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

CRITICAL EVALUATION:

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 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 co-workers (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:

i) 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 co-workers.

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_1^0) 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.

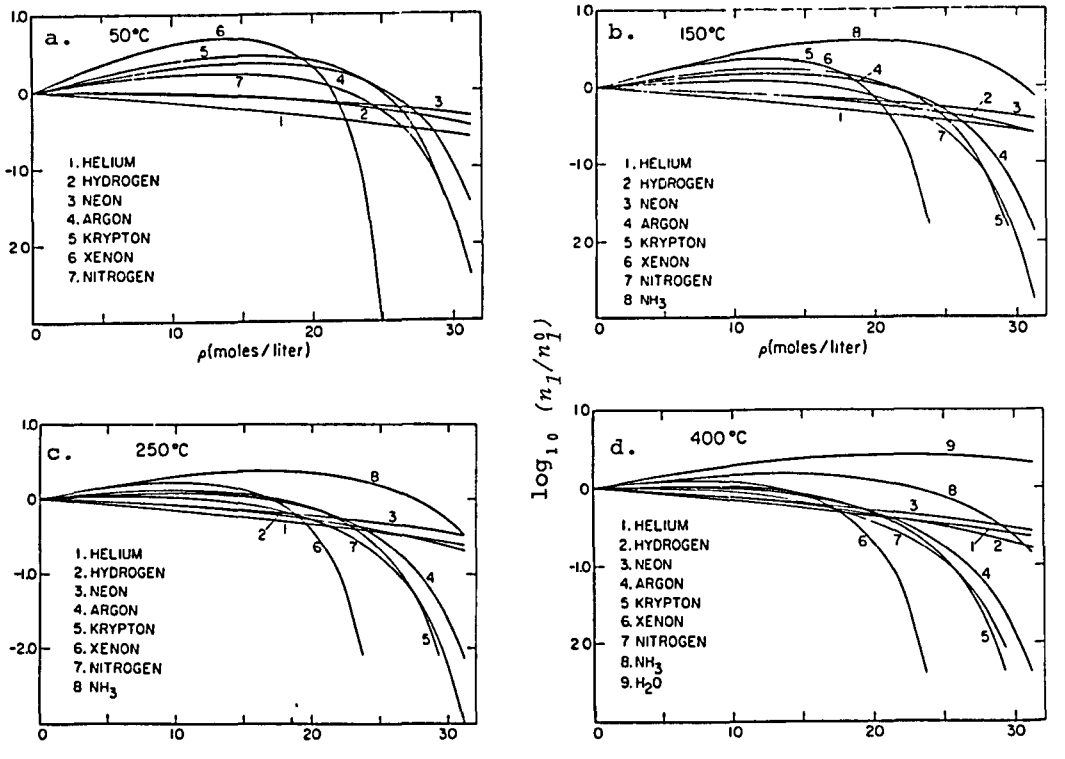


Figure 1. Mercury vapor solubility enhancement in compressed gases. log (n_1/n_1^0) *vs.* ρ_2/mol dm^{-3}. Isotherms at a. 323 K, b. 423 K, c. 523 K, and d. 673 K calculated by Haar and Sengers (ref 4).

COMPONENTS:	EVALUATOR:
(1) Mercury; Hg; [7439-97-6] (2) Compressed Gases	H. Lawrence Clever Chemistry Department Emory 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)	Hg + C_3H_8 (ref. 1)	Hg + C_4H_{10} (ref. 1)	Hg + CH_3OH (ref. 5)	Hg + CH_3COCH_3 (ref. 5)
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:

1. 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.* 1959, *55*, 1333.

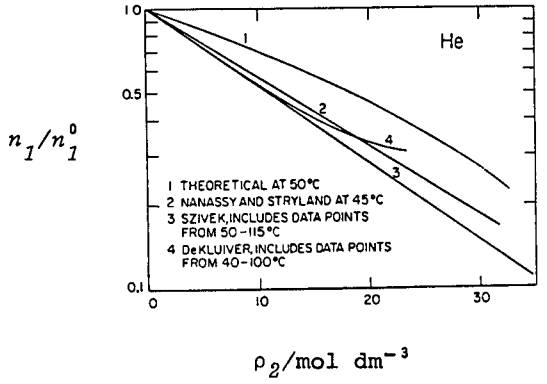
3. Stubley, D.; Rowlinson, J. S. *Trans. Faraday Soc.* 1961, *57*, 1275.

4. Haar, L.; Levelt Sengers, J. M. H. *J. Chem. Phys.* 1970, *52*, 5069.

5. Rosenberg, H. S.; Kay, W. B. *J. Phys. Chem.* 1974, *78*, 186.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] (2) Helium; He; [7440-59-7]	Haar, L.; Levelt Sengers, J. M. H. *J. Chem. Phys.* 1970, *52*, 5069 - 79.
VARIABLES: T/K = 318.15 - 388.15 ρ_2/mol dm^{-3} = 0 - 30	**PREPARED BY:** H. L. Clever

EXPERIMENTAL VALUES:



n_1/n_1^0 Concentration enhancement for mercury vapor in the gas.

ρ_2/mol dm^{-3} Number density of the gas, component 2.

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AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The mercury vapor concentration enhancement was calculated from the total absorption of the 253.7 nm resonance line of mercury as a function of foreign gas density.

If the absorption per mercury atom is taken to be independent of density, 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.

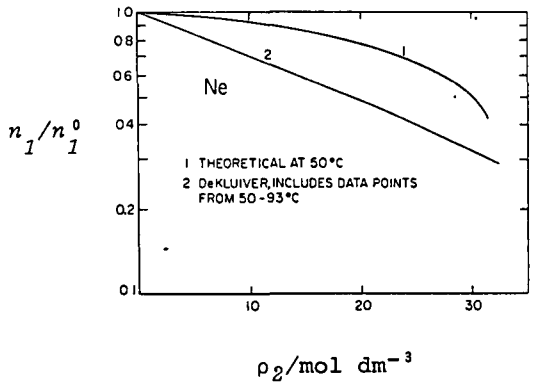
For this system the experimental data were taken from Stryland and Nanassy (ref. 1), Nanassy (ref. 2), De Kluiver (ref. 3), and Szivek (ref. 4). Additional information will be found in Michels and De Kluiver (ref. 5), Michels, De Kluiver and Castle (ref. 6), and Michels, De Kluiver, and Middelkoop (ref. 7ab).

REFERENCES:

1. Styrland, J. C.; Nanassy, A. J. *Physica* 1958, *24*, 935.
2. Nanassy, A. J. Ph.D. dissertation, 1959, Toronto.
3. De Kluiver, H. Ph.D. dissertation, 1959, Amsterdam.
4. Szivek, J. M.S. dissertation, 1961, Toronto.
5. Michels, A.; De Kluiver, H. *Physica* 1956, *22*, 919.
6. Michels, A.; De Kluiver, H.; Castle, B. *Physica* 1957, *23*, 1131.
7. Michels, A.; De Kluiver, H.; Middelkoop, D. (a) *Physica* 1958, *24*, 543; (b) *Physica* 1959, *25*, 163.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] (2) Neon; Ne; [7440-01-9]	Haar, L.; Levelt Sengers, J. M. H. *J. Chem. Phys.* 1970, *52*, 5069 - 79.
VARIABLES: T/K = 323.15 - 366.15 ρ_2/mol dm^{-3} = 0 - 30	**PREPARED BY:** H. L. Clever

EXPERIMENTAL VALUES:



n_1/n_1^0 Concentration enhancement for mercury vapor in the gas.

ρ_2/mol dm^{-3} Number density of the gas, component 2.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The mercury vapor concentration enhancement was calculated from the total absorption of the 253.7 nm resonance line of mercury as a function of foreign gas density.

If the absorption per mercury atom is taken to be independent of density, 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 De Kluiver (ref. 1). Additional information is found in the papers of Michels and De Kluiver *et al* . (ref. 2 - 4ab).

REFERENCES:

1. De Kluiver, H.
Ph.D. dissertation, 1959, Amsterdam.

2. Michels, A.; De Kluiver, H.
Physica 1956, *22*, 919.

3. Michels, A.; DeKluiver, H.; Castle, B.
Physica 1957, *23*, 1131.

4. Michels, A.; DeKluiver, H.; Middelkoop, D.
(a) *Physica* 1958, *24*, 543;
(b) *Physica* 1959, *25*, 163.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] (2) Argon; Ar; [7440-37-1]	Stubley, D.; Rowlinson, J. S. *Trans. Faraday Soc.* 1961, *57*, 1275 - 80.
VARIABLES: T/K = 457.15 - 578.15 P/MPa = 0.000 - 3.108	PREPARED BY: H. L. Clever M. Iwamoto

EXPERIMENTAL VALUES:

Temperature		Pressure		Gas Density	Solubility Ratio
t/°C	T/K	P/atm	P/MPa	c_2/mol dm^{-3}	c_1/c_1^0
184.0	457.15	0.000	0.000	0.000	1.000
		8.975	0.9093	0.239	1.032
		18.24	1.848	0.485	1.049
		24.16	2.448	0.642	1.058
218.0	491.15	0.000	0.000	0.000	1.000
		9.646	0.9773	0.239	1.030
		19.62	1.988	0.485	1.049
		25.99	2.633	0.642	1.058
256.0	529.15	0.000	0.000	0.000	1.000
		10.39	1.053	0.239	1.010
		21.16	2.144	0.485	1.023
		28.04	2.841	0.642	1.030
305.0	578.15	0.000	0.000	0.000	1.000
		11.36	1.151	0.239	1.010
		23.16	2.346	0.485	1.012
		30.67	3.108	0.642	1.036

Pressures were estimated by the compilers from the tables of Angus, S.; Armstrong, B. International Thermodynamic Tables of the Fluid State, Argon. Butterworths, 1972. Additional measurements were made at 215 and 300°C up to densities of 10 mol dm^{-3} which were reported graphically.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Below 30 atm -
Radioactive tracer method (ref. 1). Irradiated Hg and gas are equilibrated with stirring in a 0.5 x 40 cm tube until a counter at the top indicates equilibrium.

Above 30 atm -
Weight loss method (ref. 2). The weight loss of a liquid mercury sample was determined when a known volume of gas had been brought to equilibrium by diffusion of the Hg vapor in an autoclave, over a period of two weeks.

SOURCE AND PURITY OF MATERIALS:

(1) Mercury. No information given.

(2) Argon. British Oxygen Company, Limited. 99.8 percent pure.

ESTIMATED ERROR:

δT/K = ±0.2

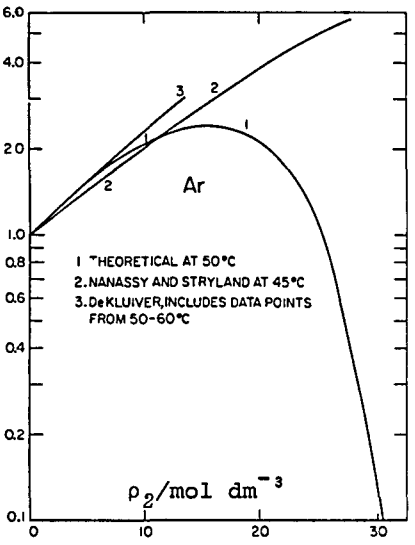
$\delta(c_1/c_1^0)/(c_1/c_1^0)$ = ±0.01

REFERENCES:

1. 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. 1959, *55*, 1333.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] (2) Argon; Ar; [7440-37-1]	Haar, L.; Levelt Sengers, J. M. H. *J. Chem. Phys.* 1970, *52*, 5069 - 79.
VARIABLES: T/K = 318.15 - 333.15 ρ_2/mol dm^{-3} = 0 - 30	**PREPARED BY:** H. L. Clever

EXPERIMENTAL VALUES:



n_1/n_1^0 Concentration enhancement for mercury vapor in the gas.

ρ_2/mol dm^{-3} Number density of the gas, component 2.

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AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The mercury vapor concentration enhancement was calculated from the total absorption of the 253.7 nm resonance line of mercury as a function of foreign gas density.

If the absorption per mercury atom is taken to be independent of density, 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), and De Kluiver (ref. 3). Additional information will be found in Szivek (ref. 4), Michels and De Kluiver (ref. 5), Michels, De Kluiver and Castle (ref. 6), and Michels, De Kluiver, and Middelkoop (ref. 7ab).

REFERENCES:

1. Styrland, J. C.; Nanassy, A. J. *Physica* 1958, *24*, 935.
2. Nanassy, A. J. Ph.D. dissertation, 1959, Toronto.
3. De Kluiver, H. Ph.D. dissertation, 1959, Amsterdam.
4. Szivek, J. M.S. dissertation, 1961, Toronto.
5. Michels, A.; De Kluiver, H. *Physica* 1956, *22*, 919.
6. Michels, A.; De Kluiver, H.; Castle, B. *Physica* 1957, *23*, 1131.
7. Michels, A.; De Kluiver, H.; Middelkoop, D. (a) *Physica* 1958, *24*, 543; (b) *Physica* 1959, *25*, 163.

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

EXPERIMENTAL VALUES:

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The mercury vapor concentration enhancement was calculated from the total absorption of the 253.7 nm resonance line of mercury as a function of foreign gas density.

If the absorption per mercury atom is taken to be independent of density, the experiment effectively measures the enhancement of mercury vapor concentration in the gas phase. The experimental data were reduced as if the absorption (oscillator strength) per mercury atom remained constant.

De Kluiver (ref. 1) and Michels *et al.* (ref. 2) report a study of the mercury 253.652 nm line in the presence of krypton. However, the study was carried out with unsaturated mercury vapor

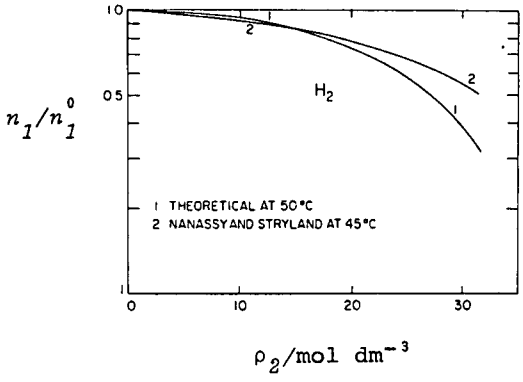
REFERENCES:

1. De Kluiver, H.
Ph.D. dissertation, 1959, Amsterdam.

2. Michels,A.;De Kluiver,H.; Middelkoop, D.
(a) *Physica* 1958, *24*, 543;
(b) *Physica* 1959, *25*, 163.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] (2) Hydrogen; H_2; [1333-74-0]	Haar, L.; Levelt Sengers, J. M. H. *J. Chem. Phys.* 1970, *52*, 5069 - 79.
VARIABLES: T/K = 318.15 ρ_2/mol dm^{-3} = 0 - 30	PREPARED BY: H. L. Clever

EXPERIMENTAL VALUES:



n_1/n_1^0 Concentration enhancement for mercury vapor in the gas.

ρ_2/mol dm^{-3} Number density of the gas, component 2.

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AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The mercury vapor concentration enhancement was calculated from the total absorption of the 253.7 nm resonance line of mercury as a function of foreign gas density.

If the absorption per mercury atom is taken to be independent of density, 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) and Nanassy (ref. 2). There are additional data in Szivek (ref. 3).

REFERENCES:

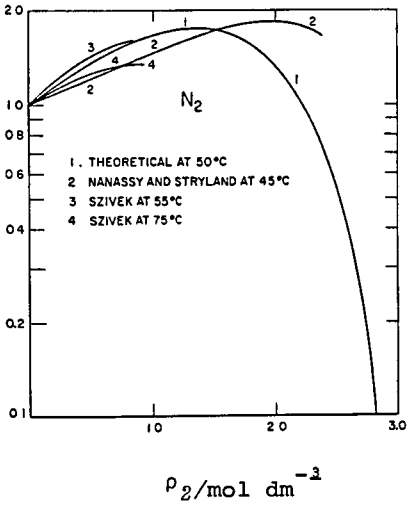
1. Styrland, J. C.; Nanassy, A. J. *Physica* 1958, *24*, 935.

2. Nanassy, A. J. Ph.D. dissertation, 1959, Toronto.

3. Szivek, J. M.S. dissertation, 1961, Toronto.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] (2) Nitrogen; N_2; [7727-37-9]	Haar, L.; Levelt Sengers, J. M. H. *J. Chem. Phys.* 1970, *52*, 5069 - 79.
VARIABLES: T/K = 318.15 - 348.15 ρ_2/mol dm^{-3} = 0 - 30	**PREPARED BY:** H. L. Clever

EXPERIMENTAL VALUES:



n_1/n_1^0 Concentration enhancement for mercury vapor in the gas.

ρ_2/mol dm^{-3} Number density of the gas, component 2.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The mercury vapor concentration enhancement was calculated from the total absorption of the 253.7 nm resonance line of mercury as a function of foreign gas density.

If the absorption per mercury atom is taken to be independent of density, 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), and Szivek (ref. 3).

REFERENCES:

1. Styrland, J. C.; Nanassy, A. J. *Physica* 1958, *24*, 935.

2. Nanassy, A. J. Ph.D. dissertation, 1959, Toronto.

3. Szivek, J. M.S. dissertation, 1961, Toronto.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] Mercury-203; ^{203}Hg; [13982-78-0] (2) Propane; C_3H_8; [74-98-6]	Jepson, W. B.; Richardson, M. J.; Rowlinson, J. S. *Trans. Faraday Soc.* 1957, *53*, 1586 - 91.
VARIABLES: T/K = 457.15, 491.15, 529.15 P/MPa = 0.00135 - 3.29	PREPARED BY: H. L. Clever M. Iwamoto

EXPERIMENTAL VALUES:

Temperature		Pressure		Gas Density	Solubility Ratio
t/°C	T/K	P/atm	P/MPa	c_2/mol dm^{-3}	c_1/c_1°
184.0	457.15	0.0133	0.00135	0.000	1.000
		9.8	0.99	0.273	1.076
		18.9	1.92	0.549	1.156
218.0	491.15	0.0398	0.00403	0.000	1.000
		10.6	1.07	0.273	1.066
		20.6	2.09	0.549	1.133
		29.4	2.98	0.815	1.180
256.0	529.15	0.1144	0.01159	0.000	1.000
		11.6	1.17	0.273	1.050
		22.5	2.28	0.549	1.104
		32.5	3.29	0.815	1.145

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

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.

The tube is thermostated by a vapor bath of boiling liquid. Samples are stirred for seven hours. The radioactivity 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 mercury ratio with and without gas. c_1° represents the concentration of pure mercury at its equilibrium vapor pressure.

SOURCE AND PURITY OF MATERIALS:

(1) Mercury and Mercury-203. Sample irradiated at Harwell. Isotope ^{197}Hg $t_{\frac{1}{2}}$ 2 - 7 days allowed to decay, activity 1.6 curie mol^{-1} of isotope ^{203}Hg $t_{\frac{1}{2}}$ 47.9 days.

(2) Propane. Chemical Research Lab, Teddington. Purity not less than 99.5 percent.

ESTIMATED ERROR:

$\delta(c_1/c_1^\circ)/(c_1/c_1^\circ) = \pm 0.01$

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] Mercury-203; ^{203}Hg; [13982-78-0] (2) Butane; C_4H_{10}; [106-97-8]	Jepson, W. B.; Richardson, M. J.; Rowlinson, J. S. *Trans. Faraday Soc.* 1957, *53*, 1586 - 91.
VARIABLES: T/K = 457.15, 491.15, 529.15 P/MPa = 0.00135 - 3.10	PREPARED BY: H. L. Clever M. Iwamoto

EXPERIMENTAL VALUES:

Temperature		Pressure		Gas Density	Solubility Ratio
t/°C	T/K	P/atm	P/MPa	c_2/mol dm^{-3}	c_1/c_1^0
184.0	457.15	0.0133	0.00135	0.000	1.000
		9.6	0.97	0.277	1.115
		17.8	1.80	0.562	1.234
		24.1	2.44	0.838	1.350
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	1.201
		27.2	2.76	0.838	1.297
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

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

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.

The tube is thermostated by a vapor bath of boiling liquid. Samples are stirred for seven hours. The radioactivity 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 mercury ratio with and without gas. c_1^0 represents the concentration of pure mercury at its equilibrium vapor pressure.

SOURCE AND PURITY OF MATERIALS:

(1) Mercury and Mercury-203. Sample irradiated at Harwell. Isotope ^{197}Hg $t_{\frac{1}{2}}$ 2 - 7 days allowed to decay, activity 1.6 curie mol^{-1} of isotope ^{203}Hg $t_{\frac{1}{2}}$ 47.9 days.

(2) Butane. Chemical Research Lab, Teddington. Purity not less than 99.5 percent.

ESTIMATED ERROR:

$\delta(c_1/c_1^0)/(c_1/c_1^0) = \pm 0.01$

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] (2) Butane; C_4H_{10}; [106-97-8]	Richardson, M. J.; Rowlinson, J. S. *Trans. Faraday Soc.* 1959, *55*, 1333 - 7.
VARIABLES: T/K = 488.05 - 566.65 P/MPa = 7.1 - 38.5	PREPARED BY: H. L. Clever M. Iwamoto

EXPERIMENTAL VALUES:

Temperature		Pressure		Gas Density	Weight of Mercury	Solubility Ratio
t/°C	T/K	P/atm	P/MPa	c_2/mol dm^{-3}	m_1/mg	c_1/c_1^1
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
214.7	487.85	200	20.3	6.916	25.2	3.52
212.9	486.05	200	20.3	6.934	23.9	3.53
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	13.2	4.726	51.6	2.35
254.8	527.95	270	27.4	6.732	67.2	2.85
299.8	572.95	100	10.1	2.725	87.0	1.54
296.0	569.15	170	17.2	4.636	105.8	2.02
293.5	566.65	380	38.5	6.905	121.3	2.37

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Weight loss method. A small reservoir containing a known weight of mercury is placed in an all-glass bulb containing a known volume of gas. The glass bulb fits in a steel bomb. Temperature is established and maintained for up to three weeks which is three times to time calculated from the diffusion coefficient to reach 98% saturation. The system is cooled to room temperature, the bulb cut open, and the mercury reservoir weighed to determine mercury loss. The mercury reservoir is so designed that mercury condensed from cooling does not enter.

SOURCE AND PURITY OF MATERIALS:

(1) Mercury. No information given.

(2) Butane. Prepared from 1-bromobutane Grignard reagent and 1-butanol. Distilled serveral times to insure absence of air and stored in sealed bulbs.

ESTIMATED ERROR:

δT/K = $\pm$0.2

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6]	Rosenberg, H. S.; Kay, W. B.
(2) Methanol or Methyl alcohol; CH_4O; [67-56-1]	*J. Phys. Chem.* 1974, *78*, 186 - 9.
VARIABLES:	PREPARED BY:
T/K = 493.15 - 573.15 P/MPa = 0.00429 - 3.16	H. L. Clever M. Iwamoto

EXPERIMENTAL VALUES:

Temperature		Pressure		Gas Density	Solubility Ratio
t/°C	T/K	P/atm	P/MPa	c_2/mol dm^{-3}	c_1/c_1^0
220.0	493.15	0.0423	0.00429	0.000	1.000
		10.1	1.02	0.267	1.063
		13.8	1.40	0.374	1.087
		17.4	1.76	0.479	1.109
		21.6	2.19	0.634	1.132
		24.5	2.48	0.744	1.143
240.0	513.15	0.0748	0.00758	0.000	1.000
		10.7	1.08	0.267	1.059
		14.5	1.47	0.374	1.083
		18.1	1.83	0.479	1.105
		23.0	2.33	0.634	1.125
		26.3	2.66	0.744	1.136
260.0	533.15	0.1267	0.01284	0.000	1.000
		11.2	1.13	0.267	1.056
		15.3	1.55	0.374	1.080
		19.1	1.94	0.479	1.100
		24.4	2.47	0.634	1.126
		27.9	2.83	0.744	1.135
280.0	553.15	0.2064	0.02091	0.000	1.000
		11.8	1.20	0.267	1.055
		16.1	1.63	0.374	1.081
		20.1	2.04	0.479	1.099
		25.8	2.61	0.634	1.120
		29.6	3.00	0.744	1.131
300.0	573.15	0.3247	0.03290	0.000	1.000
		12.4	1.26	0.267	1.055
		16.9	1.71	0.374	1.075
		21.1	2.14	0.479	1.098
		27.1	2.75	0.634	1.114
		31.2	3.16	0.744	1.125

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

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] (2) Methanol or Methyl alcohol; CH_4O; [67-56-1]	Rosenberg, H. S.; Kay, W. B. *J. Phys. Chem.* 1974, *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:

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

A modification of the radioactive tracer technique of Jepson, *et al.* (ref. 1), was used.

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 equation of state up to the second viral coefficient (ref. 2).

Temperature was established and the equilibrium cell stirred continuously until successive readings at four hour intervals differed by no more than 0.3 percent in 100,000 accumulated counts (usually two days).

SOURCE AND PURITY OF MATERIALS:

(1) Mercury. Liquid Hg sample tagged with ^{203}Hg ($t_{\frac{1}{2}}$ = 46.59 days) at initial specific activity of 7.5 *mCi*/g.

(2) Methanol. Source not given. Described as ultra-high-purity and distilled *in vacuo* into the apparatus before use.

REFERENCES:

1. Jepson, W. B.; Richardson, M. J.; Rowlinson, J. S. *Trans. Faraday Soc.* 1957, *53*, 1586.

2. Lambert, J. D.; Roberts, G. A. H.; Rowlinson, J. S.; Wilkinson, V. J. *Proc. Royal Soc., Ser A* 1949, *196*, 113.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Mercury; Hg; [7439-97-6] (2) 2-Propanone or Acetone; C_3H_6O; [67-64-1]	Rosenberg, H. S.; Kay, W. B. *J. Phys. Chem.* 1974, *78*, 186 - 9.
VARIABLES: T/K = 493.15 - 573.15 P/MPa = 0.89 - 2.82	PREPARED BY: H. L. Clever M. Iwamoto

EXPERIMENTAL VALUES:

Temperature		Pressure		Gas Density	Solubility Ratio
t/°C	T/K	P/atm	P/MPa	c_2/mol dm^{-3}	c_1/c_1^o
220.0	493.15	8.8	0.89	0.241	1.077
		12.8	1.30	0.371	1.115
		16.1	1.63	0.492	1.154
		19.1	1.94	0.631	1.191
		21.0	2.13	0.730	1.216
240.0	513.15	9.3	0.94	0.241	1.073
		13.6	1.38	0.371	1.110
		17.1	1.73	0.492	1.147
		20.6	2.09	0.631	1.172
		22.7	2.30	0.730	1.196
260.0	533.15	9.8	0.99	0.241	1.068
		14.4	1.46	0.371	1.104
		18.2	1.84	0.492	1.140
		22.0	2.23	0.631	1.165
		24.5	2.48	0.730	1.185
280.0	553.15	10.3	1.04	0.241	1.065
		15.2	1.54	0.371	1.097
		19.3	1.96	0.492	1.130
		23.4	2.37	0.631	1.152
		26.1	2.64	0.730	1.174
300.0	573.15	10.9	1.10	0.241	1.058
		16.0	1.62	0.371	1.089
		20.4	2.07	0.492	1.123
		24.9	2.52	0.631	1.146
		27.8	2.82	0.730	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] (2) 2-Propanone or Acetone; C_3H_6O; [67-64-1]	Rosenberg, H. S.; Kay, W. B. *J. Phys. Chem.* 1974, *78*, 186 - 9.
VARIABLES: T/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:

A modification of the radioactive tracer technique of Jepson, *et al.* (ref. 1), was used.

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 equation of state up to the second viral coefficient (ref. 2).

Temperature was established and the equilibrium cell stirred continuously until successive readings at four hour intervals differed by no more than 0.3 percent in 100,000 accumulated counts (usually two days).

SOURCE AND PURITY OF MATERIALS:

(1) Mercury. Liquid Hg sample tagged with ^{203}Hg ($t_{\frac{1}{2}}$ = 46.59 days) at initial specific activity of 7.5 *mCi*/g.

(2) Acetone. Source not given. Described as ultra-high-purity and distilled *in vacuo* into the apparatus before use.

REFERENCES:

1. Jepson, W. B.; Richardson, M. J.; Rowlinson, J. S. *Trans. Faraday Soc.* 1957, *53*, 1586.

2. Lambert, J. D.; Roberts, G. A. H.; Rowlinson, J. S.; Wilkinson, V. J. *Proc. Royal Soc., Ser A* 1949, *196*, 113.