

4. Correlation of Results With Theoretical Equations

The results of plotting $\log D$ vs T_m/T (Figure 12) appear to support, or at least fail to refute, a relation of the form $Q/T_m = \text{constant} \approx 26.4 \text{ cal/mole } ^\circ\text{K}$ (equation 9). This agrees with the work of Nachtrieb and Rice,^{5,9} and disagrees with that of Hudson and Hoffman.⁶ Hudson and Hoffman reported that when data for self-diffusion in lead was plotted in this manner, all points lay along a single line for pressures below 10 kilobars, but tended to lower values of D at higher pressures. This trend to lower values of D was not observed in the present investigation. Because the experimental error appears to be much less for the present study than for either of the former, and because the diffusion constant at the melting point (Table 1) appears to be very nearly a constant, we would have to conclude that an equation of the form of equation 9 is at least approximately valid for diffusion of Ag in lead at pressures below 38 kilobars.

In order to test the Dushman-Langmuir equation for D_0 (equation 8), the geometric constant d was calculated from the experimentally determined values of the activation energies. Table 1 shows that although these values are of the same order of magnitude as the distance between interstitial sites ($3.48 \text{ \AA}$), they vary by a factor of two over the pressure range of this study. Since a geometric factor will not change this much over the pressure range investigated, it is apparent that D_0 must depend on some parameter not explicitly contained in equation 8.