COMPONENTS:	EVALUATOR:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION:

Tammann (1) observed that the addition of 0.805 at % of Zn in Hg depressed the melting point of Hg by 1.66 K. Gouy (2) found from a filtration method that saturated zinc amalgam contains 5.3 at % Zn at 288-291 K. Kerp and coworkers (3) determined the solubility in the temperature range of 273-372 K; they found that between 273 and 354.5 K the results were reproducible and that the solubility increased monotonically from 4.72 to 13.57 at %, and there was an abrupt decrease in solubility at temperatures higher than 355 K. However, from comparison with later works only the solubility of 6.17 at % at 298 K is reliable. By thermal analysis, Pushin (4) determined a smooth liquidus curve of the Zn-Hg system over the complete range of compositions. Cohen and Inouye (5) carefully determined the solubility by equilibration and filtration of the amalgam at temperature, as well as some thermal experiments, and showed that Kerp's (3) results are too low in the higher temperature range, and that the abrupt change reported by the latter was not reliable; it was also shown that Pushin's data were too high in the low temperature range. From careful measurements, Crenshaw (6) found that 6.377 at % of Zn is soluble in mercury at 298 K; this result is in good agreement with Cohen and Inouye.

Peshkov (7) investigated the region of the eutectic point by thermal analysis and reported the eutectic at 231.6 K at a zinc concentration of 1.69 at %. However, Hajicek (8) calculated that the eutectic point is at 230 K and 3.26 at % Zn; the latter concentration is nearly twofold too high and is rejected. The eutectic point found by Pushin (4), 2.6 at % at 230.5 K, lies between those of (7) and (8); however, the composition and temperature given by Peshkov seem to be most reliable.

Jangg and Kirchmayr (9), from potentiometric experiments at 288 K, determined a solubility of 5.33 at %. Bennett and Lewis (10, 11) reported solubilities of 6.99 and 8.28 at % at 303 and 313 K, respectively. Schadler and Grace (12) employed a zinc amalgam concentration cell and determined a solubility of 6.75 at % at 303 K, and they also quoted an unpublished solubility of 6.32 at % at 298 K; the latter determination was made at the New Jersey Zinc Co. Dayananda and Grace (13) carried out a precise determination of zinc content in its saturated amalgam and found 9.66 at % at 323.2 K. Very precise solubility determinations also were made by EMF measurements by Benjamin and Strickland-Constable (14) and by Walls and Upthegrove (15). All of the results reported by (10) to (15) agreed with those of Cohen and Inouye (5). However, the results of thermometric titration by Zebreva and coworkers (16-18), 5.6 and 8.2 at % at 298 and 313 K, respectively, are lower than those of the above authors.

Kozin's prediction (19) of the zinc solubility, 5.73 at % at 298 K, is in fair agreement with the experimental results.

The solubility at room temperature reported by Strachan and Harris (20) is too low and is rejected. Kozin (21) determined the solubility potentiometrically at 298 to 353 K, and found that the solubility increased from 5.5 to 13.1 at % in this temperature range; these results are up to 10% too low as compared to the more precise determinations discussed above.

Kozin and Maltsev (22) showed that the solubility of zinc in gallium amalgams may be as much as 40% higher than in mercury.

The Zn-Hg phase diagram (23) is shown in Figure 1.

(Continued next page)

COMPONENTS:	EVALUATOR:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION: (continued)

Recommended (r) and tentative values of the solubility of Zn in Hg:

T/K	Soly/at %	Reference
231.6	1.7	[7]
273.2	4.1	[5]
293.2	5.88 (r)[a]	[5,11,22]
298.2	6.32 (r)	[3,6,22,31]
323.2	9.64 (r)[b]	[5,23,33]
373	19[c]	[5,23]
473	45	[4]
573	70	[4]
673	95	[4]

[a] Interpolated value from cited references.

[b] Mean value from cited references.

[c] Extrapolated value from cited references.

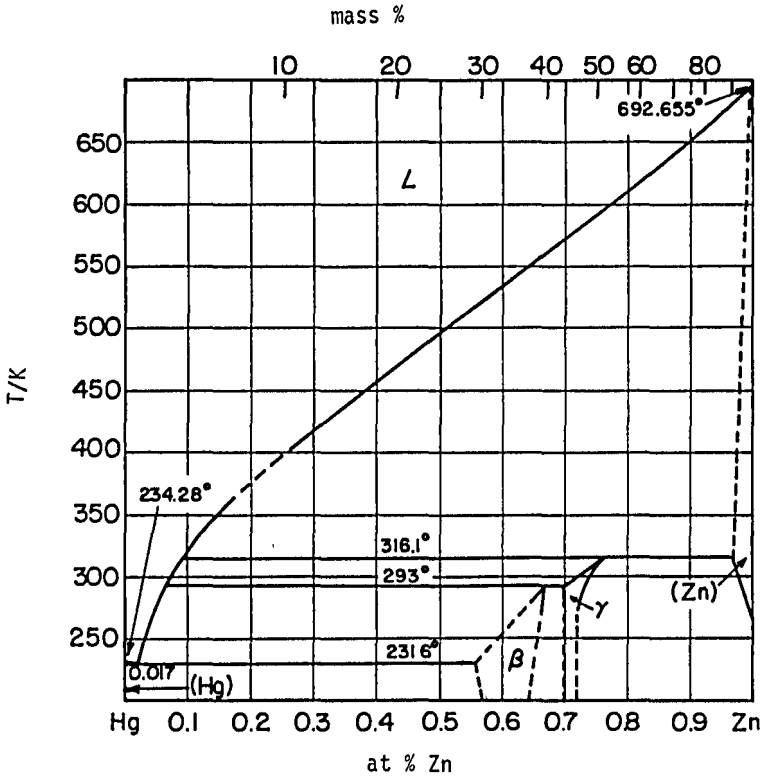

Fig. 1. The Zn-Hg system (23).

COMPONENTS:	EVALUATOR:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION:

References

1. Tammann, G. *Z. Phys. Chem.* 1889, *3*, 441.
2. Gouy, M. *J. Phys.* 1895, *4*, 320.
3. Kerp, W.; Böttger, W.; Iggena, H. *Z. Anorg. Chem.* 1900, *28*, 1.
4. Pushin, N. *Z. Anorg. Chem.* 1903, *36*, 201; *Zh. Russ. Fiz. Khim. Obshch., Ser. Khim.* 1902, *34*, 856.
5. Cohen, E.; Inouye, K. *Z. Phys. Chem.* 1910, *71*, 625; 1911, *75*, 437.
6. Crenshaw, J.L. *J. Phys. Chem.* 1910, *14*, 158.
7. Peshkov, W. *Zh. Fiz. Khim.* 1946, *20*, 835; *Acta Physicochim. URSS* 1946, *21*, 109.
8. Hajicek, O. *Hutnicke Listy* 1948, *3*, 265.
9. Jangg, G.; Kirchmayr, H. *Z. Chem.* 1963, *3*, 47.
10. Bennett, J.A.R.; Lewis, J.B. *J. Chim. Phys.* 1958, *55*, 83.
11. Bennett, J.A.R.; Lewis, J.B. *Am. Inst. Chem. Eng. J.* 1958, *4*, 418.
12. Schadler, H.W.; Grace, R.E. *Trans. Met. Soc. AIME* 1959, *215*, 559.
13. Dayananda, M.A.; Grace, R.E. *U.S. At. Ener. Comm. Rep.* TID-11742, 1961.
14. Benjamin, L.; Strickland-Constable, R.F. *Acta Met.* 1960, *8*, 362.
15. Walls, H.A.; Upthegrove, W.R. *J. Chem. Eng. Data* 1964, *9*, 184.
16. Filippova, L.M.; Gayfullin, A.Sh.; Zebreva, A.I. *Prikl. Teor. Khim.*, Alma-Ata 1974, No. 5, 76.
17. Zebreva, A.I.; Filippova, L.M.; Omarova, N.D. *Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol.* 1977, *20*, 19.
18. Filippova, L.M.; Zebreva, A.I.; Omarova, N.D.; Korobkina, N.P. *Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol.* 1978, *21*, 316.
19. Kozin, L.F. *Fiziko-Khimicheskie Osnovy Amalgamnoi Metallurgii*, Nauka, Alma-Ata, 1964.
20. Strachan, J.F.; Harris, N.L. *J. Inst. Metals* 1956-57, *85*, 17.
21. Kozin, L.F. *Tr. Inst. Khim. Nauk Akad. Nauk Kaz. SSR* 1962, *9*, 71.
22. Kozin, L.F.; Maltsev, Yu.T. *Izv. Akad. Nauk Kaz. SSR, Ser. Khim.* 1969, No. 5, 38.
23. Hultgren, R.; Desai, P.D.; Hawkins, D.T.; Gleiser, M.; Kelley, K.K. *Selected Values of the Thermodynamic Properties of Binary Alloys*, American Soc. Metals, Metals Park, Ohio, 1973, pp. 999-1003.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	Tammann, G. *Z. Phys. Chem.* 1889, *3*, 441-9.
VARIABLES: Temperature: 232-234 K	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Freezing point depression, ΔT/K, of mercury as a function of zinc content in the amalgams.

	Zinc Content	
ΔT/K	g Zn/100 g Hg	at %[a]
0.53	0.102	0.306
1.13	0.168	0.507
1.66	0.266	0.805

[a] by compilers

The melting point of mercury is reported to be 244 instead of 234 K, but it is the opinion of the compilers that the former value was a typographical error in the original publication.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Melting temperatures of amalgams were determined. No further details were presented.

SOURCE AND PURITY OF MATERIALS:

Nothing specified.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: precision ± 0.05 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	Kerp, W.; Böttger, W.; Iggena, H. *Z. Anorg. Chem.* 1900, *25*, 1-71.
VARIABLES: Temperature: 0-99°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of zinc in mercury:

t/°C	Soly/mass %	Soly/at %[a]
0	1.59±0.10	4.72
25	2.10±0.03	6.17
46.5	2.94±0.02	8.50
56	3.09±0.07	8.91
64.5	3.33±0.13	9.56
81.5	4.87±0.17	13.57
89.5	3.74±0.20	10.65
99	4.52±0.24	12.68

[a] by compilers

The results at 0° and between 46.5 and 99°C are too low, but the value at 25° is reliable.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were prepared by electrolysis of saturated $ZnSO_4$ with mercury as the cathode. The amalgams were then washed and filtered. The zinc content was determined by treating the filtrate with concentrated HCl, then precipitating the zinc as the carbonate, and subsequently heating to ZnO. The mercury content was determined gravimetrically by washing then drying the residual Hg after the HCl treatment.
The procedure for equilibration at various temperatures was not described in detail.

SOURCE AND PURITY OF MATERIALS:

No impurities were found in the recrystallized $ZnSO_4$.

Hg purity not specified.

ESTIMATED ERROR:

Soly: precision better than ± 5%.

Temp: nothing specified.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	Pushin, N. *Zh. Russ. Fiz. Khim. Obshch., Ser. Khim.* 1902, *34*, 856-904. *Z. Anorg. Chem.* 1903, *36*, 201-254.
VARIABLES:	PREPARED BY:
Temperature: (-41)-396°C	C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Temperatures of crystallization of the saturated zinc amalgams:

t/°C	at % Zn	t/°C	at % Zn
396	94.9	209.75	46.4
372	89.4	196.75	43.2
354	84.9	184	40.0
342.5	82.5	172.25	37.1
334	79.6	155	33.4
325.75	77.2	134.75	28.6
317	75	120	25.1
300	70.5	103.5	21.5
285	66.7	88.25	18
274.5	63.2	72	14.2
262.25	60	51.5	10.6
246.75	56.1	∿36	8.4
233.5	52.7	∿13	5.7
223.75	50	∿-41.5	2.6

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The amalgams were prepared by mixing weighed portions of the metals. The crystallization temperatures were determined from cooling curves. The amalgams were protected from oxidation with a layer of paraffin or vaseline on the surface.	Nothing specified.
	ESTIMATED ERROR: Soly: nothing specified. Temp: precision ± 0.5 K.
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	Cohen, E.; Inouye, K. *Z. Phys. Chem.* 1910, *71*, 625-35.
VARIABLES: Temperature: 0-100°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of zinc in mercury at various temperatures:

t/°C	Soly/mass %	Soly/at %[a]
0.3	1.37±0.02	4.09
19.9	1.99±0.01	5.86
30.0	2.39±0.01	6.99
39.95	2.86±0.01	8.28
50.0	3.37±0.04	9.66
64.75	4.28±0.14	12.06
80.1	5.36±0.10	14.80
89.5	6.10±0.08	16.62
94.8	6.59±0.10	17.79
99.6	7.04±0.13	18.85

[a] by compilers

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The amalgams were prepared by the dissolution of zinc in mercury at temperatures higher than those of the experimental measurements. The tubes with the amalgams were then shaken for one to a few days in a thermostat. The amalgams were then filtered and the filtrates were treated with HCl and the residual mercury was determined gravimetrically after being washed and dried.	Very pure zinc was obtained from Kahlbaum; mercury was purified chemically then double distilled before use.
	ESTIMATED ERROR: Soly: precision as high as ± 3%, but the mean was ± 1%. Temp: precision ± 0.2 K.
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	Crenshaw, J. L. *J. Phys. Chem.* 1910, *14*, 158-170.
VARIABLES: Temperature: 25°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of zinc in 100 g of mercury at 25.0°C was determined to be 2.220 ± 0.007 g. The solubility in atomic % calculated by the compilers is 6.377 at %.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were prepared by mixing precisely weighed quantities of the metals in a special apparatus with mercury under distilled water and polarized up to 12 V. This procedure protected the zinc from oxidation. The saturated amalgams were equilibrated for several weeks in a rotated tube immersed in a thermostat. Determination of the zinc concentration was made by two methods:

(I) Densities of the saturated and diluted amalgams of exact composition were determined pycnometrically, and the saturated amalgam concentration was obtained from a calibration curve.

(II) The saturated zinc amalgam was filtered and a known quantity of the filtrate was treated with concentrated HCl; the mercury was washed and dried and its concentration determined gravimetrically.

SOURCE AND PURITY OF MATERIALS:

Mercury was chemically purified and then distilled. $ZnSO_4$ was purified by precipitation of all other heavy metals with H_2S, then recrystallized 3 times. Metallic zinc was obtained by electrolysis of the purified $ZnSO_4$ solution, and the metal was vacuum distilled.

ESTIMATED ERROR:

Soly: accuracy ± 0.3%.
Temp: precision ± 0.02 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	Peshkov, V. *Zh. Fiz. Khim.* 1946, *20*, 835-51.
VARIABLES: Temperature: (-39)-(-20)°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Crystallization temperatures of dilute zinc amalgams:

t/°C	Soly/mass %	Soly/at %[a]
-39.33	0.100	0.306
-40.38	0.300	0.915
-41.63[b]	0.534	1.62
-41.75	0.569	1.72
-34.7	0.717	2.17
-19.9 (-17.6)	1.046	3.14

[a] by compilers

[b] eutectic point

In another paper by the same author somewhat different values of temperatures are given (1).

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were obtained by mixing the two metals. Temperatures at the start of crystallization and the end of melting were determined. Microscopic examinations also were made of the amalgams.

SOURCE AND PURITY OF MATERIALS:

Mercury purity: 99.999%
Zinc purity: 99.97%

ESTIMATED ERROR:

Soly: nothing specified.

Temp: precision ± 0.01 K.

REFERENCES:

1. Peshkov, V.
Acta Physicochem. URSS 1946, *21*, 109.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	1. Bennett, J.A.R.; Lewis, J.B. *J. Chim. Phys.* 1958, *55*, 83-7. 2. Bennett, J.A.R.; Lewis, J.B. *Am. Inst. Chem. Eng. J.* 1958, 418-22.
VARIABLES: Temperature: 30-40°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of zinc in mercury at 30 and 40°C was reported to be 2.39 and 2.86 mass %; 6.99 and 8.28 at %, respectively.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The amalgams were prepared by dissolution of a rotating zinc cylinder in Hg. The dissolution vessel was mounted inside a glove box filled with pure argon. After equilibration the amalgams were analyzed by distilling out mercury at 300°C in nitrogen atmosphere. The residue was dissolved in aqua regia and then analyzed by polarography.	99.99% pure metals were used.
	ESTIMATED ERROR: Soly: nothing specified; no better than ± 3% (compilers). Temp: precision ± 0.2 K.
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg [7439-97-6]	Schadler, H.W.; Grace, R.E. *AIME Trans.* 1959, *215*, 559-66.
VARIABLES: Temperature: 30°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

The solubility of zinc in mercury at 30°C was determined to be 6.75 at %.

The authors also quote unpublished solubility data, determined at the New Jersey Zinc Co., of 2.147 ± 0.01 and 2.157 ± 0.01 mass % at 25°C.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were prepared either by electrolysis or by dissolving solid zinc in Hg. EMF of the cell,

$$Hg(Zn)_{sat} | Zn^{++}(0.1 \text{ mol dm}^{-3}) | Hg(Zn)_x$$

were measured for a series of amalgams, including the saturated amalgam. Although not described, the solubility was probably determined from the breakpoint in the plot of EMF vs. amalgam concentration.

SOURCE AND PURITY OF MATERIALS:

Hg: ACS Reagent Grade from Goldsmith Bros.

Zn: Cast rod from New Jersey Zinc Co. with Pb <0.002%, Cd <0.00005%, and Fe <0.0003%.

ESTIMATED ERROR:

Soly: not specified; accuracy probably better than ± 1% (compilers).

Temp: precision ± 0.03 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	Benjamin, L.; Strickland-Constable, R.F. *Acta Met.* 1960, *8*, 362-72.
VARIABLES: Temperature: 23-41°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of zinc in mercury at three temperatures was reported.

t/°C	Soly/mass %	Soly/at %[a]
23.21	2.08	6.12
36.87	2.65	7.71
40.90	2.90	8.39

[a] by compilers

Kinetics of nucleation and crystal growth from zinc amalgam also were studied.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were prepared by dissolution of Zn in Hg, and concentration cells of the type,

$Zn(Hg)_x | 2\ mol\ dm^{-3}\ ZnSO_4 | Zn(Hg)_y$

were constructed. Nitrogen was bubbled through the $ZnSO_4$ solution after it had been allowed to boil. The cells were equilibrated for a day or two before EMF measurements were made.

SOURCE AND PURITY OF MATERIALS:

High purity zinc from U.K.A.E.A., Harwell.

Purity of other substances not specified.

ESTIMATED ERROR:

Soly: nothing specified; precision better than ± 1% (compilers).

Temp: precision ± 0.02 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	Dayananda, M.A.; Grace, R.E. U.S. At. Ener. Comm. Rep., TID-11742, 1961.
VARIABLES:	**PREPARED BY:**
One temperature: 50°C	C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

At 50.0°C the solubility of Zn in Hg was determined to be 3.37 mass %. The solubility in atomic % calculated by the compilers is 9.66 at %.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Single crystals of zinc were first immersed in H_2O_2 for a day, then briefly dipped in 3:1 HNO_3 and rinsed with water. The dissolution of the zinc in its unsaturated amalgam was followed by determination of its activity in the amalgam as a function of time. For this measurement, a sample of amalgam removed from the dissolution flask was used in the cell,

$$Zn(Hg)_{sat} | 0.1 \text{ mol dm}^{-3} ZnSO_4 | Zn(Hg)_x ,$$

and the activity determined from the EMF. To prevent oxidation of the amalgam, 18 V was applied between the solution (anode) and the amalgam (cathode).

SOURCE AND PURITY OF MATERIALS:

Zn purity was 99.999%; impurities were Pb, Cd, and Fe at 2×10^{-4}, 5×10^{-5}, and 3×10^{-4} %, respectively.

Hg contained 5×10^{-4} % Ag + Au and less than 1×10^{-4} % base metal.

ESTIMATED ERROR:

Temperature: precision $\pm$ 0.1 K.

Stability of EMF was $\pm 3 \times 10^{-6}$ V.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	Kozin, L.F. *Tr. Inst. Khim. Nauk Akad. Nauk Kaz. SSR* 1962, *9*, 71-80.
VARIABLES: Temperature: 25-80°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of zinc in mercury:

t/°C	Soly/at %
25	5.5
40	7.9
60	10.6
80	13.1

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were prepared by dissolution of zinc in mercury, and EMF's were measured of the cell,

$Zn(Hg)_x$ | 0.1 mol dm^{-3} $Zn(ClO_4)_2$, 0.9 mol dm^{-3} $NaClO_4$ | NaCl, Hg_2Cl_2, Hg.

The solutions were protected against oxygen with a stream of pure nitrogen. The break-point in the curve relating EMF to logarithm of zinc concentration corresponded to the saturation in the amalgam.

SOURCE AND PURITY OF MATERIALS:

The salts were recrystallized twice.

Mercury was purified chemically then doubly distilled.

Zinc was 99.999% pure.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: precision ± 0.2 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	Jangg, G.; Kirchmayr, H. *Z. Chem.* 1963, *3*, 47-56.
VARIABLES: Temperature: 15°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of zinc in mercury at 15°C was reported to be 3.68 $\pm$ 0.10 mol dm^{-3}.

The solubility in atomic % calculated by the compilers is 5.33 at %.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Amalgams were prepared by electrolysis, and a cell was constructed as follows:

$Zn(Hg)_x | ZnSO_4 | KCl, Hg_2Cl_2, Hg$.

The concentration of the saturated amalgam was determined from the breakpoint in the curve of EMF vs. log $C_{Zn(Hg)}$, where $C_{Zn(Hg)}$ is the amalgam concentration. The experiments were conducted in an inert gas atmosphere.

SOURCE AND PURITY OF MATERIALS:

Nothing specified.

ESTIMATED ERROR:

Soly: precision better than $\pm$ 3%.

Temp: nothing specified.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn; [7440-66-6] (2) Mercury; Hg; [7439-97-6]	Walls, H.A.; Upthegrove, W.R. *J. Chem. Eng. Data* 1964, *9*, 184-187.
VARIABLES: Temperature: 323-366 K	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of zinc in mercury:

T/K	Soly/mass %	Soly/at %
323.2	3.348	9.608
343.4	4.645	13.003
366.4	6.540	17.676

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were prepared by directly dissolving zinc into mercury, and the concentration ascertained from the known weights of each component. The solubilities were determined by extrapolating the concentration versus EMF curve to zero potential for the cell,

$$Zn(Hg)_{sat} | 0.1 \text{ mol dm}^{-3} ZnSO_4 | Zn(Hg)_x .$$

The saturated amalgams were prepared at temperatures slightly above experimental and slowly cooled to ascertain equilibration. The amalgams and electrolyte were handled under a blanket of argon to exclude air. Precision potentiometer and galvanometer were used; calibrated thermocouples used for temperature measurement.

SOURCE AND PURITY OF MATERIALS:

All materials were ACS Reagent Grade or better.

ESTIMATED ERROR:

Temp: precision ± 0.01 K.
EMF measurement: precision better than ± 0.05 mV.
Concentration: accuracy ± 0.001%.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Zinc; Zn [7440-66-6] (2) Mercury; Hg; [7439-97-6]	Filippova, L.M.; Zebreva, A.I.; Omarova, N.D.; Korobkina, N.P. *Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol.* 1978, *21*, 316-9.
VARIABLES: Temperature: 25-40°C	PREPARED BY: C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of zinc in mercury at 25 and 40°C were reported to be 5.6 ± 0.5 and 8.2 ± 0.1 at %, respectively.

The same solubility at 25°C is reported also in (2) and (3).

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The heterogeneous and homogeneous amalgams were prepared by direct dissolution of zinc in mercury. The amalgams were thermometrically titrated by the addition of mercury in a specially constructed apparatus (1). The zinc solubility was determined from the breakpoint of the curve relating composition to the thermal effect. All operations were performed in an argon atmosphere.

SOURCE AND PURITY OF MATERIALS:

Zinc was specified as "for analysis".

Mercury purity not specified.

ESTIMATED ERROR:

Soly: accuracy no better than ± 10%.

Temp: precision ± 0.5 K.

REFERENCES:

1. Zebreva, A.I.; Filippova, L.M.; Omarova, N.D.; Gayfullin, A.Sh. *Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Teknol.* 1976, *19*, 1043-6.
2. Filippova, L.M.; Gayfullin, A.Sh.; Zebreva, A.I. *Prikl. Teor. Khim.*, Alma-Ata, 1974, *5*, 76-82.
3. Zebreva, A.I.; Filippova, L.M.; Omarova, N.D. *Izv. Vyssh. Ucheb. Zaved, Khim. Khim. Tekhnol.* 1977, *20*, 19-22.

COMPONENTS:	EVALUATOR:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION:

In the earliest report on this system, Tammann (1) observed that the melting point of mercury was elevated by 1.8 K when 0.55 at % of cadmium was dissolved into the mercury. Heycock and Neville (2) conducted similar thermal analyses in the Cd-rich region and observed that the M.P. was depressed up to 15 K by the dissolution of up to 5.19 at % of Hg. Later measurements by Honda and Ishigaki (3) confirmed the results of ref. (2).

Gouy (4) reported a solubility of 6.8 at % at 288-291 K, but this result is rejected because it is 10% lower than the most precise measurements. From the potentiometric measurements of Jaeger (5) at 288 K a solubility of approximately 8.6 at % may be estimated; this result is rejected.

Hulett and DeLury (6) determined the solubility of cadmium at 298 K by equilibration of the two metals, followed by careful analysis of the saturated liquid. The solubility reported by these authors was 9.529 at.%. The solubility of 9.6 at % at 298 K, reported by Zebreva and coworkers (7,8) from thermometric titrations of homo- and heterogeneous amalgams, is in good agreement with the above value. Strachan and Harris (9) reported a solubility of 9.41 at % at room temperature.

Moesveld and De Meester (10) determined the solubility of Cd between 273 and 314 K from careful potentiometric measurements, and they found that the solubility increased from 4.82 to 13.76 at % in this temperature range. These authors fitted their solubility to a parabolic function of the temperature. Walls and Upthegrove (11), from careful EMF measurements, reported solubilities of 16.10 to 29.03 at % at 323.2 to 366.4 K. Kerp and coworkers (12) determined the solubility at 273-372 K by an analytical method, and their results near room temperature are in good agreement with other precise measurements; however, the results at the higher temperatures are too low, while the solubilities near 273 K are too high. Smith (13) investigated the Weston normal cell over a temperature range of 273-338 K; from the data presented in this work the solubility was estimated to increase from 5.2 to 20.3 at % over the given temperature range.

Bijl (14) and Pushin (15) reported the liquidus curve for the complete Cd-Hg system and the results from thermal analyses were in good agreement with other reported determinations; however, Bijl also determined some of the solubilities by potentiometric measurements and these results were slightly lower than those determined by thermal analysis. The liquidus determined by Jänecke (16), at 20-80 at % Cd, was in good agreement with those of refs. (14) and (15); similar agreement with the latter works was reported by Teeter (17) and by Mehl and Barrett (18). Schulze (19) determined the crystallization temperatures for compositions ranging from 13.76 to 23.74 at %, but his liquidus temperatures are slightly too low. The complete phase diagram was redetermined by Semibratova and coworkers (20), but these authors found lower liquidus temperatures in the Hg-rich and higher temperatures in the Cd-rich regions as compared to those of refs. (14),(15), and (18); the results for the remainder of the liquidus agreed well with the earlier measurements. Campbell and Kartzmark (21) conducted thermoanalytical measurements and confirmed the results of Bijl; however, the former authors did not observe the peritectic at about 463 K. Bukhman and coworkers (22) determined the Cd content in the saturated amalgams at 290-296 K and obtained solubilities of 6.59 to 9.69 at % in this temperature range; however, the temperature dependence of the solubility is too high, and only the result at 295 K is acceptable from comparison with other works.

Kozin's (23) prediction of 5.16 at % at 298 K is too low, and an estimate from Spencer's (24) EMF measurement is too imprecise.

The saturated cadmium amalgams are in equilibrium with the rather unstable ω-phase or with pure cadmium; see the most recent phase diagram (25) in Fig. 1. However, Bukhman and coworkers (22) demonstrated that $CdHg_3$ is in equilibrium with the saturated amalgams at room temperature.

The solubility of Cd in the amalgams of Bi, Pb, Sn, Tl, and Zn was reported by (26). It also was reported that the presence of Mn in the amalgam decreased the solubility of Cd only slightly (27).

(continued next page)

COMPONENTS:	EVALUATOR:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION: (continued)

The recommended (r) and tentative values of the solubility of Cd in Hg:

T/K	Soly/at %	Source
239	1.3 peritectic	[14]
273.2	4.9 (r)	[7,13]
293.2	8.6 (r)[a]	[5,13,14]
298.2	9.53 (r)	[5,10,6,25,27]
323.2	16.1 (r)	[6,14,24]
373	32 (r)[a]	[9,24,25]
473	67 (r)	[7,9,25]
573	91 (r)	[7,25]

a. Interpolated from data of cited references.

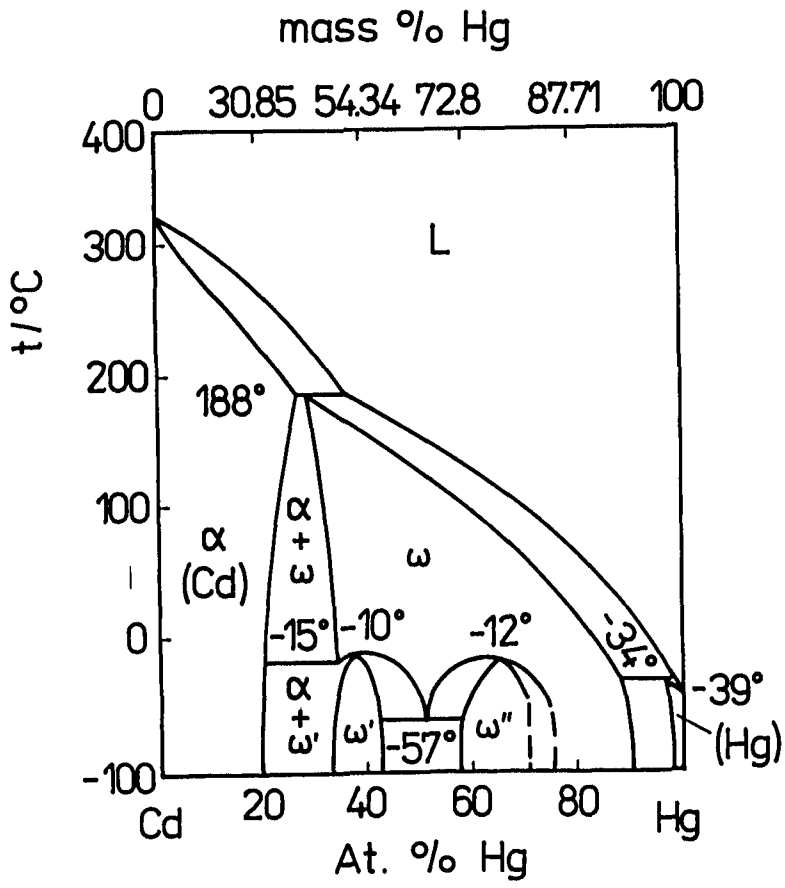

Fig. 1. The Cd-Hg system (25).

COMPONENTS:	EVALUATOR:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION:

REFERENCES

1. Tammann, G. *Z. Phys. Chem.* 1889, *3*, 441.
2. Heycock, C.T.; Neville, F.H. *J. Chem. Soc.* 1892, 888.
3. Honda, K.; Ishigaki, T. *Sci. Rep. Tohoku Univer.* 1925, *14*, 219.
4. Gouy, M. *J. Phys.* 1895, *4*, 320.
5. Jaeger, W. *Wied. Ann.* 1898, *65*, 106.
6. Hulett, G.A.; De Lury, R.H. *J. Am. Chem. Soc.* 1908, *30*, 1805.
7. Zebreva, A.I.; Filippova, L.M.; Omarova, N.D.; Gayfullin, A.Sh. *Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol.* 1976, *19*, 1043.
8. Filippova, L.M.; Zebreva, A.I.; Espenbetov, A.A. *Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol.* 1977, *20*, 1468.
9. Strachan, J.F.; Harris, N.L. *J. Inst. Metals* 1956-57, *85*, 17.
10. Moesveld, A.L.T.; De Meester, W.A.T. *Z. Phys. Chem.* 1927, *130*, 146.
11. Walls, H.A.; Upthegrove, W.R. *J. Chem. Eng. Data* 1964, *9*, 184.
12. Kerp, W.; Böttger, W.; Iggena, H. *Z. Anorg. Chem.* 1900, *25*, 1.
13. Smith, F.E. *Phil. Mag., Ser. 6* 1910, *19*, 250; *Z. Phys. Chem.* 1920, *95*, 293.
14. Bijl, H.C. *Z. Phys. Chem.* 1902, *41*, 641.
15. Pushin, N. *Z. Anorg Chem.* 1903, *36*, 201; *Zh. Russ. Fiz. Khim. Obshch., Ser. Khim.* 1902, *34*, 856.
16. Jänecke, E. *Z. Phys. Chem.* 1907, *60*, 399.
17. Teeter, C.E. *J. Am. Chem. Soc.* 1931, *53*, 3927.
18. Mehl, R.F.; Barrett, C.S. *Trans. AIME* 1930, *89*, 575; *Met. Erz.* 1930, *27*, 624.
19. Schulze, A. *Z. Phys. Chem.* 1923, *105*, 177.
20. Semibratova, N.M.; Yan-Sho-Syan, G.V.; Nosek, M.V. *Izv. Akad. Nauk Kaz. SSR, Ser. Khim.* 1969, No. 5, 30.
21. Campbell, A.N.; Kartzmark, E.M. *Can. J. Chem.* 1965, *43*, 1924.
22. Bukhman, S.P.; Lange, A.A.; Kairbaeva, A.A. *Izv. Akad. Nauk Kaz. SSR, Ser. Khim.* 1984, No. 1, 31.
23. Kozin, L.F. *Fiziko-Khimicheskie Osnovy Amalgamnoi Metallurgii*, Nauka, Alma-Ata, 1964.
24. Spencer, J.F. *Z. Elektrochem.* 1905, *11*, 681.
25. Vol, A.E.; Kagan, I.K. *Stroenie i Svoistva Dvoinykh Metallicheskikh Sistem*, Moskva, 1979, *IV*, p. 168.
26. Atamanova, N.M.; Nosek, M.V. *Izv. Akad. Nauk Kaz. SSR, Ser. Khim.* 1983, No. 3, 51.
27. Shirinskikh, A.V.; Grigoreva, M.J.; Bukhman, S.P. *Izv. Akad. Nauk Kaz. SSR, Ser. Khim.* 1983, No. 5, 20.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Tammann, G. *Z. Phys. Chem.* 1889, *3*, 441-9.
VARIABLES: Temperature: 234-236 K	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Changes in freezing point of mercury, ΔT, upon addition of small amounts of cadmium.

ΔT/K	g Cd/100 g Hg	at % Cd[a]
0.4	0.073	0.13
0.85	0.143	0.255
1.5	0.270	0.479
1.8	0.310	0.550

[a] by compilers

The melting point of Hg was reported to be 244 K instead of 234 K; in the opinion of the compilers there was a typographical error in the reported melting point of Hg.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Melting points of amalgams were determined. Details of experimental procedure not presented.

SOURCE AND PURITY OF MATERIALS:

Nothing specified.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: better than ± 0.05 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Heycock, C.T.; Neville, F.H. *J. Chem. Soc.* 1892, 888-914.
VARIABLES: Temperature: 305-321°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Temperatures of crystallization of saturated cadmium amalgams:

t/°C	atoms Hg/100 atoms Cd	at % Hg[a]
320.52	0.0285	0.0285
320.3	0.118	0.118
319.92	0.259	0.258
319.05	0.584	0.581
317.59	1.106	1.094
314.93	2.063	2.021
311.59	3.288	3.183
305.5	5.477	5.193

[a] by compilers

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Weighed quantities of the metals were placed in a hard glass tube then evacuated prior to sealing. The tube was heated to red heat and well shaken. The melting temperatures were determined with carefully calibrated thermometers.	Nothing specified.
	ESTIMATED ERROR: Soly: nothing specified. Temp: precision ± 0.05 K (compilers)
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Kerp, W.; Böttger, W.; Iggena, H. *Z. Anorg. Chem.* 1900, *25*, 1-71.
VARIABLES: Temperature: 0-99°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of cadmium in mercury at 0 to 99°C:

t/°C	Soly at %[a]	Soly mass %
0	5.52	3.17 ± 0.12
18	8.25	4.80 ± 0.05
25	9.54	5.58 ± 0.13
30	10.65	6.26 ± 0.02
35	11.83	6.99 ± 0.03
38	12.61	7.48 ± 0.03
40.5	13.09	7.78 ± 0.06
44	14.05	8.39 ± 0.10
56.8	17.07	10.34 ± 0.12
63	18.66	11.39 ± 0.10
73	22.09	13.71 ± 0.17
82	25.09	15.80 ± 0.20
89	27.39	17.45 ± 0.15
99	30.36	19.63 ± 0.03

[a] by compilers

The most reliable solubilities were obtained near room temperature. The solubilities at higher temperatures are slightly lower than those from the most reliable determinations, whereas at 0°C the solubility is too high.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Amalgams were prepared electrolytically from saturated $CdSO_4$ solution with Hg as the cathode. The heterogeneous amalgams were filtered, and the filtrates were treated with HCl. The cadmium concentrations were determined from the difference in weight between the original amalgam and the residual mercury after the acid treatment.

SOURCE AND PURITY OF MATERIALS:

Nothing specified.

ESTIMATED ERROR:

Soly: precision better than ± 3%.

Temp: nothing specified.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Bijl, H.C. *Z. Phys. Chem.* 1902, *41*, 641-71.
VARIABLES: Temperature: (-36)-273°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Temperatures of crystallization of cadmium amalgams were determined from cooling curves, A, and from potentiometric measurements, B.

A		B	
t/°C	at % Cd	t/°C	at % Cd
-36.4	0.47	25	9
-34.6	0.94	50	16
-1.6	5.52	75	23
34.0	12.44		
54.4	18.39		
68.8	22.21		
84.6	27.22		
121.8	40.04		
149.6	50.28		
163.6	55.10		
190.8	64.33		
214.6	70.90		
237.3	74.58		
273.4	84.96		

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were prepared by mixing the metals and heating in CO_2 atmosphere. Cadmium was previously cleaned with HCl then dried. The cooling curves of the amalgams were recorded. Also, potentials of the following cell were determined:

$Cd(Hg)_x | CdSO_4(aq.) | Cd(Hg)_a$

where a = 12.04%.

SOURCE AND PURITY OF MATERIALS:

Cadmium supplied by Merck.

Mercury was purified; method not specified.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: precision ± 0.2 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Pushin, N.A. *Zh. Russ. Fiz. Khim. Obshch., Ser. Khim.* 1902, *34*, 856-904; *Z. Anorg. Chem.* 1903, *36*, 201-254.
VARIABLES: Temperature: (-11)-316°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Crystallization temperatures of amalgams as a function of mercury concentration.

t/°C	at % Hg	t/°C	at % Hg
316.25	1.7	176.5	40.0
310.0	3.8	166.5	43.4
297.0	7.8	154.5	47.7
281.0	12.5	143.75	51.8
261.75	17.7	129.5	56.8
243.5	22.6	114.5	62.3
222.0	28.0	102.5	66.6
212.75	30.4	89.25	71.2
207.5	31.6	78.25	75.0
200	33.3	70.50	77.5
199.25	33.5	62.5	80.0
196.0	34.3	51.25	83.4
192.0	35.3	40.5	86.4
187	36.4	31.0	88.9
183.75	37.5	12.5	92.8
181	38.4	-6.0	95.8
179	38.9	-11.0	96.6
178	39.4		

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The amalgams were obtained by mixing the metals, followed by heating. Cooling curves were recorded on the amalgams; the amalgams were protected from oxidation by a film of paraffin or vaseline during the measurements.	Nothing specified.
	ESTIMATED ERROR: Soly: nothing specified. Temp: precision ± 0.5 K.
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Jänecke, E. *Z. Phys. Chem.* 1907, *60*, 399-412.
VARIABLES: Temperature: 67-248°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Temperatures of crystallization were determined for saturated cadmium amalgams of various compositions.

t/°C	at % Cd
248	80
199	66.5
147	50
102	33.5
67	20

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The melting points were determined from cooling curves with the temperatures observed either with a mercury thermometer or with a thermoelement. Microscopic observations also were carried out in parallel.

SOURCE AND PURITY OF MATERIALS:

Nothing specified.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: ± 1 K (compilers).

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Hulett, G.A.; DeLury, R.H. *J. Am. Chem. Soc.* 1908, *30*, 1805-27.
VARIABLES: Temperature: 25°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of cadmium in mercury at 25.00°C was reported to be 5.573 ± 0.002 mass %.

The solubility in atomic % calculated by the compilers is 9.529 at %.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were made by mixing the exactly weighed metals. The cadmium dissolution was carried out in special apparatus where Hg was polarized at 10 V under distilled water. This prevented the oxidation of Cd. Saturation of the amalgam was carried out in a tube which was rotated for several days in a thermostat. The Cd concentration was determined by two methods: I. Densities of the saturated and diluted amalgams were determined pycnometrically, and the concentration of the saturated amalgam was obtained from a calibration curve. II. The saturated amalgam was filtered and the weighed filtrate treated with HCl to dissolve the Cd. The mass difference between amalgam and residual Hg gave the Cd content. Correction applied for dissolution of traces of Hg.

SOURCE AND PURITY OF MATERIALS:

Mercury was chemically purified and then distilled. $CdSO_4$ was purified by first precipitating CdS with H_2S, then the CdS was dissolved in H_2SO_4 to form $CdSO_4$; the latter was recrystallized. Metallic Cd was obtained by electrolysis and the Cd was double distilled.

ESTIMATED ERROR:

Soly: precision ± 0.03%.

Temp: precision ± 0.01 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Smith, F.E. *Phil. Mag., Ser. 6* 1910, *19*, 250-276.
VARIABLES: Temperature: 0-65°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

The author investigated the Weston normal cell over a range of cadmium amalgam concentrations and temperatures. From the extensive data, the following cadmium solubilities have been derived by the compilers.

	Soly	
t/°C	mass %	at %
0	3	5.2
5	3.5	6.0
10	4	6.9
15	5	8.6
20	5.5	9.2
25	6	10.2
30	7	11.9
35	8	13.4
40	9	15.0
45	10	16.5
50	10.5	17.2
55	11	18.0
60	12	19.5
65	12.5	20.3

The measurements were not concerned with the solubility determinations so that precise results were not obtained. The same results are also presented in a later paper (1).

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

EMF measurements were made on cells of the type,

$Cd(Hg)_x|CdSO_4(sat)|Hg_2SO_4,Hg$.

The EMF attained a constant value when saturation was reached.

SOURCE AND PURITY OF MATERIALS:

Cadmium was obtained from Kahlbaum, Merck, Baird and Tallock, and from Harrington. The Hg, $CdSO_4$, and Hg_2SO_4 were purified by prior methods (2).

ESTIMATED ERROR:

Soly: nothing specified.

Temp: nothing specified.

REFERENCES:

1. Smith, F.E.
Z. Phys. Chem. 1920, *95*, 293.

2. Smith, F.E.
Phil. Trans. Roy. Soc. 1908, *207*, 393.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Schulze, A. *Z. Phys. Chem.* 1923, *105*, 177-203.
VARIABLES: Temperature: 20-72°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Crystallization temperatures of the saturated cadmium amalgams were reported as a function of cadmium concentration.

t/°C	at %[a]	mass %
20.0	9.2	5.4
38.9	13.76	8.21
45.4	15.51	9.33
57.4	19.06	11.66
61.6	20.46	12.60
72.3	23.74	14.85

[a] by compilers

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were prepared by mixing the metals, and cooling curves were obtained. The saturated liquid phase was also analyzed by dissolution of the amalgam with HNO_3, followed by precipitation of CdS with H_2S. The CdS was subsequently dissolved in HNO_3. Details of experimental method not given.

SOURCE AND PURITY OF MATERIALS:

Cadmium supplied by Kahlbaum.

Mercury was "purest" grade which was further vacuum distilled a few times.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: precision $\pm$ 0.1 K (compilers)

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Honda, K.; Ishigaki, T. *Sci. Rep. Tohoku Univ.* 1925, *14*, 219-33.
VARIABLES: Temperature: 590-594 K	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Depression of freezing point of cadmium was reported to be 1.29 and 3.75 K for 99.5 and 98.5 at % Cd amalgam, respectively. The melting point of Cd was assumed to be 594.1 K.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The usual method of thermal analysis was used. The alloys were melted in an alundum tube, and the melts were protected from oxidation with a thick layer of asbestos wool, over which was poured fluid paraffin or vaseline. Temperatures were measured with a copper-constantan thermocouple.

SOURCE AND PURITY OF MATERIALS:

Extra pure metals from Merck were probably used.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: precision better than $\pm$ 0.5 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Moesveld, A.L.T.; De Meester, W.A.T. *Z. Phys. Chem.* 1927, *130*, 146-53.
VARIABLES: Temperature: 0-41°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of cadmium in mercury:

t/°C	Soly/mass %	Soly/at %[a]
0.00	2.76	4.82
9.00	3.70	6.42
17.00	4.63	7.97
25.00	5.70	9.74
33.00	6.86	11.62
41.00	8.21	13.76

[a] by compilers

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Potential difference between saturated amalgam electrode and amalgam electrodes of various concentrations were measured; a saturated $CdSO_4$ solution was used as the electrolyte. The potential difference was equal to zero when both half-cells contained the saturated amalgam. The increase in the cadmium concentration in the second half-cell was obtained by electrolysis of the $CdSO_4$ solution.

SOURCE AND PURITY OF MATERIALS:

Cadmium from Kahlbaum and pure mercury were used.

ESTIMATED ERROR:

Soly: accuracy ± 1% (compilers).

Temp: nothing specified.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Mehl, R.F.; Barrett, Ch.S. *Trans. AIME* 1930, *89*, 575-88.
VARIABLES: Temperature: (-35)-88°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

The authors present their data in graphical form. The compilers read off the following liquidus data points from the curve.

t/°C	Soly/at %
-35	0.8
-34	1.3
-25	2
-19	2.5
-13	3
-10	3.5
-2	5
+6.5	6.5
12.5	7.5
17.5	8.5
28.5	10.5
48	15.5
57	18.5
65.5	20
74	22
76	24
85.5	27.5
88	28

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were prepared by mixing the metals in a Pyrex tube. Heating and cooling curves were recorded with calibrated iron-constantan thermocouples; thermopotentials were measured with a precision potentiometer.

SOURCE AND PURITY OF MATERIALS:

Mercury was purified with nitric acid then twice distilled at a low pressure.

Cadmium was 99.90% pure with traces of Zn, Pb, and Fe.

ESTIMATED ERROR:

Soly: nothing specified.
Temp: precision ± 0.1 K in original measurements; accuracy ± 1 K at best for values read from graph.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Walls, H.A.; Upthegrove, W.R. *J. Chem. Eng. Data* 1964, *9*, 184-7.
VARIABLES: Temperature: 323-366 K	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of cadmium in mercury:

T/K	Soly/mass %	Soly/at %
323.2	9.710	16.102
343.4	13.758	22.161
366.4	19.310	29.927

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Amalgams were prepared by directly dissolving Cd in Hg, and the concentration ascertained from the known weights of each component. The solubilities were determined by extrapolating the concentration versus EMF curve to zero potential for the cell,

$Cd(Hg)_{sat} | CdSO_4(aq) | Cd(Hg)_x$.

The saturated amalgams were prepared at temperatures slightly above experimental and slowly cooled to assure equilibrium. The amalgams and electrolyte were handled under a blanket of argon to exclude air. Precision potentiometer and galvanometer were used; calibrated thermocouples were used for temperature measurements.

SOURCE AND PURITY OF MATERIALS:

All materials were ACS Reagent Grade or better.

ESTIMATED ERROR:

Soly: accuracy better than $\pm$ 0.001%.

Temp: precision $\pm$ 0.01 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Semibratova, N.M.; Yan-Sho-Syan, G.V.; Nosek, M.V. *Izv. Akad. Nauk Kaz. SSR, Ser. Khim* 1969, No. 5, 30-8.
VARIABLES: Temperature: (-38)-296°C	PREPARED BY: C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Liquidus temperatures for the Cd-Hg system were reported.

t/°C	Soly/at %
-38	1.0
-25	2.5
-10	5.0
+27	10.0
44	15.0
61	20.0
69	22.5
94	30.0
107	35.0
116	38.0
122	40.0
128	42.5
149	50.0
177	60.0
184	62.5
202	65.0
221	70.0
237	72.5
239	75.0
257	78.0
261	80.0
273	82.5
287	85.0
296	90.0

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were prepared by dissolution of solid cadmium in mercury.

Samples of the alloys were encapsulated in tubes with dry CO_2. The tubes were heated up to 350°C and the cooling curves were recorded with the use of a copper-constantan thermocouple.

SOURCE AND PURITY OF MATERIALS:

Cadmium of purity "O". Mercury was purified chemically, electrochemically and doubly distilled under vacuum.

ESTIMATED ERROR:

Soly: not specified.

Temp: accuracy ± 2 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Hg; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Zebreva, A.I.; Filippova, L.M.; Omarova, N.D. *Izv. Vysch. Uchebn. Zaved., Khim. Khim. Tekhnol.* 1976, *19*, 1043-6.
VARIABLES: Temperature: 25°C	PREPARED BY: C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of cadmium in mercury at 25°C was reported to be 9.6 at %.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The heterogeneous and homogeneous amalgams were prepared by direct dissolution of Cd in Hg. The amalgams were thermometrically titrated by the addition of Hg in a specially constructed apparatus. The Cd solubility was determined from the break-point of the curve relating composition to the thermal effect. All operations were performed in an argon atmosphere.	Nothing specified.
	ESTIMATED ERROR: Soly: precision ± 5%. Temp: precision ± 0.5 K.
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Cadmium; Cd; [7440-43-9] (2) Mercury; Hg; [7439-97-6]	Bukhman, S.P.; Lange, A.A.; Kairbaeva, A.A. *Izv. Akad. Nauk Kaz. SSR, Ser. Khim.* 1984, No. 1, 31-4.
VARIABLES: Temperature: 17-23°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

The solubilities of Cd in Hg:

t/°C	Soly/mass %	Soly/at %[a]
17	3.80	6.59
20	4.61	7.94
	4.72	8.12
	4.57	7.87
21	4.86	8.35
22	5.20	9.25
	5.27	9.37
	5.27	9.37
23	5.67	9.69

[a] by compilers

The results at lower temperatures are understated. The $CdHg_3$ solid phase was identified to be in equilibrium with the saturated amalgam.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The Cd amalgam was obtained by electrolysis of solution of $CdSO_4$ in 1 mol dm^{-3} H_2SO_4. The amalgam was conditioned 24-30 h at cathodic polarization and then filtered. The filtrate was dissolved completely in HNO_3. Hg(II) was reduced with formic acid and Cd(II) was analyzed by atomic absorption spectroscopy or by titration with EDTA.

SOURCE AND PURITY OF MATERIALS:

$CdSO_4$ was analytically pure. Mercury purity not specified.

ESTIMATED ERROR:

Soly: precision better than ± 2% (compilers).

Temp: nothing specified.

REFERENCES: