

**Answer on question #51566, Physics, Solid State Physics**

**Question** A metallic element has a density of  $7.15 \text{ g cm}^{-3}$ , a lattice constant of  $2.880 \text{ \AA}$ , and an atomic weight of  $51.9961$ . Calculate the number of atoms per unit cell of this element and predict its lattice crystal structure.

**Solution** To find number of atoms per unit cell we have to divide mass of lattice by atomic weight of atom. Mass of lattice can be found as

$$m_l = V_l \cdot \rho$$

where  $V_l = 2.88^3 \text{ \AA}^3$  volume of lattice and  $\rho = 7150 \text{ kg/m}^3$  is density. So

$$m_l = 2.88^3 \cdot 10^{-30} \cdot 7150 \approx 1.7 \cdot 10^{-26} \text{ kg}$$

So, atoms per unit cell:

$$n = \frac{m_l}{m_{atom}} = \frac{1.7 \cdot 10^{-26}}{1,66 \cdot 10^{-27}} \approx 10$$

From this, we can conclude, that element has Body-centered cubic crystal structure.