established by freezing point measurements.[6] The chlorine trifluoride and bromine trifluoride probably contained less than one mole per cent. impurity. In any case, diamagnetic impurities should introduce only a small error into the results which are assigned a probable error of about two per cent.

Acknowledgment.—The authors are grateful to the Atomic Energy Commission for support of this work through contract AT(11-1)-151.

(6) M. T. Rogers, J. L. Speirs, H. B. Thompson, Jr., and M. B. Panish, THIS JOURNAL, **76**, 4843 (1954); M. T. Rogers and J. L. Speirs, unpublished results.

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The Enthalpy and Heat Capacity of Magnesium and of Type 430 Stainless Steel from 700 to 1100°K.

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RECEIVED MARCH 24, 1955

Kelley[1] has reviewed the literature on the heat of melting of magnesium. All of the data have been derived from temperature–composition studies of binary alloys. Since the values range from 1,160 to 2,480 cal./gram atom, it was desirable to make a direct measurement of this quantity.

Measurements were made in a dropping calorimeter similar to that described by Southard.[2] Approximately 0.44 mole of double sublimed magnesium (99.95 to 99.98% pure) was sealed in a thin-walled container of type 430 Stainless Steel by welding in an atmosphere of argon. A duplicate container was used in determining the enthalpy of the stainless steel.

The experimental data were treated as recommended by Shomate.[3] Enthalpy is expressed by the relationship

$$H_T - H_{298.16} = aT + bT^2 + cT^{-1} + d \qquad (1)$$

The constants representing the experimental data are given in Table I. Enthalpy is expressed in cal./gram and T in degrees Kelvin.

TABLE I

VALUES FOR THE CONSTANTS IN EQUATION 1 FROM 700 TO 1100°K.

Material	Constants a	b	c	d
Type 430 Stainless steel	−0.05709	0.000141	−7380.6	29.236
Solid magnesium	.1835	.0000760	−1360.5	−56.916
Liquid magnesium	.2176	.0000535	484.63	16.851

The solid line in Fig. 1 shows the enthalpy of magnesium calculated from equation 1. The spread of the experimental error of the observed values also is shown. The maximum deviation of the observations from the line is ±0.7%. Two or three measurements were made at each temperature.

The heat of melting of magnesium was found to be 88 ± 2 cal./gram or 2,140 ± 50 cal./gram atom (1953, at. wt. Mg = 24.32).

(1) K. K. Kelley, U. S. Bur. Mines Bull., 393 (1936).
(2) J. C. Southard, THIS JOURNAL, **63**, 3142 (1941).
(3) C. H. Shomate, *J. Phys. Chem.*, **58**, 368 (1954).

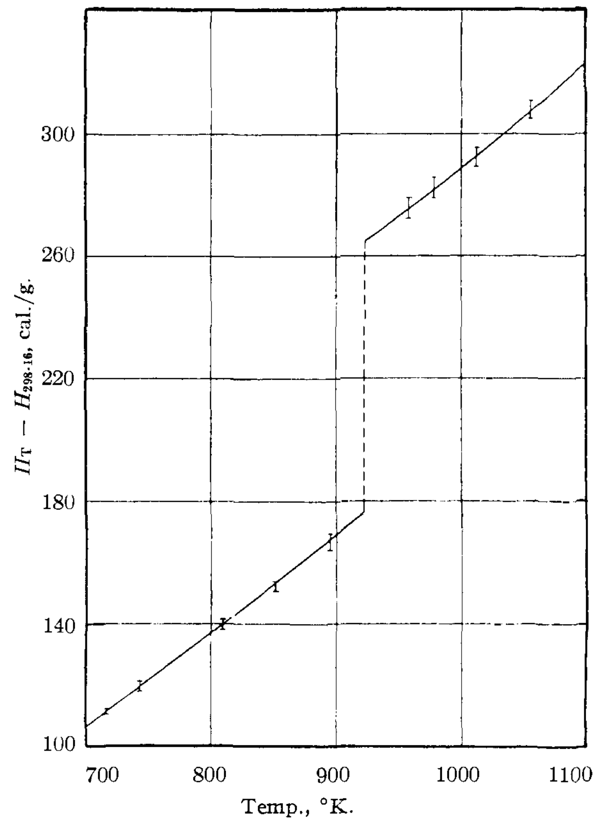

Fig. 1.—Enthalpy of magnesium; m.p. 923°K., heat of fusion = 88 cal./g.; line drawn through smoothed values. I indicates spread of experimental error of 2 or 3 observed values.

Differentiation of equation 1 gives the heat capacity

$$C_p = a + 2bT - cT^{-2} \qquad (2)$$

Heat capacities calculated from this equation are listed in Table II.

TABLE II

HEAT CAPACITY OF MAGNESIUM AND OF TYPE 430 STAINLESS STEEL FROM 700 TO 1100°K.

Temp., °K.	Heat capacity: Magnesium, cal./g. atom/deg.	Magnesium, cal./g./deg.	430 stainless steel, cal./g./deg.
700	7.09	0.292	0.155
750	7.24	.298	.168
800	7.42	.305	.180
850	7.61	.313	.193
900	7.81	.321	.206
923	Melting point		
950	7.75	.319	.219
1000	7.88	.324	.232
1050	8.01	.329	.246
1100	8.14	.335	.259

Caution is urged in extrapolating beyond the limits of the observations.

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