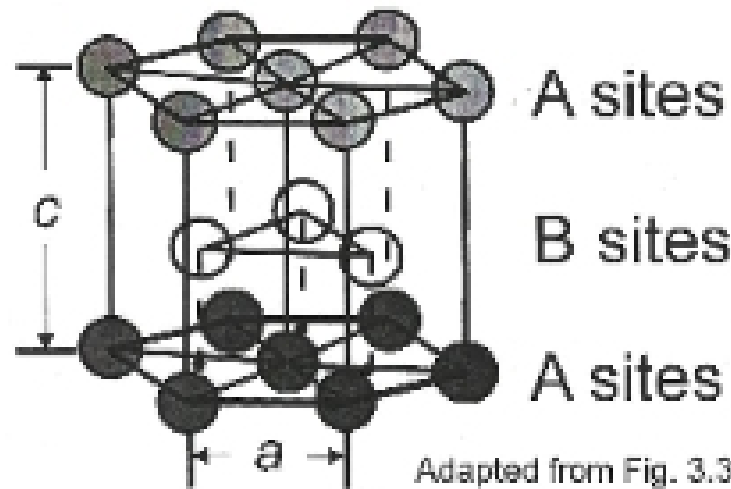


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# Hexagonal Close-Packed Structure (HCP)

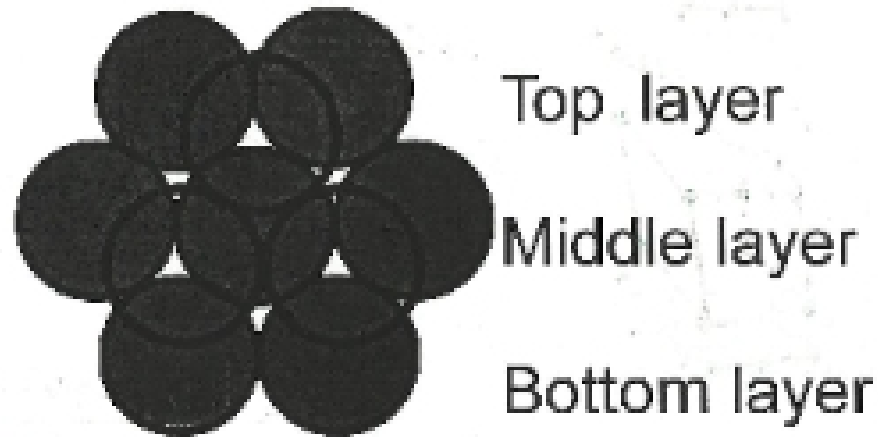


- ABAB... Stacking Sequence
- 3D Projection



Adapted from Fig. 3.3(a), Callister 7e.

- 2D Projection



- Coordination # = 12

6 atoms/unit cell

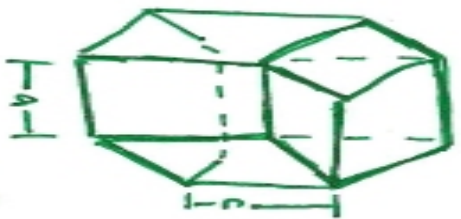
• APF = 0.74

Close-packed highest possible packing factor

•  $c/a = 1.633$

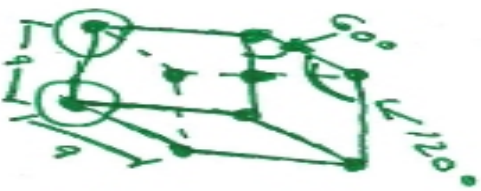
ex: Cd, Mg, Ti, Zn





$$\text{ratio } \frac{c}{a} = 1.633$$

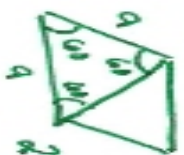
FCC + HCP - very dense



split

- 8 corners
- 1 center
- Step 1.  $a = 2r$  ← atomic radius
- 2. 2

$$APF = \frac{\text{Vol. occupied}}{\text{Vol. available}}$$



$$2 \times \frac{1}{2} a \sin 120 = \left[ \frac{\sqrt{3} a^2}{2} \right] C$$

$$C = 1.633a = \frac{\sqrt{3}}{2} a^3 (1.633)$$

Volume available

$$APF = \frac{2 \times \left( \frac{4}{3} \pi r^3 \right)}{\frac{\sqrt{3}}{2} a^3 (1.633)}$$

← area of atoms

$$= \frac{2 \times \frac{4}{3} \pi \frac{a^3}{8}}{\frac{\sqrt{3}}{2} a^3 (1.633)}$$

$$a = 2r$$

a = diameter of atom