



# SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)  
SNS Kalvi Nagar, Saravanampatti Post  
Coimbatore - 641 035



Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai  
Accredited by NBA & accredited by NAAC with 'A+' Grade, Recognized by UGC

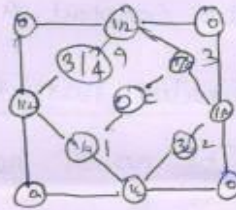
## Diamond cubic structure

This structure is a combination of two interpenetrating FCC sub lattices

The diamond has FCC structure with the basis of two atoms (x & y)

x atom is located with an origin (0, 0, 0)

y " " " " " "  $a/4, a/4, a/4$



## NO. of atoms per unit cell

NO. of corner atoms per unit cell =  $\frac{1}{8} \times 8 = 1$

" " Face centered atoms per unit cell =  $\frac{1}{2} \times 6 = 3$

no. of atoms inside the unit cell = 4

$$\Rightarrow 1 + 3 + 4 \Rightarrow 8$$

## Atomic radius



IN  $\Delta XYZ$

$$xy^2 = xz^2 + zy^2$$

$$= x^2 + z^2 + zy^2$$

$$= \left(\frac{a}{4}\right)^2 + \left(\frac{a}{4}\right)^2 + \left(\frac{a}{4}\right)^2 \Rightarrow \frac{3a^2}{16} \quad \text{--- (1)}$$



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we know

$$xy = 2r$$
$$(xy)^2 = 4r^2 \quad \text{--- (2)}$$

Compare ① x ②

$$4r^2 = \frac{3a^2}{16}$$
$$r^2 = \frac{3a^2}{64}$$
$$r = \frac{a\sqrt{3}}{8}$$

Lattice constant  $a = \frac{8r}{\sqrt{3}}$

Coordination number

The no. of nearest neighbors is 4

Packing factor

$$P.F = \frac{V}{V}$$
$$= \frac{8 \times \frac{4}{3} \pi r^3}{a^3}$$
$$= \frac{32 \pi r^3}{3a^3} \quad r = \frac{a\sqrt{3}}{8}$$
$$= \frac{32 \pi \frac{a^3 \sqrt{3} \sqrt{3}}{8 \times 8 \times 8}}{3a^3}$$
$$\frac{\pi \sqrt{3}}{16}$$
$$= 34\%$$

34% of the unit cell is occupied by atoms and remaining 66% is vacant.