

3.16 (a) For indium, and from the definition of the APF

$$\text{APF} = \frac{V_S}{V_C} = \frac{n \left(\frac{4}{3} \pi R^3 \right)}{a^2 c}$$

we may solve for the number of atoms per unit cell, n , as

$$\begin{aligned} n &= \frac{(\text{APF}) a^2 c}{\frac{4}{3} \pi R^3} \\ &= \frac{(0.693)(4.59)^2(4.95)(10^{-24} \text{ cm}^3)}{\frac{4}{3} \pi (1.625 \times 10^{-8} \text{ cm})^3} \\ &= 4.0 \text{ atoms/unit cell} \end{aligned}$$

(b) In order to compute the density, we just employ Equation 3.5 as

$$\begin{aligned} \rho &= \frac{n A_{\text{In}}}{a^2 c N_A} \\ &= \frac{(4 \text{ atoms/unit cell})(114.82 \text{ g/mol})}{\left[(4.59 \times 10^{-8} \text{ cm})^2 (4.95 \times 10^{-8} \text{ cm}) / \text{unit cell} \right] (6.023 \times 10^{23} \text{ atoms/mol})} \\ &= 7.31 \text{ g/cm}^3 \end{aligned}$$