Session #15: Homework Problems

Problem #1

Iron (Fe) ($\rho = 7.86$ g/cm^3) crystallizes in a BCC unit cell at room temperature. Calculate the radius of an iron atom in this crystal. At temperatures above 910ºC iron prefers to be FCC. If we neglect the temperature dependence of the radius of the iron atom on the grounds that it is negligible, we can calculate the density of FCC iron. Use this to determine whether iron expands or contracts when it undergoes transformation from the BCC to the FCC structure.

Problem #2

Determine the total void volume (cm^3/mole) for gold (Au) at 27^{o}C; make the hard-sphere approximation in your calculation, and use data provided in the periodic table.

Problem #3

Determine the atomic (metallic) radius of molybdenum (Mo). Do not give the value listed in the periodic table; calculate it from other data given.

Problem #4

A metal is found to have BCC structure, a lattice constant of 3.31 Å, and a density of 16.6 g/cm^3. Determine the atomic weight of this element.

Problem #5

At 100°C copper (Cu) has a lattice constant of 3.655 Å. What is its density at this temperature?

Problem #6

Determine the second-nearest neighbor distance for nickel (Ni) (in pm) at 100°C if its density at that temperature is 8.83 g/cm^3.

Problem #7

Determine the highest linear density of atoms (atoms/m) encountered in vanadium (V).

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