COMPONENTS:	EVALUATOR:
(1) Beryllium; Be; [7440-41-7] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION:

Nerad (1) reported that the solubility of beryllium in mercury increases uniformly from 2×10^{-5} to 8×10^{-4} at % at 373 and 1073 K, respectively; however, no experimental details were given by the author. Wang (2) determined the solubility of beryllium at 644 K and reported a value of 1.3×10^{-4} at %. This value appears to be in agreement with the estimates by Nerad (1). Strachan and Harris (3) could not detect the dissolution of beryllium in mercury at room temperature, and these authors estimated that the solubility was below 2×10^{-2} at %.

Zucker (4) heated a mixture of mercury and beryllium powder at 923 K for one hour, and this author also reduced Be(II) on a mercury cathode from various solvents; the content of beryllium in the amalgams from these studies was never higher than 5×10^{-2} at %. Zucker stated that the latter concentration is the upper limit of the solubility at room temperature, but in the opinion of the evaluators this value is much too high. Kozin calculated that the solubility of beryllium at 298 K is 8.7×10^{-3} (4) and 1.5×10^{-2} at % (5); these estimated values appear too high, as were the predicted solubilities of a number of other amalgam systems. The formation of $BeHg_2$ has been reported for the Be-Hg system (6).

Tentative value of the solubility of Be in Hg at 644 K is 1×10^{-4} at % (2).

References

1. Nerad, A.J.; as cited by Kelman, L.R.; Wilkinson, W.D.; Yaggee, F.L. U.S. At. Ener. Comm. Rep., ANL-4417, 1950.
2. Wang, J.Y.N. *Nucl. Sci. Eng.* 1964, *18*, 18.
3. Strachan, J.F.; Harris, N.L. *J. Inst. Metals* 1956-57, *85*, 17.
4. Zucker, D. U.S. At. Ener. Comm. Rep., ORNL-3488, 1963, p. 28.
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6. Kozin, L.F. *Fiziko-Khimicheskie Osnovy Amalgamnoi Metallurgii*, Nauka, Alma-Ata, 1964.
7. Kells, M.C.; Holden, R.B.; Whitman, C.I. *J. Am. Chem. Soc.* 1957, *79*, 3925.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Beryllium; Be; [7440-41-7] (2) Mercury; Hg; [7439-97-6]	Wang, J.Y.N. *Nucl. Sci. Eng.* 1964, *18*, 18-30.
VARIABLES: Temperature: 644 K	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

The solubility of beryllium in mercury at 644 K was reported to be 0.06 mg/Kg.

The corresponding solubility in atom % calculated by the compilers is 1.3×10^{-4} at %.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Sheet of Be, which was cleaned, degreased, and vacuum-dried, was presumably equilibrated with Hg in a quartz capsule; the capsule was contained in a stainless steel autoclave. The Be content in the liquid was determined by an unspecified acid extraction analysis.

SOURCE AND PURITY OF MATERIALS:

Fresh, triple-distilled mercury and beryllium of "high purity" were used.

ESTIMATED ERROR:

Soly: nothing specified; precision about 10% (compilers).

Temp: precision ± 5 K.

REFERENCES:

COMPONENTS:	EVALUATOR:
(1) Magnesium; Mg; [7439-95-4] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION:

Kerp and coworkers (1) reported the first determination of magnesium solubility in mercury; they found solubilities of 2.52 at % at room temperature and approximately 8 at % at 573 K. The room temperature solubility agrees with subsequent measurements by other workers, but the 573 K value is much too low, probably because of oxidation of the magnesium. Cambi and Speroni (2) determined a partial phase diagram in the Hg-rich region and they showed that the solubility of magnesium increases monotonically from 2.5 to 29 at % in the temperature range of 290 to 643 K. Smits and Beck (3) and Beck (4) determined the phase diagram for the composition range above 15 at % Mg by thermo-analytical and potentiometric measurements. Loomis (5) equilibrated the saturated amalgam at 295.6 K and precisely determined the magnesium content in the liquid phase to be 2.60 at %. At 277 K, Williams (6) reported a solubility of 2.15 at %. Danilchenko (7) redetermined the complete phase diagram and obtained solubilities which were slightly higher at low temperatures, and the solubilities were slightly different between 17 and 33 at %, as compared to the data of (2) and (4). Dergacheva and Kozin (8) determined a solubility of 2.82 at % at 298 K.

Other solubility determinations of magnesium, which were reported, gave only solubility limits: less than 2.5 at % (9) and less than 8×10^{-3} at % (10) at room temperature. Also Kozin's (11) predicted value of 0.86 at % at 298 K is too low.

The saturated magnesium amalgams are in equilibrium with various intermediate solid phases, as shown by the phase diagram (12) in Fig. 1.

Recommended (r) and tentative solubilities of magnesium in the Hg-rich region.

T/K	Soly/at %	Reference
293	2.50 (r)	1,2,5
298	2.7	5,8
323	4.5[a]	2
373	9.3	2,7
473	20 (r)	2,4,7
573	26	4,7
673	31[a]	4
773	37[a]	4
873	45	4
900	50.0	4,7

[a] Interpolated from data of cited reference

COMPONENTS:	EVALUATOR:
(1) Magnesium; Mg; [7439-95-4] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION:

References

1. Kerp, W.; Böttger, W.; Iggena, H. *Z. Anorg. Chem.* 1900, *25*, 1.
2. Cambi, L.; Spereni, G. *Atti Reale Accad. Lincei, Ser. 5* 1915, *24*, 734.
3. Smits, A.; Beck, R.P. *Proc. Kong. Akad. Wetensch*, Amsterdam 1921, *23*, 975.
4. Beck, R.P. *Rec. Trav. Chim.* 1922, *41*, 353.
5. Loomis, A.G. *J. Am. Chem. Soc.* 1922, *44*, 8.
6. Williams, E.J. *Phil. Mag., Ser. 6* 1925, *50*, 589.
7. Danilchenko, P.T. *Zh. Russ. Fiz. Khim. Obshch., Ser. Khim.* 1930, *62* (1), 975.
8. Dergacheva, M.B.; Kozin, L.F. *Vestn. Akad. Nauk Kaz. SSR* 1974, No. 6, 56.
9. Kremann, R.; Müller, R. *Z. Metallk.* 1920, *12*, 303.
10. Strachan, J.F.; Harris, N.L. *J. Inst. Metals* 1956-57, *85*, 17
11. Kozin, L.F. *Fiziko-Khimicheskie Osnovy Amalgamnoi Metallurgii*, Nauka, Alma-Ata, 1964.
12. Hansen, M.; Anderko, K. *Constitution of Binary Alloys*, McGraw-Hill, New York, 1958, p. 823.

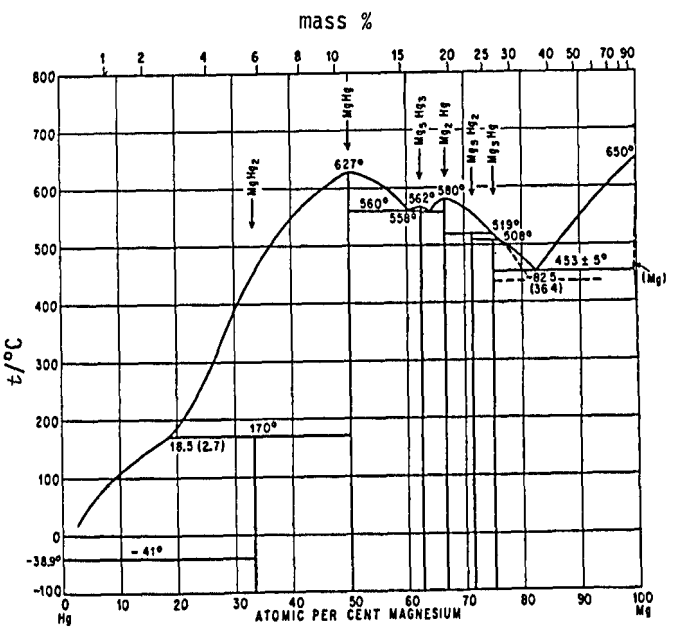

Fig. 1. The Mg-Hg system (12).

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Magnesium; Mg; [7439-95-4] (2) Mercury; Hg; [7439-97-6]	Kerp, W.; Böttger, W.; Iggena, H. *Z. Anorg. Chem.* 1900, *25*, 1-71.
VARIABLES:	**PREPARED BY:**
Room temperature	C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

The solubility of magnesium in mercury was reported to be 0.313 mass %. The solubility in atomic % calculated by the compilers is 2.52 at %. At about 300°C the solubility was estimated to be around 1 mass %. This value is much too low (compilers). The compound, $MgHg_6$, was found in the equilibrium solid phase at room temperature. However, this compound has not been confirmed by later workers.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Bands of Mg were cleaned in alcohol and ether, then equilibrated with Hg in a glass container. The amalgam was filtered and the Mg content in the saturated filtrate was determined as magnesium phosphate.

SOURCE AND PURITY OF MATERIALS:

Nothing specified.

ESTIMATED ERROR:

Soly: nothing specified; precision no better than ± 10% (compilers).

Temp: nothing specified.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Magnesium; Mg; [7439-95-4] (2) Mercury; Hg; [7439-97-6]	Cambi, L.; Speroni, G. *Atti Reale Accad. Lincei, Ser. 5*, 1915, *24*, 734-38.
VARIABLES: Temperature: 17-370°C	**PREPARED BY:** G. Cuminski; Z. Galus

EXPERIMENTAL VALUES:

Freezing points in the Mg-Hg system were reported for concentrations up to 29 at % Mg.

t/°C	Mg/at %
17	2.5
55	5
89	8
106	10
119	12
145	14
168	18
207	21
230	23
277	25
335	27
370	29

At the higher magnesium concentrations it was impossible to record the liquidus curves because of the boiling of the amalgams at about 412°C. The solid phase in equilibrium with the saturated amalgams was determined to be $MgHg_2$.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Appropriate amounts of magnesium were dissolved in boiling mercury in an atmosphere of pure nitrogen for a period of up to 2 days. Cooling curves were then recorded on the amalgams. The samples of the amalgams were analyzed alkacimetrically.	Pure mercury was redistilled. 99% pure magnesium contained 0.36% of Fe and Al.
	ESTIMATED ERROR: Soly: precision ± 3%. Temp: precision ± 1 K.
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Magnesium; Mg; [7439-95-4] (2) Mercury; Hg; [7439-97-6]	Loomis, A.G. *J. Am. Chem. Soc.* 1922, *44*, 8-19.
VARIABLES: Temperature: 22°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of magnesium in mercury at 22.4°C was determined to be 0.323 ± 0.001 mass %. The corresponding solubility in atomic % calculated by the compilers is 2.60 at %.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Amalgams were prepared in vacuo by warming Hg with an excess of Mg. The amalgams were allowed to stand for several days with frequent shaking, then they were filtered through a plug of glass wool under a pressure of hydrogen. The magnesium content in the filtrate was determined as magnesium phosphate.

SOURCE AND PURITY OF MATERIALS:

Mercury was purified chemically and distilled in vacuo. Magnesium of high quality was carefully freed from all oxides.

ESTIMATED ERROR:

Soly: accuracy ± 0.3%.

Temp: not specified.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Magnesium; Mg; [7439-95-4] (2) Mercury; Hg; [7439-97-6]	Beck, R.P. *Rec. Trav. Chim.* 1922, *41*, 353-61.
VARIABLES: Temperature: 151-637°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Crystallization temperatures of magnesium amalgams were reported.

t/°C	at % Mg	t/°C	at % Mg
637 ± 1	99.0	569 ± 3	70.0
623 ± 1	97.0	578 ± 1	68.0
609	95.0	579	67.5
529	90.0	576	66.67
488	85.0	566	65.0
435 ± 1	82.5	562 ± 1	62.0
462	82.0	562	60.0
482 ± 1	80.0	587	57.5
489 ± 1	79.0	607	55.0
485 ± 1	77.41	624 ± 1	50.0
505	77.0	603	45.0
508 ± 1	76.0	549 ± 1	40.0
518 ± 1	75.5	477	35.0
517 ± 3	75.0	388	30.0
529	74.0	290	25.0
550 ± 3	72.5	200 ± 1	20.0
		151	16.0

These results were previously reported only in graphical form (1).

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were prepared by dissolution, in vacuo, of weighed amounts of magnesium in mercury. The crystallization temperatures were determined from heating and cooling curves. Temperatures were determined with a thermocouple.

SOURCE AND PURITY OF MATERIALS:

Magnesium from Kahlbaum was free of alkali metals.
Mercury was purified with the "Ostwald pipette."

ESTIMATED ERROR:

Soly: Nothing specified.

Temp: precision ± 2 K.

REFERENCES:

1. Smits, A.; Beck, R.P.
Proc. Kong. Akad. Wetensch., Amsterdam, 1921, *23*, 975.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Magnesium; Mg; [7439-95-4] (2) Mercury; Hg; [7439-97-6]	Williams, E.J. *Phil. Mag. Ser. 6*, 1925, *50*, 589-99.
VARIABLES: Temperature: 4°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of magnesium in mercury at 4°C was determined to be 0.2654 mass %. The atomic % solubility calculated by the compilers is 2.149 at %.

It is possible that the amalgams were slightly supersaturated, so that the solubility value is several percent too high.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The preparation of the amalgam and the measurements were made in an evacuated cell. The electrical resistance was measured at decreasing temperatures on an amalgam which contained 0.2654 mass % Mg. The resistance decreased suddenly as the temperature was lowered to about 4°C, thus indicating the point of saturation.

SOURCE AND PURITY OF MATERIALS:

Nothing specified.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: ± 0.2 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Magnesium; Mg; [7439-95-4] (2) Mercury; Hg; [7439-97-6]	Danilchenko, P.T. *Zh. Russ. Fiz. Khim. Obshch., Ser Khim.* 1930, *62*, 975-88.
VARIABLES: Temperature: 15-620°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

The freezing points of magnesium amalgams were reported.

t/°C	at % Mg	t/°C	at % Mg
15	2.74	558	64.42
66	6.62	570	66.67
107	10.16	569	67.52
112	10.91	558	70.84
136	13.88	552	71.84
155	16.55	544	72.58
171	19.34	534	73.50
203	21.10	518	74.09
219	22.81	508	75.24
241	23.00	502	76.25
289	24.82	487	78.44
308	25.95	472	79.95
305	26.72	461	81.09
346	28.60	454	81.47
366	29.86	448	81.91
630	50.46	487	85.14
608	54.85	497	86.04
601	55.34	537	89.64
590	56.67	560	91.77
567	59.05	590	93.25
553	61.70	620	96.53

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams with 0-8 mass % of Mg were prepared by dissolution of magnesium chips in mercury in a glass tube at temperature of 350 to 420°C. Further heating under vacuum or in hydrogen atmosphere yielded the alloy with 12.5 mass % of Mg. Such alloys were melted with mercury or magnesium under layer of carnalyte. Samples of the liquid amalgams were analyzed: Mg as MgO or $Mg_2P_2O_7$ and Hg probably gravimetrically. Cooling and heating curves were recorded with the help of a calibrated Nichrome-constantan thermocouple.

SOURCE AND PURITY OF MATERIALS:

Magnesium purity was 99.81%.

Mercury was double-distilled.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: nothing specified; no better than $\pm$ 1 K (compilers).

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Magnesium; Mg; [7439-95-4] (2) Mercury; Hg; [7439-97-6]	Dergacheva, M.B.; Kozin, L.F. *Vestn. Akad. Nauk Kaz. SSR* 1974, No. 6, 56-60.
VARIABLES:	**PREPARED BY:**
Temperature: 25°C	C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of magnesium in mercury at 25°C was reported to be 1.955 mol dm^{-3}. The solubility in mass % and atomic % calculated by the compilers are 0.35 mass % and 2.82 at %, respectively.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were prepared electrolytically and used to determine the potentials of the cell:

$Mg(Hg)\,|\,Mg^{2+}\,|\,Mg(Hg)_x$

The electrolyte was an ether solution of $MgBrC_2H_5$. The solubility of the magnesium was determined from the breakpoint in the plot of EMF against the logarithm of magnesium concentration.

SOURCE AND PURITY OF MATERIALS:

Nothing specified.

ESTIMATED ERROR:

Soly: nothing specified; precision probably several percent (compilers).

Temp: nothing specified.

REFERENCES:

COMPONENTS:	EVALUATOR:
(1) Calcium; Ca; [7440-70-2] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION:

The most reliable solubilities for the Ca-Hg system are the most recent determinations by Bruzzone and Merlo (1) who reported the complete phase diagram for this system. Unfortunately, these authors reported their results as the phase diagram only, and no numerical data were presented. Data points on the liquidus were determined in the range of 10 to 100% Ca in (1), and the authors combined their data with those of an early report by Eilert (2) for the liquidus in the range of 4.5 to 13.4 at % Ca to draw the complete phase diagram. The data in the overlapping region in (1) and (2) were in satisfactory agreement. The eutectic at 759 K in the Ca-rich region was confirmed by Hilpert (3). There were other early efforts to determine the solubility of calcium in mercury at lower temperatures (4-7), but only Cambi and Speroni (5) presented solubility data which are acceptable. The latter authors found that the solubility increased from 2.86 to 13.81 at % in the temperature range of 382 to 573 K. Also, Cambi (6) showed from potentiometric measurements that the solubility of calcium at 298 K is slightly higher than 1 at %. Kozin's (8) predicted solubility of 0.62 at % at 298 K appears to be of the correct magnitude.

The saturated calcium amalgams are in equilibrium with various intermediate phases, as shown in Figure 1 (1). Only the compounds CaHg, $CaHg_2$ and $CaHg_3$ have been established with certainty in the Hg-rich region (1); other reported compounds (1,2,5, 9) are still questionable. The system needs further investigation in this region.

Recommended (r) and tentative values of the solubility of calcium in mercury in the Hg-rich region. See phase diagram, Figure 1, for complete solubility range.

T/K	Soly/at %	Source
373	4	2
473	7.7 (r)	2,5
573	11 (r)	2,5,1
673	14.5[a] (r)	1,2
773	19[a]	1
873	25	1
973	29	1
985	30	1

[a] Interpolated from data of cited references.

References

1. Bruzzone, C.; Merlo, F. *J. Less-Common Met.* 1973, *32*, 237.
2. Eilert, A. *Z. Anorg. Chem.* 1926, *151*, 96.
3. Hilpert, K. *Ber. Kernforschungsanlage, Jülich* 1981, JUEL-1744, pp. 121, 132.
4. Smith, G.McP.; Bennett, H.C. *J. Am. Chem. Soc.* 1909, *31*, 799; 1910, *32*, 622.
5. Cambi, L.; Speroni, G. *Atti Reale Accad. Lincei, Ser. 5* 1914, *23*, (2), 599.
6. Cambi, L. *Atti Reale Accad. Lincei, Ser. 5* 1915, *24*, (1), 817.
7. Strachan, J.F.; Harris, N.L. *J. Inst. Metals* 1956-57, *85*, 17.
8. Kozin, L.F. *Fiziko-Khimicheskie Osnovy Amalgamnoi Metallurgii*, Nauka, Alma-Ata, 1964.
9. Jangg, G.; Weihs, G. *Monatsh. Chem.* 1975, *106*, 1149.

COMPONENTS:	EVALUATOR:
(1) Calcium; Ca; [7440-70-2] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION: (Continued)

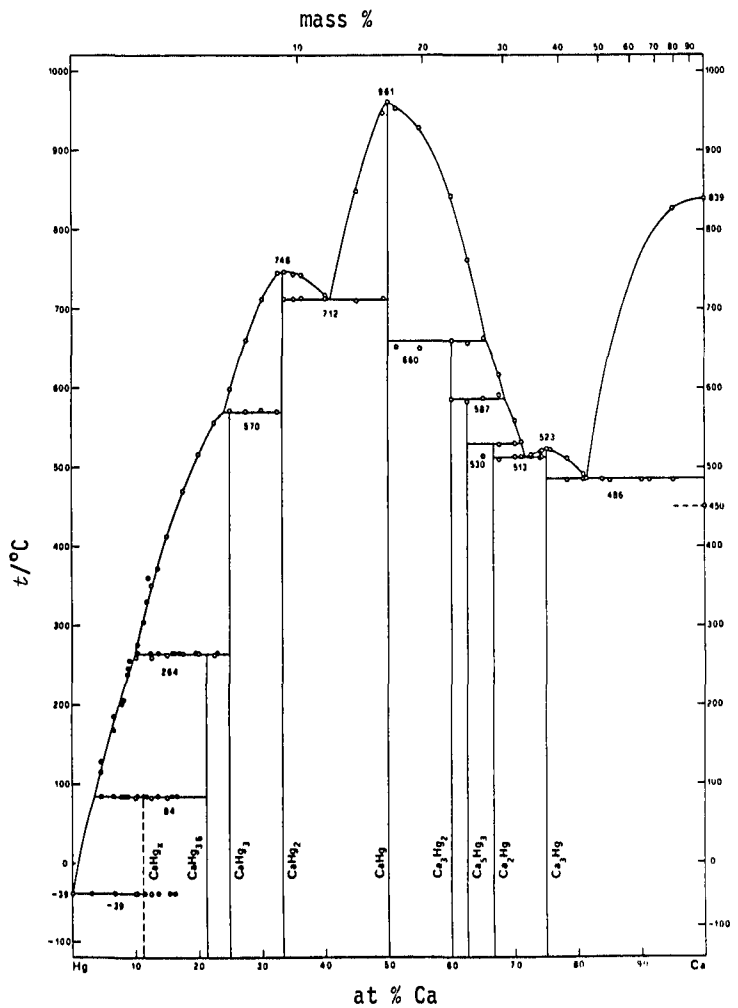

Fig. 1. The Ca-Hg system (1).

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Calcium; Ca; [7440-70-2] (2) Mercury; Hg; [7439-97-6]	Cambi, L.; Speroni, G. *Atti Reale Accad. Lincei, Ser. 5* 1914, *23* (2), 599-611.
VARIABLES: Temperature: 109-300°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Crystallization temperatures of calcium amalgams were reported.

t/°C	at % Ca
109	2.86
184	6.55
195	7.75
225	9.07
244	9.65
252	11.87
264	13.0
300	13.81

Additional experiments at lower and at higher calcium content than in the above were performed. At 0.48 and 1.82 at % the authors could not observe the crystallization temperature. In the higher concentration range, up to 32.8 at %, the amalgam was observed to boil at 377°C. The last three crystallization temperatures in the table are too low.

The compounds $CaHg_4$ and $CaHg_2$ were found in the solid phase.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Calcium was dissolved in mercury and the amalgams were kept at temperatures up to 300°C for 3 days. The crystallization temperatures were then determined in an atmosphere of dry nitrogen or carbon dioxide. The samples of the amalgams were analyzed alkacimetrically.

SOURCE AND PURITY OF MATERIALS:

Pure mercury was redistilled.

Calcium was 99.8% pure.

ESTIMATED ERROR:

Soly: precision ± 2%.

Temp: nothing specified.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Calcium; Ca; [7440-70-2] (2) Mercury; Hg; [7439-97-6]	Eilert, A. *Z. Anorg. Chem.* 1926, *151*, 96-104.
VARIABLES: Temperature: 115-372°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Crystallization temperatures of calcium amalgams were determined.

t/°C	mass % Ca	at % Ca[a]
372	3.00	13.4
359.5	2.67	12.1
330	2.58	11.7
304	2.46	11.2
274.5	2.23	10.2
256	1.93	8.97
246	1.90	8.84
238	1.84	8.57
206	1.73	8.09
201	1.64	7.70
185	1.41	6.68
168	1.37	6.50
128	0.94	4.53
115	0.93	4.49

[a] by compilers

Analyses of the solid phases showed the presence of the compounds $CaHg_{10}$, $CaHg_5$, and $CaHg_3$.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgams were obtained by dissolution of calcium in mercury at temperatures up to 340°C. The cooling curves of the samples were determined with a copper-constantan thermocouple. The experiments were performed in an atmosphere of pure, dry carbon dioxide. The samples were analyzed alkacimetrically: an excess of standard HCl was added and back-titrated with standard NaOH.

SOURCE AND PURITY OF MATERIALS:

Calcium purity was 99.2%; the metal contained 0.8% CaO. Mercury was purified with Hg_2SO_4-H_2SO_4 solution and was distilled under vacuum.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: precision ± 0.25 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Calcium; Ca; [7440-70-2] (2) Mercury; Hg; [7439-97-6]	Bruzzone, G.; Merlo, F. *J. Less-Common Met.* 1973, *32*, 237-41.
VARIABLES: Temperature: 533-1234 K	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

The data were presented as points on the phase diagram. The points from the liquidus were read from the curve by the compilers.

T/K	Soly/at %	T/K	Soly/at %
533	10	1226	51.3
623	12.5	1199	55
686	15	1114	60
743	17.5	1036	62.5
789	20	935	65
830	22.5	891	67.5
872	25	842	70
934	27.5	804	71.2
986	30	789	72.5
1018	23.5	793	74.1
1019	33.3	796	75
1017	35	794	75.7
1015	36.1	789	78.2
991	40	764	80.8
1121	45	759	81.4
1221	49.2	1100	95
1234	50		

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Appropriate amounts of both metals, to yield approximately 25 grams of amalgam, were placed in iron crucibles and the iron lids were sealed onto the crucibles. The latter were heated to melt the amalgams, then continuously shaken while they were cooled in air. Thermal analyses were made from heating and cooling curves with Chromel-Alumel thermocouples. X-ray analyses and metallographic examination were made on the solid phases. Sample handling of the amalgams was done in argon atmosphere.

SOURCE AND PURITY OF MATERIALS:

Calcium from Fluka was further purified by method in (1). Mercury was 99.99% pure.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: precision ± 2 K (compilers).

REFERENCES:

1. Peterson, D.T.; Fattore, V.G. *J. Phys. Chem.* 1961, *65*, 2052.

COMPONENTS:	EVALUATOR:
(1) Strontium; Sr; [7440-24-6] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION:

Kerp (1) reported the first investigation on the solubility of strontium in mercury, and he determined solubilities of 3.4 and 3.6 at % at 338 and 354 K, respectively. Subsequently, Kerp and coworkers (2) used the same method of filtration and chemical analysis of the amalgams which had been equilibrated at temperatures ranging from 273 to 354 K; the solubilities of Sr at 338 and 354 K in the second work were higher than in (1). Smith and Bennett (3) employed a similar method at 296 K and reported a solubility of 2.53 at %. Kozin's (4) predicted solubility of 0.49 at % at 298 K is too low because the strong interaction between the metals were neglected.

Most recently, Bruzzone and Merlo (5) determined the complete phase diagram of the Sr-Hg system. However, in the region of low strontium content the results were in only qualitative agreement with earlier determinations (2). As shown in the phase diagram (5), the saturated amalgams are in equilibrium with various intermediate solid phases.

Tentative solubility of strontium in the Hg-rich region. See the phase diagram, Figure 1, for complete solubility range.

T/K	Soly/at %	Reference
273	1.6	2
293	2.3	2,3
298	2.5[a]	2,3
323	3.2[b]	2
373	4[b]	2,5
473	6[b]	2,5
573	9	5
673	13	5
773	22[b]	5
873	24[b]	5
969	27	5

[a] Extrapolated from data of cited references.

[b] Interpolated from data of cited references.

References

1. Kerp, W. *Z. Anorg. Chem.* 1898, *17*, 284.
2. Kerp, W.; Böttger, W.; Iggena, H. *Z. Anorg. Chem.* 1900, *25*, 1,
3. Smith, G.McP.; Bennett, H.C. *J. Am. Chem. Soc.* 1910, *32*, 622; 1909, *31*, 799.
4. Kozin, L.F. *Fiziko-Khimicheskie Osnovy Amalgamnoi Metallurgii*, Nauka, Alma-Ata, 1964.
5. Bruzzone, G.; Merlo, F. *J. Less-Common Metals* 1974, *35*, 153.

COMPONENTS:	EVALUATOR:
(1) Strontium; Sr; [7440-24-6] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION:

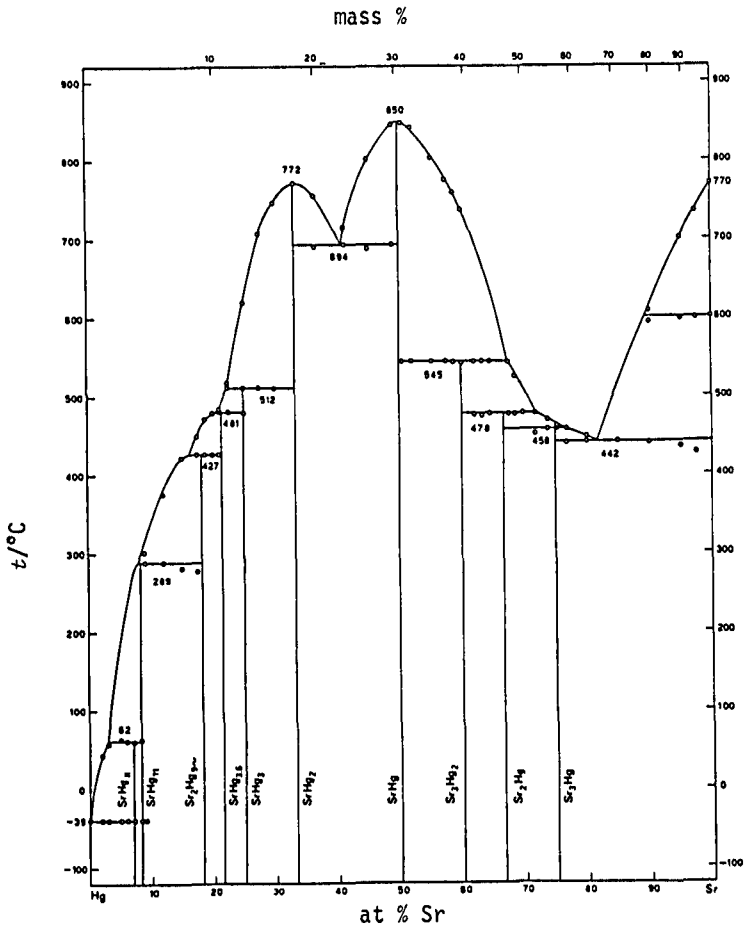

Fig. 1. The Sr-Hg system (5).

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Strontium; Sr; [7440-24-6] (2) Mercury; Hg; [7439-97-6]	Kerp, W.; Böttger, W.; Iggena, H. *Z. Anorg. Chem.* 1900, *25*, 1-71.
VARIABLES: Temperature: 0-81°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

The solubility of strontium in mercury was determined at various temperatures.

t/°C	Soly/mass %	Soly/at %[a]
0	0.73 ± 0.02	1.65
20	1.02 ± 0.05	2.30
30	1.25 ± 0.05	2.82
46	1.33 ± 0.02	2.99
56	1.52 ± 0.06	3.41
64.5	1.76 ± 0.12	3.94
81	1.77 ± 0.19	3.96

[a] by compilers

It is possible that the amalgams were not saturated above 30°C and supersaturated at 0°C. The solid compound in equilibrium with the amalgam was determined to be $SrHg_{12}$.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The amalgams were prepared by electrolysis of a saturated solution of $SrCl_2$ with circulating amalgam as the cathode. The electrolyte was renewed several times during the electrolysis. The equilibrated amalgams were filtered through a Gooch crucible at the equilibration temperature. The strontium contents were determined alkacimetrically. All experiments were performed in an atmosphere of dry hydrogen.	Mercury was treated with HNO_3, then washed, dried and filtered. $SrCl_2$ purity not specified.
	ESTIMATED ERROR: Soly: precision better than ± 10%. Temp: nothing specified.
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Strontium; Sr; [7440-24-6] (2) Mercury; Hg; [7439-97-6]	Bruzzoni, G.; Merlo, F. *J. Less-Common Met.* 1974, *35*, 153-7.
VARIABLES: Temperature: 316-1122 K	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

The data were presented as points on the phase diagram. The liquidus points were read from the curve by the compilers.

T/K	Soly/at %	T/K	Soly/at %
316	2.0	1119	49
330	3.0	1122	50.3
575	10	1113	52
650	12.5	1076	55.3
696	15	1050	57.5
723	16.5	1034	58.7
745	18.7	1012	60
753	20	817	67.5
756	21	1076	68.3
791	22.5	751	71.2
894	25	743	73.7
981	27.5	733	75.2
1021	30	731	77
1045	33.3	721	80
1030	36.5	881	90
989	41	975	95
1076	45	1008	97.5

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Appropriate amounts of both metals, to yield approximately 25 grams of amalgam, were placed in iron crucibles and the iron lids were sealed onto the crucibles. The crucibles were heated to melt the amalgams, then continuously shaken while they were cooled in air. Thermal analyses were made from heating and cooling curves with Chromel-Alumel thermocouples. X-ray analyses and metallographic examinations were made on the solid phases. Sample handling of the amalgams was done in argon atmosphere.

SOURCE AND PURITY OF MATERIALS:

Strontium from Fluka was 99.8% pure.

Mercury was 99.99% pure.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: ± 2 K (compilers).

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Strontium; Sr; [7440-24-6] (2) Mercury; Hg; [7439-97-6]	1. Smith, G. McP.; Bennett, H.C. *J. Am. Chem. Soc.* 1909, *31*, 799-806. 2. Same authors, ibid. 1910, *32*, 622-26.
VARIABLES:	PREPARED BY:
Temperature: 23°C	C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

At 23°C the solubility of strontium in mercury was reported to be 1.12 mass %. The atomic % solubility calculated by the compilers is 2.53 at %.

Chemical analysis of the solid phase suggested the compound $SrHg_{12-13}$.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The amalgam was obtained by electrolysis of a saturated solution of $SrCl_2$. The resulting amalgam was washed and dried, then kept for 3 days in a glass-stoppered bottle, then again washed, dried, and filtered. Both the solid and filtrate were analyzed alkacimetrically: an excess of 0.1 mol-dm^{-3} HCl was added to the filtrate then back-titrated with 0.1 mol-dm^{-3} NaOH.	"Very pure salts" from Kahlbaum. Mercury purity not specified.
	ESTIMATED ERROR: Soly: nothing specified; no better than few percent (compilers). Temp: nothing specified.
	REFERENCES:

COMPONENTS:	EVALUATOR:
(1) Barium; Ba; [7440-39-3] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION:

The first determinations of the barium content in its saturated amalgams were reported by Kerp (1) for the temperature range of 273 to 354 K; it was found that the barium solubility increased from 0.25 to 1.18 at % in this temperature range. Subsequently, Kerp and coworkers (2) determined the solubility up to 322 K to verify the earlier results; these authors observed that the solubility did not increase smoothly over their temperature range, but that there was a break at 303 K. Smith and Bennett (3) reported a barium solubility of 0.47 at % at 297 K, a value which was in good agreement with a solubility of 0.50 at % at 298 K which was reported by Kerp et al. In all of these early works the solubilities were determined by filtration and chemical analysis of the equilibrated amalgams.

More recently, the complete phase diagram for the Ba-Hg system was determined by thermal analysis and X-ray crystallography by Bruzzone and Merlo (4). These authors reported their data as a phase diagram only, but their solubilities for barium in the Hg-rich region were higher than those reported by Kerp et al. (2), and the liquidus was a smooth curve near 303 K, contrary to that observed by (2). Makarova and coworkers (5) also observed a smooth curve at 293 to 333 K where the solubility increased from 0.63 to 1.09 at % over this range. However, the solubilities reported by (5) at 293 and 313 K appear to be too high. Filipova et al. (6,7) reported a solubility of 0.63 at % at 298 K; this value lies between those of (2) and (5).

Rejected values for the solubility of barium at room temperature were reported by Strachan and Harris (8) and by Kozin (9); the latter predicted a solubility of 1.9 at % at 298 K.

As shown in the phase diagram in Figure 1 (4), the saturated liquid is in equilibrium with various intermediate solid phases.

Tentative solubility of barium in the Hg-rich region. See Figure 1 for complete solubility range.

T/K	Soly/at %	Reference
273	0.23	1,2
293	0.46	1,2
298	0.49	2,3
323	0.9	2
373	2	2
473	6	4
573	9	4
673	11	4
763	16	4

COMPONENTS:	EVALUATOR:
(1) Barium; Ba; [7440-39-3] (2) Mercury; Hg; [7439-97-6]	C. Guminski; Z. Galus Department of Chemistry University of Warsaw Warsaw, Poland July, 1985

CRITICAL EVALUATION:

References

1. Kerp, W. *Z. Anorg. Chem.* 1898, *17*, 284.
2. Kerp, W.; Böttger, W.; Iggena, H. *Z. Anorg. Chem.* 1900, *25*, 1.
3. Smith, G.McP.; Bennett, H.C. *J. Am. Chem. Soc.* 1910, *32*, 622; 1909, *31*, 799.
4. Bruzzone, G.; Merlo, F. *J. Less-Common Metals* 1975, *39*, 27.
5. Makarova, I.A.; Lange, A.A.; Bukhman, S.P. *Izv. Akad. Nauk Kaz. SSR, Ser. Khim.* 1980, No. 6, 37.
6. Filippova, L.M.; Zhumakanov, V.Z.; Klyukas, Yu.E.; Zebreva, A.I. *Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol.* 1984, *27*, 1241.
7. Filippova, L.M.; Zhumakanov, V.Z.; Zebreva, A.I.; Smurigina, T.V. *Fiz. Khim. Issled. v Rastvorakh*, Alma-Ata, 1982, 40.
8. Strachan, J.F.; Harris, N.L. *J. Inst. Metals* 1956-57, *85*, 17.
9. Kozin, L.F. *Fiziko-Khimicheskie Osnovy Amalgamnoi Metallurgii*, Nauka, Alma-Ata, 1964.

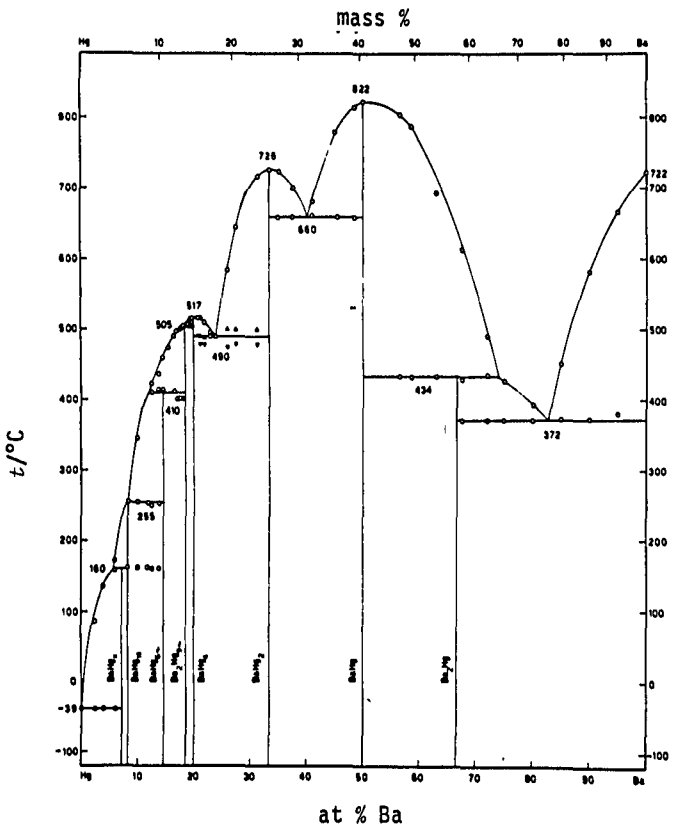

Fig. 1. The Ba-Hg system (4).

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Barium; Ba; [7440-39-3] (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 barium in mercury.

t/°C	Soly/Mass %	Soly at %[a]
0	0.15 ± 0.01	0.22
0[b]	0.17 ± 0.01	0.25
20	0.32 ± 0.02	0.47
21[b]	0.32 ± 0.02	0.47
25	0.34	0.50
27.6	0.35	0.51
28.1	0.36	0.52
29.2	0.38 ± 0.01	0.55
30	0.43 ± 0.02	0.63
35	0.46	0.67
46	0.52 ± 0.01	0.76
56	0.68 ± 0.02	0.99
64.7[b]	0.81 ± 0.02	1.18
65	0.83 ± 0.02	1.21
81	0.97 ± 0.03	1.41
89.5	1.06 ± 0.03	1.54
99	1.26 ± 0.04	1.83

[a] by compilers

[b] from ref. (1)

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Amalgams were prepared by electrolysis of saturated $BaCl_2$ with circulating Hg as the cathode; the solution was renewed several times during the preparation. The amalgams were filtered through a Gooch crucible after various periods from the end of the electrolysis. Barium content in the filtrates was determined alkacimetrically.

SOURCE AND PURITY OF MATERIALS:

Mercury was purified with HNO_3, then dried and filtered.

Barium purity not specified.

ESTIMATED ERROR:

Soly: precision better than ± 5%.

Temp: nothing specified.

REFERENCES:

1. Kerp, W.
Z. Anorg. Chem. 1898, *17*, 284.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Barium; Ba; [7440-39-3] (2) Mercury; Hg; [7439-97-6]	1. Smith, G.McP.; Bennett, H.C. *J. Am. Chem. Soc.* 1910, *32*, 622-26. 2. Same authors, ibid. 1909, *31*, 799-806.
VARIABLES:	PREPARED BY:
Temperature: 24°C	C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of barium in mercury at 24°C was reported to be 0.32 mass %. The solubility in atomic % calculated by the compilers is 0.47 at %. Solid phase chemical analysis suggested the compound $BaHg_{12}$.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgam was obtained by electrolysis of saturated solution of $BaCl_2$ at 6-7 V, then the resulting amalgam was washed and dried, and the solid phase was separated by suction filtration through Chamois skin. The filtrate and the crystals were analyzed alkacimetrically by adding an excess of 0.1 mol dm^{-3} HCl to a weighed portion of the amalgam then back-titrating with 0.1 mol dm^{-3} NaOH to determine the Ba content.

SOURCE AND PURITY OF MATERIALS:

"Very pure salts" from Kahlbaum.

Mercury purity not specified.

ESTIMATED ERROR:

Soly: nothing specified; probably no better than few percent (compilers).

Temp: nothing specified.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Barium; Ba; [7440-39-3] (2) Mercury; Hg; [7439-97-6]	Bruzzone, G.; Merlo, F. *J. Less-Common Metals* 1975, *39*, 271-6.
VARIABLES: Temperature: 360-1095 K	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

The data were reported graphically as points on the phase diagram. The points from the liquidus line were read from the curve by the compilers.

T/K	Soly/at %	T/K	Soly/at %
360	2.3	918	27.5
410	4.0	990	31.5
446	6.2	999	33.3
528	8.5	996	35
619	10	974	37.5
696	12.5	957	41.2
710	13.7	1052	45
731	14.5	1087	48.5
745	15.5	1095	50
762	16.5	1079	56.5
770	17.0	1060	58.5
773	17.4	967	62.5
777	17.8	888	67.5
781	18.2	764	72
789	19.5	701	75
790	21	667	80
782	22	725	85
769	23	855	90
763	24	939	95
857	26		

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Appropriate amounts of both metals, to yield approximately 25 grams of amalgam, were placed in iron crucibles and the iron lids were sealed onto the crucibles. The latter were heated to melt the amalgams, then continuously shaken while they were cooled in air. Thermal analyses were made from heating and cooling curves, with Chromel-Alumel thermocouples. X-ray analyses and metallographic examinations were made on the solid phases. Sample handling of the amalgams was done in argon atmosphere.

SOURCE AND PURITY OF MATERIALS:

Barium from Fluka was 99.6% pure.

Mercury was 99.99% pure.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: precision $\pm$ 2 K (compilers).

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Barium; Ba; [7440-39-3] (2) Mercury; Hg; [7439-97-6]	Makarova, I.A.; Lange, A.A.; Bukhman, S.P. *Izv. Akad. Nauk Kaz. SSR, Ser. Khim.* 1980, No. 6, 37-41.
VARIABLES: Temperature: 293-333 K	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

Solubility of barium in mercury.

T/K	Soly/mass %	Soly/at %[a]
293	0.43	0.63
313	0.64	0.93
333	0.75	1.09

[a] by compilers

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The amalgam was obtained by electroreduction of Ba(II) on Hg from a solution of 0.05 mol-dm^{-3} $BaCl_2$ in 0.5 mol-dm^{-3} LiCl. Barium content in the amalgam was determined by decomposition of the amalgam with 0.1 mol-dm^{-3} HCl and gravimetric analysis as $BaSO_4$. Voltammetric oxidation of the stirred amalgam was performed; a bend on the curve relating limiting current to concentration corresponded to the solubility of barium in mercury.

SOURCE AND PURITY OF MATERIALS:

$BaCl_2$ and LiCl were chemically pure.

Hg purity not specified.

ESTIMATED ERROR:

Soly: nothing specified.

Temp: precision ± 0.5 K.

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Barium; Ba; [7440-39-3] (2) Mercury; Hg; [7439-97-6]	Filippova, L.M.; Zhumakanov, V.Z.; Klyukas, Yu.E.; Zebreva, A.I. *Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol.* 1984, *27*, 1241-2.
VARIABLES: Temperature: 25°C	**PREPARED BY:** C. Guminski; Z. Galus

EXPERIMENTAL VALUES:

The solubility of barium in mercury was reported to be 0.42 mol-dm^{-3}. The atomic % solubility calculated by the compilers is 0.63 at %.

These results also were reported in ref. (1).

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The heterogenous barium amalgam was obtained by an electrolytic method, but the details were not specified. Barium content (N_{Ba}) was determined by an unspecified analysis. The amalgams were titrated with mercury and the heat of dilution (Q) was determined. A breakpoint in the curve of Q vs. N_{Ba} corresponds to the composition of the saturated amalgam. All experiments were carried out in an argon atmosphere.

SOURCE AND PURITY OF MATERIALS:

Nothing specified.

ESTIMATED ERROR:

Soly: precision probably ± 10% (compilers).

Temp: stability of ± 0.005 K.

REFERENCES:

1. Filippova, L.M.; Zhumakanov, V.Z.; Zebreva, A.I.; Smurigina, T.V. *Fiz.-Khim. Issled v Rastvorakh*, Alma-Ata, 1982, 40.