

Answers to selected suggested problems in Chapter 12 (1, 5, 26)

12.1

The 2 characteristics of component ions that determine the crystal structure of a ceramic compound are: (1) magnitude of electrical charge on each ion or need to maintain charge neutrality), and (2) the relative size of the cations and anions.

12.5

Refer to Table 12.2, 12.3, and 12.4

a.

$$r_C/r_A = 0.714$$

Coordination # (Ca^{2+}) = 6

So: NaCl crystal structure

b.

$$r_C/r_A = 0.364$$

Coordination # (Mn^{2+}) = 4

So: zinc blende crystal structure

c.

$$r_C/r_A = 0.704$$

Coordination # (K^+) = 6

So: NaCl crystal structure

d.

$$r_C/r_A = 0.867$$

Coordination # (Cs^+) = 8

So: CsCl crystal structure

12.26

The silicate materials have relative low densities because the atomic bonds are primarily covalent and therefore directional. This limits the packing efficiency of the atoms, and therefore the magnitude of the density.