

As might be expected, what is represented by an experimentally determined diffusion constant will depend upon the experimental situation. We have already mentioned that diffusion is concentration dependent. In addition to this, it may be enhanced by grain boundary and surface diffusion^{22,23} and either enhanced or reduced by an oxide or non-crystalline layer between the solvent and the solute.^{4,8} It may also vary with the purity of the solvent material.³ Many reported diffusion constants represent some average of these several effects.

The most meaningful diffusion constant should be that for pure lattice diffusion of a pure solute material of low concentration in a pure, single crystal solvent.¹² Care should be taken to approach this situation as closely as possible. In general, diffusion constants for temperatures near the melting point approach those for pure lattice diffusion more closely than lower temperature ones do.

4. Theoretical Equations

From a phenomenological point of view, there are many theories advanced,^{2,5,8,9,11,26} all of which (for the ideal case where D is not a function of concentration) take the form

$$D = D_0 \exp \left(\frac{-Q}{RT} \right) \quad (6)$$

where R is the gas constant, T is the absolute temperature and Q is called the activation energy, the difference in the various mechanisms being in the interpretation of Q and D_0 . One of the prime objectives of this investigation is to determine the pressure dependence of these terms for our