18.14 (a) Perhaps the easiest way to determine the values of ρ_0 and *a* in Equation 18.10 for pure copper in Figure 18.8, is to set up two simultaneous equations using two resistivity values (labeled ρ_{t1} and ρ_{t2}) taken at two corresponding temperatures (T_1 and T_2). Thus,

$$\rho_{t1} = \rho_0 + aT_1$$
$$\rho_{t2} = \rho_0 + aT_2$$

And solving these equations simultaneously lead to the following expressions for a and ρ_0 :

$$a = \frac{\rho_{t1} - \rho_{t2}}{T_1 - T_2}$$
$$\rho_0 = \rho_{t1} - T_1 \left[\frac{\rho_{t1} - \rho_{t2}}{T_1 - T_2} \right]$$
$$= \rho_{t2} - T_2 \left[\frac{\rho_{t1} - \rho_{t2}}{T_1 - T_2} \right]$$

From Figure 18.8, let us take $T_1 = -150^{\circ}$ C, $T_2 = -50^{\circ}$ C, which gives $\rho_{t1} = 0.6 \times 10^{-8} (\Omega-m)$, and $\rho_{t2} = 1.25 \times 10^{-8} (\Omega-m)$. Therefore

$$a = \frac{\rho_{t1} - \rho_{t2}}{T_1 - T_2}$$
$$= \frac{\left[(0.6 \text{ x } 10^{-8}) - (1.25 \text{ x } 10^{-8})\right](\Omega - \text{m})}{-150^{\circ}\text{C} - (-50^{\circ}\text{C})}$$
$$6.5 \text{ x } 10^{-11} (\Omega - \text{m})/^{\circ}\text{C}$$

and

$$\rho_0 = \rho_{t1} - T_1 \left[\frac{\rho_{t1} - \rho_{t2}}{T_1 - T_2} \right]$$

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