DESIGN PROBLEMS

Specification of Composition

4.D1   This problem calls for us to compute the concentration of lithium (in wt%) that, when added to aluminum, will yield a density of 2.47 g/cm^3. Solution of this problem requires the use of Equation 4.10a, which takes the form

$$\rho_{ave} = \frac{100}{\dfrac{C_{Li}}{\rho_{Li}} + \dfrac{100 - C_{Li}}{\rho_{Al}}}$$

inasmuch as $C_{Li} + C_{Al} = 100$. According to the table inside the front cover, the respective densities of Li and Al are 0.534 and 2.71 g/cm^3. Upon solving for C_{Li} from the above equation, we get

$$C_{Li} = \frac{100\,\rho_{Li}\left(\rho_{Al} - \rho_{ave}\right)}{\rho_{ave}\left(\rho_{Al} - \rho_{Li}\right)}$$

$$= \frac{(100)(0.534\ \text{g/cm}^3)(2.71\ \text{g/cm}^3 - 2.47\ \text{g/cm}^3)}{(2.47\ \text{g/cm}^3)(2.71\ \text{g/cm}^3 - 0.534\ \text{g/cm}^3)}$$

$$= 2.38\ \text{wt\%}$$