Reasons:

1. Anisotropic nature=this is due to different arrangement of particle in different direction so it change physical property such as electrical resistance, refractive index etc.

2.isotropic nature-arrangement of particle is same but irregular in all direction this is due to no long range order of arrangement so physical property are same in all direction.

CLASSIFICATION OF CRYSTALLINE SOLID:

There are four types of crystalline solid

.molecular solid

.ionic solid

.metallic solid

.covalent or network solid

**molecular solid-molecules are constituent particle of molecular solid. These are further divided into three categories.*

Table 3 Properties of Ionic, Metallic, Molecular, and Covalent Network Crystals

Crystal	Entities	Force/Bond	Properties	Examples
ionic	cations anions	ionic	hard; brittle; medium to high melting point; liquid and solution conducts	NaCl(s), Na_3PO_4(s), $CuSO_4 \cdot 5H_2O$(s)
metallic	cations electrons	metallic	soft to very hard; solid and liquid conducts; ductile; malleable; lustrous	Pb(s), Fe(s), Cu(s), Al(s)
molecular	molecules	London dipole—dipole hydrogen	soft; low melting point; nonconducting solid, liquid, and solution	H_2O(s) (ice), CO_2(s) (dry ice), I_2(s)
covalent network	atoms	covalent	very hard; very high melting point; nonconducting	C(s), SiC(s), SiO_2(s)

CRYSTAL LATTICE AND UNIT CELL:

Crystal lattice- 3d arrangement of constituent particle in space.

There are 14 possible structure of crystal lattice called bravoes lattice.

Feature of crystal lattice-

$$= \frac{4\times 4/3\pi r^3}{\left(2\sqrt{2}r\right)^3}\times 100\%$$

$$= \frac{16/3\pi r^3}{16\sqrt{2}r^3}\times 100\ \% = 74\%$$

Packing efficiency in body centered cubic structure-

In body-centred cubic structures, the three atoms are diagonally arranged. To find the packing efficiency we consider a cube with edge length a, face diagonal length b and cube diagonal as c.

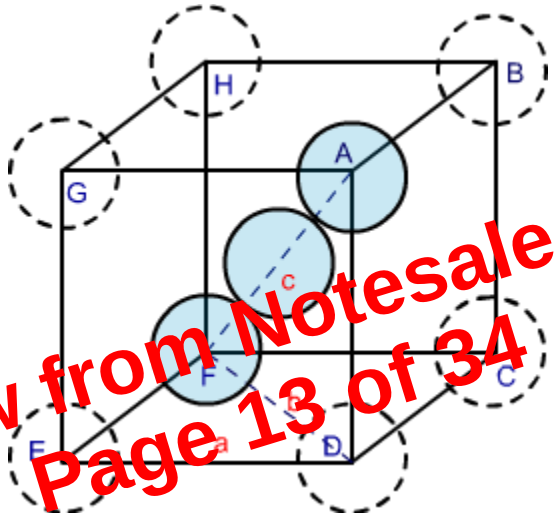


Image 3: BCC structure

In ∆ EFD according to Pythagoras theorem

$b^2 = a^2 + a^2$

$b^2 = 2a^2$

$b = \sqrt{2}\, a$

Now in ∆ AFD according to Pythagoras theorem

$c^2 = a^2 + b^2 = a^2 + 2a^2$

$c^2 = 3a^2$

$c = \sqrt{3}\, a$

If the radius of each sphere is 'r' then we can write

$c = 4r$

$\sqrt{3}\, a = 4r$

$r = \sqrt{3}/\, 4\, a$

As there are two atoms in the bcc structure the volume of constituent spheres will be

$2 \times (4/3)\, \pi\, r^3$

$$\text{Packing Efficiency} = \frac{\text{Volume occupied by 2 spheres} \times 100}{\text{Total volume of unit cell}}\%$$

$$= \frac{2 \times \frac{4}{3}\pi r^3}{\frac{4}{\sqrt{3}r}^3} \times 100\%$$

$$= 68\%$$

$$\text{APF} = \frac{N_{atom}\, V_{atom}}{V_{crystal}} = \frac{2 \times \frac{4}{3}\, \pi r^3}{\left(\frac{4r}{\sqrt{3}}\right)^3}$$

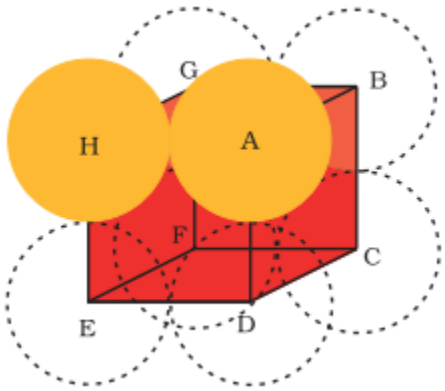
$$= \frac{\pi\sqrt{3}}{8} \approx 0.68017476$$

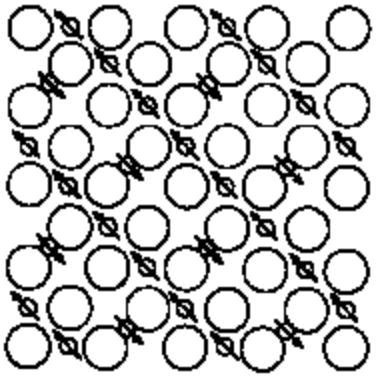
Therefore packing efficiency of the body-centred unit cell is 68%.

Metals like iron and chromium fall under bcc category.

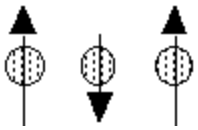
Simple Cubic Lattice

In simple cubic lattice, the atoms are located only on the corners of the cube. From the given figure we can see that the particles are in touch only at the edges.





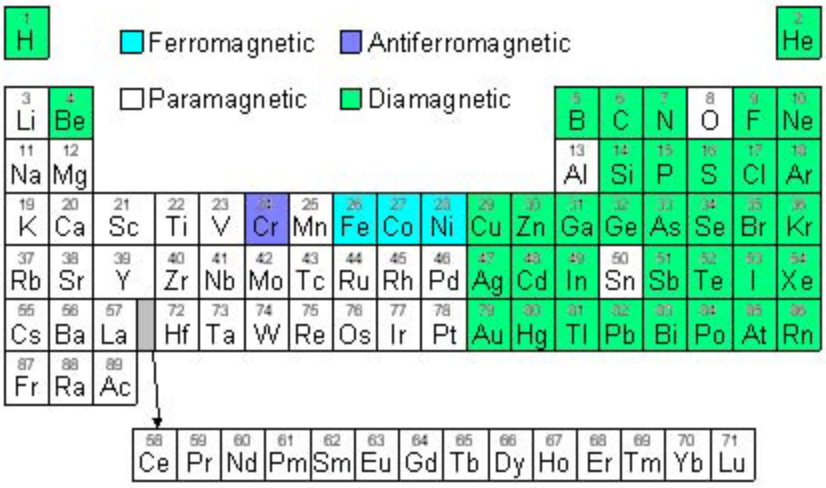
Ferrimagnetism



Anti-Ferromagnetic Substance

In Anti-Ferromagnetic material, the magnetic moments of atoms or molecules, usually related to the spin of the electrons, align in a regular pattern with neighbouring spins in opposite directions.MnO is an example of anti-ferromagnetism

Classification of elements in periodic table based on Magnetic Properties



Frequently Asked Questions (FAQs)