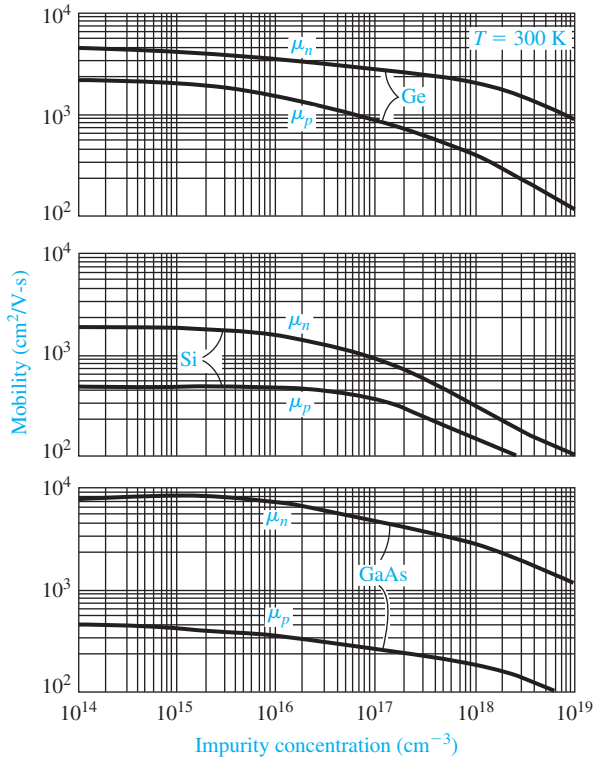

Figure 5.3 | Electron and hole mobilities versus impurity concentrations for germanium, silicon, and gallium arsenide at $T = 300$ K.
(From Sze [14].)

If these two scattering processes are independent, then the total probability of a scattering event occurring in the differential time dt is the sum of the individual events, or

$$\frac{dt}{\tau} = \frac{dt}{\tau_I} + \frac{dt}{\tau_L} \tag{5.17}$$

where τ is the mean time between any scattering event.

Comparing Equation (5.17) with the definitions of mobility given by Equation (5.13) or (5.14), we can write

$$\boxed{\frac{1}{\mu} = \frac{1}{\mu_I} + \frac{1}{\mu_L}} \tag{5.18}$$

where μ_I is the mobility due to the ionized impurity scattering process and μ_L is the mobility due to the lattice scattering process. The parameter μ is the net mobility. With two or more independent scattering mechanisms, the inverse mobilities add, which means that the net mobility decreases.