Electrical Resistivity of Metals

18.13 We want to solve for the parameter A in Equation 18.11 using the data in Figure 18.37. From Equation 18.11

$$A = \frac{\rho_i}{c_i\,(1 - c_i)}$$

However, the data plotted in Figure 18.37 is the total resistivity, ρ_{total}, and includes both impurity (ρ_i) and thermal (ρ_t) contributions (Equation 18.9). The value of ρ_t is taken as the resistivity at $c_i = 0$ in Figure 18.37, which has a value of 1.7×10^{-8} (Ω-m); this must be subtracted out. Below are tabulated values of A determined at $c_i = 0.10$, 0.20, and 0.30, including other data that were used in the computations. (*Note:* the c_i values were taken from the upper horizontal axis of Figure 18.37, since it is graduated in atom percent zinc.)

c_i	$1 - c_i$	ρ_{total} (Ω-m)	ρ_i (Ω-m)	A (Ω-m)
0.10	0.90	4.0×10^{-8}	2.3×10^{-8}	2.56×10^{-7}
0.20	0.80	5.4×10^{-8}	3.7×10^{-8}	2.31×10^{-7}
0.30	0.70	6.15×10^{-8}	4.45×10^{-8}	2.12×10^{-7}

So, there is a slight decrease of A with increasing c_i.