CHAPTER 3

3.25 Calculate r for (a) BCC metal $a_0 = 0.3294$ nm (b) FCC metal $a_0 = 4.0862$ Å

(a) After deriving relationship between a and r for BCC

$$r = \frac{\sqrt{3}\,a_0}{4} = \frac{(\sqrt{3})(0.3294\text{ nm})}{4} = 0.1426\text{ nm}$$
$$= 1.426 \times 10^{-8}\text{ cm}$$

(b) for FCC

$$r = \frac{\sqrt{2}\,a_0}{4} = \frac{(\sqrt{2})(4.0862\text{ Å})}{4} = 1.4447\text{ Å} = 1.4447 \times 10^{-8}\text{ cm}$$

3.35 Calculate the # of unit cells and no. of Fe atoms in a paper clip weighing 0.59g.

$$a_{0\,Fe_{BCC}} = 2.866 \times 10^{-8}\text{ cm} \quad \therefore \quad V_{\substack{unit\\cell}} = (2.866 \times 10^{-8}\text{ cm})^3 = 2.354 \times 10^{-23}\text{ cm}^3$$

$$\rho = 7.87\text{ g/cm}^3 \quad \therefore \quad \text{no. of unit cells} = \frac{0.59\text{ g}}{(7.87\text{ g/cm}^3)(2.354 \times 10^{-23}\text{ cm}^3/\text{cell})}$$
$$= 3.19 \times 10^{21}\text{ cells}$$

$$\text{no of Fe atoms} = \left(\frac{2\text{ atoms}}{\text{cell}}\right)(3.19 \times 10^{21}\text{ cells})$$
$$= 6.37 \times 10^{21}\text{ atoms}$$

3.36 For a 4" x 4" x 0.001" sheet of Al, calculate the no. of unit cells and the thickness of the foil in unit cells

$$a_0 = 4.04958 \times 10^{-8}\text{ cm} \quad \therefore \quad V_{\substack{unit\\cell}} = (4.04958 \times 10^{-8})^3$$
$$= 6.6409 \times 10^{-23}\text{ cm}^3$$

$$V_{foil} = (4")(4")(0.001") = 0.016\text{ in}^3 \Rightarrow 0.262\text{ cm}^3$$

$$\text{no. of unit cells} = \frac{0.262\text{ cm}^3}{6.6409 \times 10^{-23}\text{ cm}^3/\text{cell}} = 3.945 \times 10^{21}\text{ cells}$$

$$\text{thickness} = \frac{(0.001")(2.54\text{ cm/in})}{4.04958 \times 10^{-8}\text{ cm}} = 6.27 \times 10^{4}\text{ cells}$$

3.75 Stacking sequences for HCP and FCC?

HCP = ABAB
FCC = ABCABC