

4.20 This problem asks us to determine the number of molybdenum atoms per cubic centimeter for a 16.4 wt% Mo-83.6 wt% W solid solution. To solve this problem, employment of Equation 4.18 is necessary, using the following values:

$$C_1 = C_{\text{Mo}} = 16.4 \text{ wt\%}$$

$$\rho_1 = \rho_{\text{Mo}} = 10.22 \text{ g/cm}^3$$

$$\rho_2 = \rho_{\text{W}} = 19.3 \text{ g/cm}^3$$

$$A_1 = A_{\text{Mo}} = 95.94 \text{ g/mol}$$

Thus

$$\begin{aligned} N_{\text{Mo}} &= \frac{N_{\text{A}} C_{\text{Mo}}}{\frac{C_{\text{Mo}} A_{\text{Mo}}}{\rho_{\text{Mo}}} + \frac{A_{\text{Mo}}}{\rho_{\text{W}}} (100 - C_{\text{Mo}})} \\ &= \frac{(6.023 \times 10^{23} \text{ atoms/mol}) (16.4 \text{ wt\%})}{\frac{(16.4 \text{ wt\%})(95.94 \text{ g/mol})}{10.22 \text{ g/cm}^3} + \frac{95.94 \text{ g/mol}}{19.3 \text{ g/cm}^3} (100 - 16.4 \text{ wt\%})} \\ &= 1.73 \times 10^{22} \text{ atoms/cm}^3 \end{aligned}$$