

silver-lead system. It is thought that this dependence might help in the interpretation of the mechanisms involved.

Empirically,  $Q$  is usually obtained from a plot of  $\log D$  vs  $1/T$ , and  $D_0$  by extrapolation of this plot. Another way of obtaining  $Q$ , used by many authors for comparison, is to calculate  $Q$  from the Dushman-Langmuir equation;<sup>7</sup>

$$D = \frac{d^2 Q}{N h} \exp\left(\frac{-Q}{RT}\right) \quad (7)$$

consequently,

$$D_0 = \frac{d^2 Q}{N h} \quad (8)$$

where  $N$  is Avogadro's number,  $h$  is Plank's constant, and  $d$  is the inter-atomic spacing. The two approaches agree quite well in most cases.<sup>27</sup> However, Van Liempt<sup>28</sup> points out that this agreement is no proof of equation 7 due to the insensitivity of values of  $Q$  obtained to changes as large as a factor of 10 in  $D_0$ . This objection may not be too serious in light of the statement made by Nowick<sup>29</sup> in defense of a similar equation by Zener "that values of  $D_0$  obtained from conventional plots of  $\ln D$  vs  $1/T$  often appear to be in error by factors as great as  $10^8$ ."

Braun and Van Liempt, using Lindemann's theory of melting, derived an equation relating the activation energy to the melting temperature ( $T_m$ ) of the solvent;

$$Q = 3b^2 R T_m \quad (9)$$

where  $b$  is a number characteristic of the solvent material, approximately equal to 2 for all materials. This equation shows fairly good agreement