

ENGR 240 Science of Materials
Homework 4
15 points

1. [2 points] Calculate the atomic packing factor (APF) for the bcc unit cell.

2. [3 points] Nickel has the fcc structure and a lattice parameter of $a = 0.3517$ nm.
 - a. Determine the atomic radius in nm.
 - b. Determine the atomic volume Ω in nm^3 (assume a spherical atom shape).
 - c. Determine the density in g/cm^3 and compare this answer to the Ni density value given in the table at the front of your textbook.

3. [4 points] Sketch an fcc unit cell.
 - a. Determine the planar density for the $(1\ 1\ 1)$.
 - b. Determine the planar density for the $(1\ 1\ 0)$.
 - c. Determine the linear density for the $[0\ 1\ \bar{1}]$.
 - d. Determine the linear density for the $[1\ 0\ 0]$.

4. [2 points] Calculate the planar densities for the $(1\ 1\ 1)$ and the $(1\ 1\ 0)$ in the bcc structure.

5. [3 points] Callister Problem 3.56 – x-ray diffraction of iron.

6. [1 point] Are the properties of single crystals isotropic? Explain your answer.