Chapter 11: Homework solutions

11.5. Crystal structure and the ratio of ionic radii

11.7. Calculate the critical radius ratio for octahedral coordinate.

$r_{void} = \sqrt{2}r - r = 0.414r$

$r_{void}/r = 0.414$

11.8. BaO: $r_{Ba2+}/r_{O2-} = 1.08$. Coordinate # = 8

LiF: $r_{Li+}/r_{F-} = 0.59$. Coordinate number = 6

11.9. The ionic radii of Cs+ and I- are 0.165 nm and 0.220 nm, respectively, and their atomic masses are 132.9 g/mol and 126.9 g/mol, respectively. The

Assume the lattice constant is a: 2x(0.165+0.220) nm =$3^{1/2}$a, a = 0.77/$3^{1/2}$ nm = 0.44456 nm

The volume of the unit cell is: a^3. There are 1 Cs atom and 1 I atom in the unite cell.

The density = weight of atoms/volume in an unit cell

$$= \frac{(132.9 + 126.9)g/mol}{6.023 \bullet 10^{23}/mol \bullet (0.44456 \bullet 10^{-7} cm)^3} = 4.9 \text{ g/cm}^3$$

11.10. The ionic radii of Cs+ and Br- are 0.165 nm and 0.196 nm, respectively, and their atomic masses are 132.9 g/mol and 79.9 g/mol, respectively. The

Assume the lattice constant is a: 2x(0.165+0.196) nm =$3^{1/2}$a, a = 0.41685 nm

The volume of the unit cell is: a^3. There are 1 Cs atom and 1 Br atom in the unite cell.

The density = weight of atoms/volume in an unit cell

$$= \frac{(132.9 + 79.9)g/mol}{6.023 \bullet 10^{23}/mol \bullet (0.41685 \bullet 10^{-7} cm)^3} = 4.88 \text{ g/cm}^3$$