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A COMPILATION AND ANALYSIS OF MELTING CURVE DATA FOR ARGON

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An attempt is made to fit a Simon type equation to the melting curve of argon in the pressure range 0-8 kilobar. These data points have been collected from experiments made over the past 17 years. When the fit is extrapolated to the pressure range 18-26 kilobar, serious disagreement with observed results is found.

Over the past seventeen years, articles have appeared containing experimental measurements of the melting curve of argon [1-9]. The most recent of these has shown conclusively that a Simon-type equation does not fit the P-T melting curve of *both* mercury and argon [3]. Now it is of interest to compare (especially in the high pressure region) the least squares fit of a Simon equation fitted to P-T points at low pressures (0-18 kb) to those experimental points at higher pressures (18-26 kb). This interest has been generated, in part, by the conjecture that the solid-liquid coexistence line ends in a critical point.

To fit the equation of form $P = A[(T/T_0)^C - 1]$, the parameters A and c must be determined, the triple point temperature T_0 having been taken as 83.809°K [6]. The 41 data points from zero to eight kilobar provided input for an iterative computer program which gives $A = 2.249 \pm 0.040$ kb. The figure ± 0.040 kb represents the ninety-nine percent confidence limit for A when A is calculated in the above manner. Its importance is that, if a second A-value is calculated for another data set and the difference between the two is greater than ± 0.040 kb, then one must conclude that something other than random error has caused the difference. The c-value obtained from this process is 1.528 ± 0.070. Hardy, Crawford and Daniels, on the other hand, have determined $A = 2.2293 \pm 0.0035$ kb and $c = 1.5351 \pm 0.0012$ (a summary of differences in calculated pressure between the two fits is found in table 1).

A graph of argon melting curve points is presented below [1, 2, 4-9]. The line drawn through the melting curve data is the graph of $P = 2.249[(T/T_0)^{1.528} - 1]$.

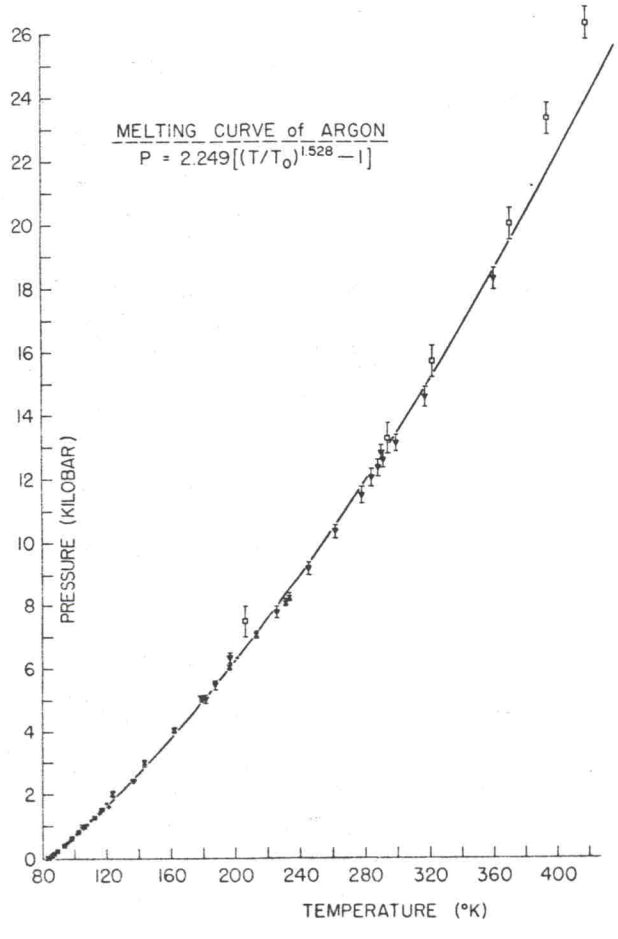

Fig. 1. The points plotted above are: Grace and Kennedy □, Lahr and Eversole ▼, Robinson ×, Crawford and Daniels ●, Michels and Prins ■, van Witzenburg and Stryland +.