

useful, but not of any fundamental significance. It allows us to understand volume dependence at different temperatures in a phenomenological way but does not give us any deep insight into the processes.

D. CHANGE OF K WITH VOLUME

I have emphasized that at least at low temperatures the electrical resistivity depends sensitively on the relative proportions of N- and U-processes. This in turn depends on both the geometry of the Fermi surface and the anisotropy of the phonon-dispersion curves.

At high temperatures, however, where all scattering processes, whether N or U, involve large-angle scattering, it is probably more legitimate to separate out the dependence of the vibration amplitude (or the number of phonons) on volume from the other terms so that we can focus attention on the volume dependence of the electron-phonon interaction.

At high temperatures equation (39) applies. If we allow the pressure to vary at constant temperature we have from this equation:

$$\frac{\partial \ln \rho_{\text{ph}}}{\partial \ln V} = \frac{\partial \ln K}{\partial \ln V} - 2 \frac{\partial \ln \theta}{\partial \ln V} \quad (42)$$

In this expression we can estimate $\frac{\partial \ln \theta}{\partial \ln V}$ from the Grüneisen parameter; this in turn can be determined from purely equilibrium measurements on the metal since we have:

$$-\partial \ln \theta / \partial \ln V = \gamma = V \beta / \chi C_v \quad (43)$$

where β is the volume expansion coefficient, χ is the compressibility and C_v is the molar heat capacity at constant volume.

In this way we can estimate the change of θ with volume, and so determine the change of K with volume; cf. Table III. Table IV gives the results for the monovalent metals at 0° C. Our next problem is to understand the values of $\partial \ln K / \partial \ln V$ listed in the Table. Before considering the theoretical work that has been done on this, there are three further points about the variation of K with volume that must be brought out.