

Table IV: Activation Volumes

	a axis			c axis		
$T, ^\circ\text{C.}$	225.6	208.8	192.0	225.6	208.8	192.0
$\Delta V, \text{cm.}^3$	4.96 ± 0.38	5.20 ± 0.25	5.91 ± 0.50	5.31 ± 0.38	5.23 ± 0.30	5.36 ± 0.30

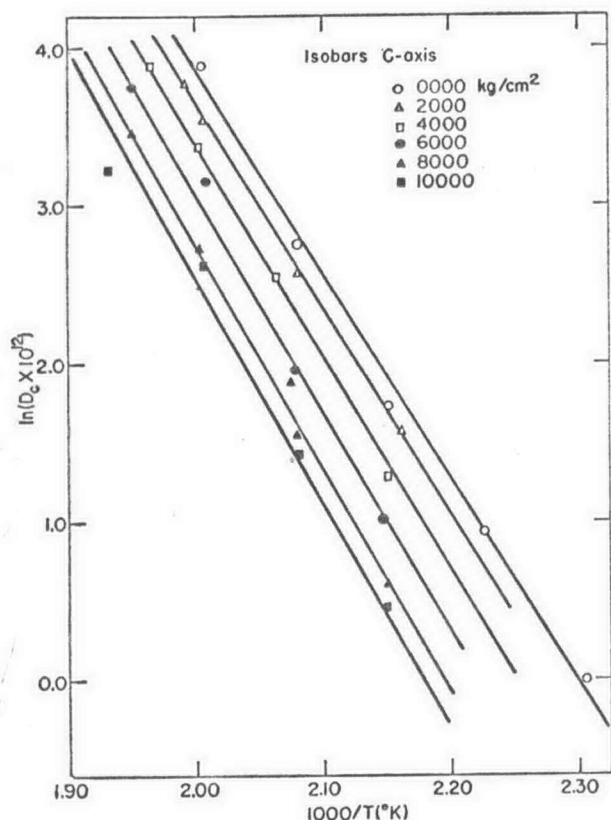


Figure 3. c-Axis diffusion isobars.

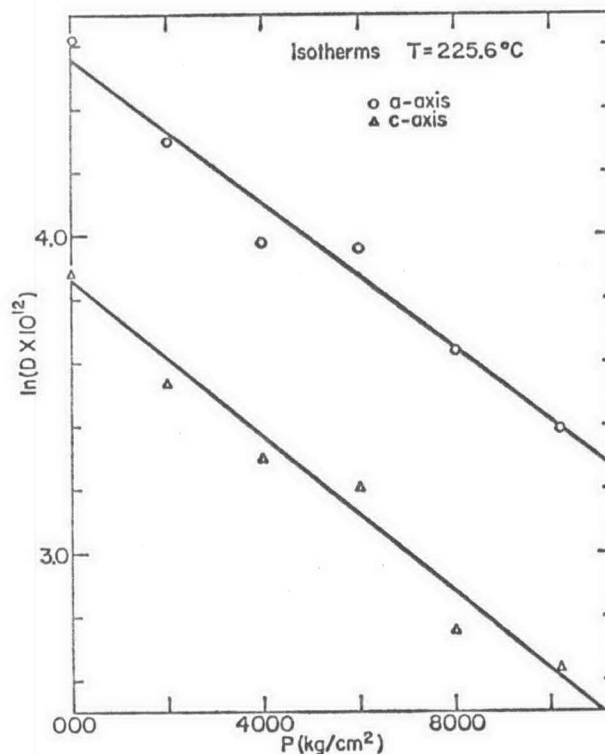
tion energies for diffusion in intrinsically different directions plays an important role in the discussion of possible diffusion mechanisms in tin.

Isotherms. Values of $(\partial \ln D / \partial T)_P$ from the isobars were used to correct the data to the appropriate nominal temperatures (225.6, 208.8, 192.0°). Corrections were generally less than 5%. The least-squares isotherm at 225.6° is shown in Fig. 4. Activation volumes derived from these isotherms via the usual formula²

$$\left(\frac{\partial \ln (D / \gamma a^2 \nu)}{\partial P} \right)_T = -\Delta V / RT \quad (7)$$

are given in Table IV, along with their standard deviations.

As for ΔH values, the activation volumes are essentially equal for both *a*- and *c*-diffusion directions. The apparent variation in *a*-axis ΔV values may or may not

Figure 4. Diffusion isotherms (225.6°) for *a* and *c* axes.

be real since it is just outside the limits of experimental error. For the purposes of this discussion, ΔV can be considered constant, equal to 5.3 cm.³/mole for both *a*- and *c*-axis diffusion. This result is central in the discussion of possible diffusion mechanisms.

Corresponding States Test. The isobar data and the change in melting temperature of tin with pressure are sufficient to test the corresponding states relation (2) of Rice and Nachtrieb.⁵ The most accurate determination of the melting curve to 10 kbars has been made by Babb.¹⁷ From his results, T_m/T was found for each value of D . Figure 5 is a plot of $\ln D$ against T_m/T for diffusion along each axis. The lines shown are least-squares lines for the respective axis. Apparently the corresponding states relation is quite closely satisfied.

It is interesting to compare *a*- and *c*-axis values of

(17) S. E. Babb, *J. Chem. Phys.*, **37**, 922 (1962).