

11.4 We are asked to compute the volume percent graphite in a 2.5 wt% C cast iron. It first becomes necessary to compute mass fractions using the lever rule. From the iron-carbon phase diagram (Figure 11.2), the tie-line in the α and graphite phase field extends from essentially 0 wt% C to 100 wt% C. Thus, for a 2.5 wt% C cast iron

$$W_{\alpha} = \frac{C_{\text{Gr}} - C_0}{C_{\text{Gr}} - C_{\alpha}} = \frac{100 - 2.5}{100 - 0} = 0.975$$

$$W_{\text{Gr}} = \frac{C_0 - C_{\alpha}}{C_{\text{Gr}} - C_{\alpha}} = \frac{2.5 - 0}{100 - 0} = 0.025$$

Conversion from weight fraction to volume fraction of graphite is possible using Equation 9.6a as

$$\begin{aligned} V_{\text{Gr}} &= \frac{\frac{W_{\text{Gr}}}{\rho_{\text{Gr}}}}{\frac{W_{\alpha}}{\rho_{\alpha}} + \frac{W_{\text{Gr}}}{\rho_{\text{Gr}}}} \\ &= \frac{\frac{0.025}{2.3 \text{ g/cm}^3}}{\frac{0.975}{7.9 \text{ g/cm}^3} + \frac{0.025}{2.3 \text{ g/cm}^3}} \\ &= 0.081 \text{ or } 8.1 \text{ vol\%} \end{aligned}$$