Varga pages of tables There are value both liquid and expansion, coef: vaporization, e capacities of t	ftik Handbook (r s of liquid and s of vapor pres l vapor. There ficient of isoth ntropy and const he liquid at 10	reference al gaseous me sure, densi are values hermal comp tant volume degree inte	bove) contains about twelve rcury physical properties. ity, and specific volume of of coefficients of thermal ressibility, latent heat of and constant pressure heat ervals from 0 to 800°C.		
	A small table g conductivity, v to 800°C.	ives values of t iscosity and ot	the liquid s ther propert	specific resistance, thermal ties from the melting point		
	The mercury vap and velocity of 0.01 to 200 bar, thermal conduct	or specific vol sound are given A separate ta ivity of mercury	lume, entha n from 180 able gives y vapor.	lpy, entropy, heat capacity to 2000°C at pressures from values of the viscosity and		

COMPONENTS:	EVALUATOR:
Mercury; Hg; [7439-97-6]	Appendix III Density of Liquid Mercury

There are several evaluations of the density of liquid mercury. Density data are reproduced on the following page from two evaluations as a function of temperature between 253 and 1073 K. The values are given in the units of megagram per cubic meter, Mg m⁻³, which conveniently have the same decimal location at grams per cubic centimeter.

Density values in the first column are from Herington, Brown and Lane (ref. 1). The values are described as the "absolute density of mercury at a pressure of 101.325 kPa for temperatures $t/^{\circ}C$ on the International Practical Temperature Scale of 1968". The values are based on data presented by Bigg (ref. 2) corrected to bring the values to the 1968 IPTS.

The Herington *et al.* table contains values at one degree intervals from -20 to 100 °C, and at ten degree intervals from 100 to 300 °C. Also presented are values of the temperature coefficient and error in density. Reproduced on the next page are density values at five degree intervals from -20 to 100 °C, and at ten degree intervals from 100 to 300 °C.

Density values in the second column are from Vargaftik (ref. 3). They are described as properties of mercury in saturation. They are credited to the evaluation of Vukalovich and Fokin (ref. 4). There are no mentions of the original data source or the temperature scale.

The Vargaftik table contains density values at ten degree intervals from 0 to 800° C. Reproduced here are the density values at ten degree intervals from 0 to 300° C, at 20 degree intervals from 300 to 400° C, and at 40 degree intervals from 400 to 800° C.

The two evaluations differ slightly with the Russian data being a little smaller at all temperatures over the 0 to 300°C range common to both tables. The difference in parts per million, ppm, is given below for several temperatures. The difference is negligible for most applications.

t∕°C		0	50	90	200	300
Difference	(ppm)	3.7	1.5	4.5	7.6	15.5

REFERENCES:

- Herington, E. F. G.; Brown, I.; Lane, J. E.; Ambrose, D. Pure Appl. Chem. <u>1976</u>, 45, 1 - 9.
- 2. Bigg, P. H. Brit. J. Appl. Phys. <u>1964</u>, 15, 1111 3.
- Vargaftik, N. B. Tables on the thermophysical properties of liquids and gases, Hemisphere Pub. Corp., Washington and London, 1975. (English translation of the 2nd Russian Edition, distributed by Halsted Press); Chem. Abstr. <u>1974</u>, 80, 137452v; <u>1976</u>, 84, 35655d.
- Vukalovich, M. P.; Fokin, R. V. Thermophysical properties of mercury, Standards Press, <u>1971</u>, 311 pp.; Chem. Abstr. <u>1973</u>, 78, 114619z.

238		Appei	ndices				
COMPONENTS: Mercury;	Hg; [7439-9	7-6]	EVALU App Den	ATOR: pendix II usity of	I Liquid Me	ercui	ry
CRITICAL EVALUAT	'ION:	<u> </u>	I				
Temperature	Dens	sity	 Temp	erature	کت کت اللہ کے لیے کہ ایک کر ا	Dens	sity
t/°C T/K	(1)p/Mg m ⁻³	(2)p/Mg m ⁻³	≠/°C	T/K	(1)p/Mg	m - 3	(2) p/Mg m ⁻³
$\begin{array}{c} -20 & 253.15 \\ -15 & 258.15 \\ -10 & 263.15 \\ -5 & 268.15 \\ 0 & 273.15 \\ 5 & 578.15 \\ 10 & 283.15 \\ 15 & 288.15 \\ 20 & 293.15 \\ 25 & 298.15 \\ 30 & 303.15 \\ 35 & 308.15 \\ 40 & 313.15 \\ 45 & 318.15 \\ 50 & 323.15 \\ 55 & 328.15 \\ 60 & 333.15 \\ 65 & 338.15 \\ 70 & 343.15 \\ 75 & 348.15 \\ 80 & 353.15 \\ 85 & 358.15 \\ 90 & 363.15 \\ 95 & 368.15 \\ 100 & 373.15 \\ 110 & 383.15 \\ 120 & 393.15 \\ 130 & 403.15 \\ 140 & 413.15 \\ 150 & 423.15 \\ 160 & 433.15 \\ 170 & 443.15 \\ 180 & 453.15 \\ 190 & 463.15 \\ 200 & 473.15 \\ 210 & 483.15 \\ 200 & 473.15 \\ 210 & 483.15 \\ 200 & 473.15 \\ 210 & 483.15 \\ 200 & 473.15 \\ 210 & 483.15 \\ 220 & 493.15 \\ 230 & 503.15 \\ 240 & 513.15 \\ 250 & 523.15 \\ 260 & 533.15 \\ 290 & 563.15 \\ 300 & 573.15 \\ \end{array}$	13.64459 13.63218 13.61978 13.59708 13.59508 13.59508 13.57044 13.55815 13.54587 13.53362 13.52137 13.50914 13.49693 13.48473 13.49693 13.48473 13.44823 13.44823 13.44823 13.44823 13.44823 13.44823 13.44823 13.44823 13.44823 13.44823 13.44823 13.44823 13.4510 13.42397 13.37560 13.36354 13.3274 13.3034 13.2794 13.2554 13.2315 13.2076 13.1837 13.1298 13.1360 13.1121 13.0883 13.0645 13.0407 13.0169 12.9930 12.9930 12.9930 12.9954 12.9215 12.8737	13.59503 13.57039 13.54583 13.52133 13.49689 13.47251 13.44819 13.42393 13.39971 13.37554 13.35142 13.32734 13.30330 13.27929 13.25531 13.23137 13.20745 13.18356 13.15968 13.15968 13.15968 13.15968 13.15968 13.15968 13.15968 13.15968 13.15968 13.15968 13.15968 13.15968 13.15968 13.1665 12.99282 12.96898 12.94514 12.9734 12.8735	320 340 360 380 400 440 520 560 600 640 680 720 720 800	593.15 613.15 633.15 653.15 713.15 753.15 793.15 873.15 913.15 993.15 1073.15			12.8256 12.7776 12.7294 12.6811 12.6326 12.5348 12.4358 12.336 12.234 12.130 12.025 11.918 11.809 11.697 11.584

COMPONENTS:	EVALUATOR:
Mercury; Hg; [7439-97-6]	Appendix IV Vapor Pressure of Liquid Mercury
CRITICAL EVALUATION:	I
The vapor pressure of mercury has experimental data have been evaluate data from three evaluations. Two early 1970's and one was done in 1955	been measured by many workers. The ed a number of times. We present here of the evaluations were done in the 1.
Douglas, Ball, and Ginnings compared vapor pressure equation they develor Their equation for the vapor pressur the Gibbs energies of saturated lique thermodynamic data at that time. The imperfections and temperature scale. constants is difficult to use. Vap are tabulated at 20 degree intervals in their paper. These values are give	values from 14 laboratories with the oped from thermodynamic data in 1951. e of mercury was obtained by equating id and vapor using the best available by took into account the effect of gas The equation, which contains over 20 or pressure values from the equation s from near the triple point to 500°C oven on the next page.
Douglas, Ball, and Ginnings give a si reproduces the vapor pressure of the to within 0.01 percent. The equation	impler equation for practical use that full equation between 100 and 500°C is
log (p/mmHg) = 11.257555 - 3339 + 2.95697 x 10 ⁻⁴ - 1.5605 x 10 ⁻¹⁴	9.202/(θ/K) - 1.153092 log(θ/K) (θ/K) - 7.4588 x 10 ⁻⁰ (θ/K) ² (θ/K) ³ + 3.600 exp(-5360/(θ/K)),
where θ is the temperature on the 194 Scale, related at the thermodynamic s	8 International Practical Temperature scale by
$(T/K) - (\Theta/K) = 0.6381 - 4.809 x$ - 7.481 x 10 ⁻³ (6	x 10 ⁻³ (θ/K) + 1.1096 x 10 ⁻⁵ (θ/K) ² θ/K) ³ .
Unfortunately these equations are sor sent a thorough careful evaluation, a they are related to the 1948 IPTS.	newhat dated. However, they do repre- and they should not be ignored because
Ambrose and Sprake combined measure and information from earlier evaluat vapor pressure of mercury. The first polynomial for the 400 to 686 K tempe	ements of their own with earlier data ions to develop two equations for the t equation is a third order Chebyshev erature interval. It is
$(T/K) \log(p/kPa) = 1313.8587/2 + 0.2965 E_3$	+ 997.8311 E ₁ (x) - 3.0387 E ₂ (x) (x)
where	
$x = \{2(T/K) - (686)\}$	+ 400)}/(686 - 400)
and the Chebyshev polynomials are	`
$E_0(x) = 1, E_1(x) = x, E_2(x) = 2x^2 - 1$ $8x^2 + 1.$, $E_3(x) = 4x^3 - 3x$, and $E_4(x) = 8x^4 - 3x^4$
They are related by the recurrence re	lation
$E_{s + 1}(x) = 2xE_{s}$	$(x) - E_{s - 1}(x).$
Value from the equation are reprod 673.15 K. The second equation of A Chebyshev polynomial for the 400 to fitted to experimental data over the cal temperature and pressure. The equation	uced on the next page from 273.15 to Ambrose and Sprake is a fifth order 1765 K temperature interval. It was 400 to 772 K range and to the criti- quation is:
$(T/K) \log(p/kPa) = 8745.7706/2 + 29.7025 E_3$	+ 4708.7980 E ₁ (x) + 13.2829 E ₂ (x) (x) + 11.7077 E ₄ (x) + 4.5180 E ₅ (x)
(continued on page 243)	

COMPONENTS:		EVALUATOR:	
Mercury; Hg; [7439-97-6]		Appendix IV Vapor Pressure of Liquid Mercury	
CRITICAL EVAI	LUATION:		
	Ambrose and Sprake	Douglas, Ball Cinnings	Vargaftik
t∕°C	p/mmHg	p/mmHg	p/mmHg
-38,88 -20		0.00219 x 10 ⁻³ 0.02336 x 10 ⁻³	
0 10	0.197 x 10 ⁻³ 0.515 x 10 ⁻³	0.1996 x 10 ⁻³	0.205 x 10 ⁻³ 0.533 x 10 ⁻³
20	1.258×10^{-3}	1.268×10^{-3}	1.30×10^{-3}
25 30 40	$\begin{array}{c} 2.893 \times 10^{-3} \\ 6.304 \times 10^{-3} \end{array}$	6.340 x 10 ⁻³	2.98 x 10 ⁻³ 6.47 x 10 ⁻³
50 60	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	26.048 x 10 ⁻³	13.4×10^{-3} 26.5 × 10^{-3}
80	49.44×10^{-3} 90.75 × 10 ⁻³	90.954 x 10 ⁻³	50.4×10^{-3} 92.4 × 10 ⁻³
90 100 110	0.1610 0.2768 0.4623 0.7517	0.2771	0.164 0.281 0.468
130	1.193	1 9400	1.21
150	2.808	1.0435	2.83
170	6.180 8.775	8.7734	6.15 8.83
190 200	12.40	17.27	12.48 17.37
210 220	23.72 32.14	32.15	23.83
230 240	43.02 56.90	56.93	43.19 57.11
250 260	74.45 96.41	96.70	74.70 96.70
270 280 290	123.6 157.4 197.8	157.23	124.0 157.5 198.3
300 310	247.1	247.41	247.6
320 330	376.7	377.27	377.4
340 350	558.4 673.2	559.22	559.3 674.3
360 370	806.8 961.3	808.00	807.9 962.7
380 390	1139.1 1342.8	1140.65	1140.6 1344.4
400	1575.0	1576.64	1576.9
420 440 460 480 500	2136.7 2848.2 3736.4 4829.8 6159.2	2137.76 2848.1 3733.8 4822.9 6145.4	
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COMPONENTS :		EVALUATOR	R:	_	
Mercury; Hg; [7439-97-6]		Append Vapor	ix IV Pressure d	of Liquid	Mercury
CRITICAL EVALUATION:			<u> </u>		
	Ambrose and	Sprake	 Vargaft	 :ik	
t/°C	p/bar		p/bai	c	
0 10 20	0.2632 x 0.6869 x 1.677 x	10 ⁻⁶ 10 ⁻⁶ 10 ⁻⁶	0.2728 0.7101 1.7929	x 10 ⁻⁶ x 10 ⁻⁶ x 10 ⁻⁶	
25	2.562 x	10-*			
30 40 50 60 70	3.857 x 8.405 x 17.44 x 34.60 x 65.91 x	10-6 10-6 10-6 10-6 10-6	3.68 8.626 17.86 35.36 67.24	x 10 ⁻⁸ x 10 ⁻⁶ x 10 ⁻⁶ x 10 ⁻⁶ x 10 ⁻⁶	
80 90 100 110 120 130 140 150 160 170 180 190 200 210 220	0.121 x 0.2146 x 0.3690 x 0.6163 x 1.002 x 1.590 x 2.466 x 3.744 x 5.573 x 8.144 x 11.70 x 16.53 x 23.03 x 31.62 x 42.85 x	10 - 3 10 - 3	0.1232 0.2182 0.3745 0.6247 1.015 1.608 2.491 3.778 5.618 8.204 11.78 16.64 23.15 31.77 43.04	x 10 ⁻³ x 10 ⁻³	
230 240 250 260	57.35 x 75.86 x 99.26 x	10-3 10-3 10-3	57.58 76.14 99.59	x 10 ⁻³ x 10 ⁻³ x 10 ⁻³	
270 280 290 300 310 320 330 340 350 360 370 380 390	0.1233 0.1648 0.2094 0.2637 0.3294 0.4083 0.5022 0.6135 0.7444 0.8975 1.0756 1.2816 1.5187 1.7903		0.12392 0.16527 0.20993 0.26435 0.33015 0.40910 0.50320 0.61460 0.74567 0.89896 1.0772 1.2834 1.5207 1.7925		
400 420 440 460 480 500 520 520 540 560 580 600 620	2.0999 2.8487 3.797 4.982 6.439 8.212 10.341 12.872 15.851 19.324 23.34 27.94		2.1024 2.852 3.801 4.986 6.446 8.222 10.358 12.901 15.899 19.403 23.46 28.14		

Apper	ndices
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COMPONENTS :		EVALUATOR:
COMPONENTS: Mercury; Hg; [7439-97-6]		Appendix IV Vapor Pressure of Liquid Mercury
CRITICAL EVALUATION:		
	Ambrose and	Sprake Vargaftik
<i>t/</i> °C	p/bar	p/bar
640 660	33.18 39.11	33.47 39.53
680 700 720	45.76 53.18 51.42	46.36 . 54.03 62.59
740 760	70.51 80.50	72.10 82.60
780	91.42	94.17
800 820	103.29 116.16	106.85
860 880	145.00 161.03	
900	178.15	
950 1000 1050	225.9 281.2 344.2	
1100 1150	415.8 496.7	
1200 1250 1300	588.3 692.4 912.0	
1350	950.8	
1400 1450 1490	1115 1312 1500	
1492 (ct)	1510	

COMPONENTS:

EVALUATOR:

Appendix IV

Vapor Pressure of Liquid Mercury

CRITICAL EVALUATION:

Mercury; Hg; [7439-97-6]

with

$x = \{2(T/K) - (400 + 1765)\}/(1765 - 400)$

and the Chebyshev polynomials defined as stated previously. Values from the equation are given on the next two pages for temperatures from 683.15 to 1765 K.

The third set of values presented here are the vapor pressures from Var-gaftik based on the evaluation of Vukalovich and Fokin. The table presents the vapor pressure in bars at 10 degree intervals from 0 to 800°C and in mmHg from 0 to 400°C.

Both Douglas, Ball and Ginnings and Ambrose and Sprake mention that the vapor pressures from the triple point to 400 K show poorer agreement than the values measured at higher temperatures. We make no recommendation that one data set is better than the other. The differences may reflect the overall uncertainty of the data on which they are based.

REFERENCES:

- Douglas, T. B.; Ball, A. F.; Ginnings, D. C. J. Res. National Bureau of Standards <u>1951</u>, 46, 334 48. Ambrose, D.; Sprake, C. H. S. J. Chem. Thermodyn. <u>1972</u>, 4, 603 -1.
- J. Chem. Thermodyn. <u>1972</u>, 4, 603 -2. 20.
- Vargaftik, N. B. Tables on the thermophysical properties of liquids 3. and gases, Hemisphere Pub. Corp., Washington and London, <u>1975</u>. (English translation of the 2nd Russian Edition, distributed by Halsted Press); Chem. Abstr. <u>1974</u>, 80, 137452v; <u>1976</u>, 84, 35655d. Vukalovich, M. P.; Fokin, R. V. Thermophysical properties of mer-cury, Standards Press, <u>1971</u>, 311 pp.; Chem. Abstr. <u>1973</u>, 78,
- 4. 114619z.

COMPONENTS :	EVALUATOR:
Mercury; Hg; [7439-97-6]	Appendix V Second Virial Coefficient of Mercury Vapor

CRITICAL EVALUATION:

Douglas, Ball, and Ginnings evaluated graphically the second virial coefficient of mercury vapor at temperatures of 430, 530, 630, and 730 K. They took into account the molar dissociation energy of Hg_2 .

The empirical equation

 $B_{11}/cm^3 mol^{-1} = 56.4 - 43.82 exp(655/(T/K))$

represents the second virial coefficient, B_{11} , in the 373 to 773 K temperature range. Differentiation with respect to temperature gives

 $B'/cm^3 K^{-1} = dB/dT = (655/(T/K)^2)(56.4 - B).$

Values of B and B' as a function of temperature are given below.

Tem] t/°C	perature T/K	2nd Virial Coefficient B ₁₁ /cm³ mol ⁻¹	Temperature Coefficient (dB/dT)/cm ³ K ⁻¹ mol ⁻¹
100	373.15	-197	1.19
120	393.15	-175	0.98
140	413.15	-158	0.82
160	433.15	-142	0.69
180	453.15	-130	0.59
200	473.15	-118	0.51
220	493.15	-109	0.45
240	513.15	-101	0.39
260	533.15	-93	0.34
280	553.15	-87	0.31
300	573.15	-81	0.27
320	593.15	-76	0.25
340	613.15	-71	0.22
356.58	629.73 (bp)	-68	0.20
360	633.15	-67	0.20
380	653.15	-63	0.18
400	673.15	-60	0.17
420	693.15	-56	0.15
440	713.15	-53	0.14
460	733.15	-51	0.13
480	753.15	-48	0.12
500	773.15	-46	0.11

Mixed second virial coefficients, B_{12} , have been obtained from the solubility of mercury in compressed gases for mercury + argon, + propane, + butane, + methanol, and + acetone. The values are given in the evaluation of the solubility of mercury in compressed gases.

REFERENCES:

Douglas, T. B.; Ball, A. F.; Ginnings, D. C. J. Res. Nat. Bur. Stand. <u>1951</u>, 46, 334 - 48.

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COMPONENTS:	EVALUATOR:
	Appendix VI
Mercury; Hg; [7439-97-6]	Manager Buthalan of Managinakian
	Mercury Enthalpy of Vaporization
	Pressures
COITICAL EVALUATION:	L
The values below were calculated	from data in Wargaftik (see references 3
and 4 in Appendixes III and IV).	IIVm data in varyattin (bee issuince -
Enthalpy of V	aporization Molar Volume
	101 · V/Cm · moi ·
0 61.5	14.755
10 61.4	71 14.781
	99 14.808
	27 14.655 956 14_862
50 61.1	.85 14.889
60 61.1	15 14.916
	47 14.943
00.5 00 60.9	78 14.970 10 74 997
100 60.8	42 15.024
110 60.7	75 15.051
120 60.7	09 15.078
	43 15.105
150 60.5	12 15.160
160 60.4	47 15.188
170 60.3	82 15.215
180 00.3 100 60.2	17 15.243 15.270
200 60.1	RR 15.298
220 60.0	15.354
240 59.9	31 15.410
260 59.8	02 15.467 70 15.52 <i>A</i>
300 59.5	40 15.582
320 59.4	15.640
340 59.2	.69 15.699
36U 59.1 390 58.9	29 15.758
400 58.8	15.879
440 58.5	16.003
480 58.1	.78 16.130
520 57.8	
600 56.9	16-535
640 56.4	08 16.680
680 55.8	16.830
1 760 54.5 800 53.7	10 17.100 155 17.315
	,
Several values of the mercury c	ohesion parameter calculated from the
$\delta/MPa^{\frac{1}{2}} = (($	$(\Delta H - RT)/V)^{\frac{1}{2}}$ are:
Temperature	Cohesion Parameter
	0/ MPG -
0 273.15	63.4
25 298.15	63.1
5U 323.13 100 373.15	62.7
150 423.15	62.0 61.3
200 473.15	60.6

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