ENGR 145 Fall 2023
Homework Set #2
Due Wednesday, Sept. 13

CR Ch. 3

3.9 Calculate the radius of a palladium (Pd) atom, given that Pd has an FCC crystal structure, a density of 12.0 g/cm^3, and an atomic weight of 106.4 g/mol.

3.46 List the point coordinates for all atoms that are associated with the FCC unit cell (Figure 3.1).

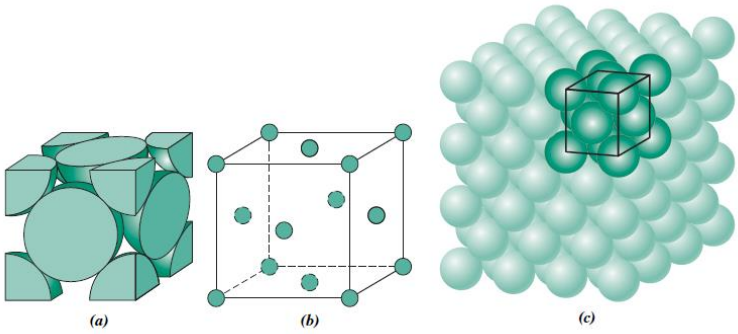
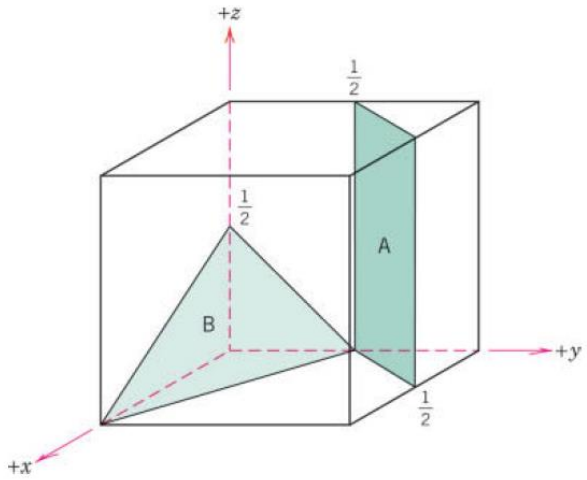


Figure 3.1 For the face-centered cubic crystal structure, (*a*) a hard-sphere unit cell representation, (*b*) a reduced-sphere unit cell, and (*c*) an aggregate of many atoms.
[Figure (*c*) adapted from W. G. Moffatt, G. W. Pearsall, and J. Wulff, *The Structure and Properties of Materials*, Vol. I, *Structure*, p. 51. Copyright © 1964 by John Wiley & Sons, New York. Reprinted by permission of John Wiley & Sons, Inc.]

3.69 Determine the Miller indices for the planes shown in the following unit cell:



3.80 **(a)** Derive linear density expressions for FCC [100] and [111] directions in terms of the atomic radius R.

(b) Compute and compare linear density values for these same two directions for copper (Cu).

3.95 The metal rhodium (Rh) has an FCC crystal structure. If the angle of diffraction for the (311) set of planes occurs at 36.12° (first-order reflection) when monochromatic x-radiation having a wavelength of 0.0711 nm is used, compute the following:

(a) The interplanar spacing for this set of planes

(b) The atomic radius for a Rh atom

Thought question: In addition to x-rays, crystalline materials can be studied by electron diffraction. What does this say about the properties of an electron beam?