

3.8 We are asked to determine the radius of a palladium atom, given that Pd has an FCC crystal structure. For FCC, $n = 4$ atoms/unit cell, and $V_C = 16R^3\sqrt{2}$ (Equation 3.4). Now,

$$\begin{aligned}\rho &= \frac{nA_{\text{Pd}}}{V_C N_A} \\ &= \frac{nA_{\text{Pd}}}{(16R^3\sqrt{2})N_A}\end{aligned}$$

And solving for R from the above expression yields

$$\begin{aligned}R &= \left(\frac{nA_{\text{Pd}}}{16\rho N_A \sqrt{2}} \right)^{1/3} \\ &= \left[\frac{(4 \text{ atoms/unit cell})(106.4 \text{ g/mol})}{(16)(12.0 \text{ g/cm}^3)(6.023 \times 10^{23} \text{ atoms/mol})(\sqrt{2})} \right]^{1/3} \\ &= 1.38 \times 10^{-8} \text{ cm} = 0.138 \text{ nm}\end{aligned}$$