

with the results of work done for many systems at atmospheric pressure.³⁰

It would appear that the best check of this relationship would be by comparing it with the results obtained for a single system studied over a wide pressure (melting point) range. This has been done by Rice and Nachtrieb⁵ for self-diffusion in lead up to 12 kilobars, and by Hudson and Hoffman⁶ to 40 kilobars (Bridgman's resistance scale). The former investigators report a functional dependence of Q on T_m similar to that of equation 9. The latter claim that although this relation may appear to hold below 10 kilobars, it does not appear to be valid at higher pressures. It is hoped that the present study might shed more light on this matter.

A quantity of considerable interest, which may be derived³¹ through the use of quasi-equilibrium thermodynamics, is the activation volume, ΔV_a .

$$\left[\frac{\partial \ln(D/D_0)}{\partial P} \right]_T \equiv \frac{\Delta V_a}{RT} \quad (10)$$

The activation volume, as reported by Hudson and Hoffman for self-diffusion in lead ranges from 13 cm³/mole at 770°K to 10.4 cm³/mole at 475°K. Although there is considerable scatter in their data, the ratio

$\Delta V_a/V_m$ (where V_m is the molar volume) is approximately equal to .64.

It may be possible to gain some insight into the mechanism of diffusion of Ag in Pb by examining this ratio for our system.