1, 9, 2021

CHAPTER - 1

SOLID STATE :→

LECTURE - 1

Matter → Anything that occupies space and has mass

- MATTER ⟶ SAME SUBSTANCE

  ↓

  H_2O → SOLID

  H_2O → LIQUID

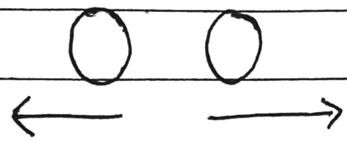
  H_2O → GAS

  ↓

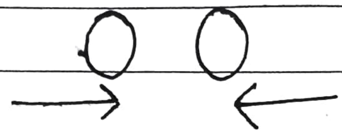
  MOLECULES

STATE ⟶ function (Thermal energy, FOA)

Thermal energy depends on temprature



Force of attraction depends on pressure



Solid state → $FOA >> T.E$

Liquid state → $FOA \approx TE$

Gaseous state → $TE >> FOA$

1) **Solid State**

⇒ Volume fixed
⇒ Shape fixed

2) **Liquid State**

⇒ Volume fixed
⇒ Shape not fixed

3) **GASEOUS STATE**

⇒ Volume not fixed
⇒ Shape not fixed.

Shape is same as constant if mean position is same.

Volume is constant if average distance between both molecules ~~are~~ is same.

SOLIDS

CRYSTALLINE → AMORPHOUS

CRYSTALLINE V/S AMORPHOUS :→

1) On the basis of arrangement :→

⇒ Amorphous → Short range order
⇒ Crystalline → Long range order.

2) On the basis of Melting point :→

⇒ Amorphous → Range of Melting points.
⇒ Crystalline → Sharp melting point.

3) On the basis of Isotropicity :→

⇒ Amorphous → Isotropic
⇒ Crystalline → Anisotropic.

4) On the basis of cleavage :→

⇒ Amorphous → irregular plane.
⇒ Crystalline → Smooth plane.

SOLID
LIQUID } Condensed State of Matter.

LIQUID
GAS } FLUIDS → Particles can move.

Amorphous Solids → Super Cooled Liquids
And
Pseudo Solids.

CARBON
- Amorphous — Coal, Coke
- Crystalline — Diamond, Graphite

Quarts $\longleftarrow SiO_2 \longrightarrow$ Quarts Glass

(Crystalline) (Amarphous)

<u>NOTE</u> → About 99% of Solids in our world are crystalline so it's not possible to remember all of them but we can remember Amorphous Solids as they are limited in nature.

<u>AMORPHOUS</u> :→

⇒ Rubber, glass, polymers, Cellophane, plastic, teflon

<u>CRYSTALLINE</u> :→

⇒ $ZnCl_2$, Na_2SO_4, NaCl, Benzene, Ar and many more...

$$
\begin{tikzcd}
\text{Amorphous} \arrow[r] \arrow[r, bend left=40, "\text{Melt } \Delta \text{, Slow Cooling}"] & \text{Crystalline} \arrow[l, bend left=40, "\text{Melt } \Delta \text{, Fast Cooling}"]
\end{tikzcd}
$$

We can convert any Amorphous Solid to Crystalline by melting it and then Cooling it Slowly. Slow cooling gives time to molecules for an perfect arrangement and to convert Crystalline back to amorphous, we melt it again and cool it fast. Fast Cooling will not give time to molecules for arranging.

Classification of Crystalline Solids :→

CRYSTALLINE SOLIDS

- IONIC SOLIDS
- METALLIC SOLIDS
- MOLECULAR SOLIDS
- COVALENT SOLIDS

Covalent Solids are also known as network solids

1) <u>Ionic Solids</u> :→

⇒ <u>Examples</u> → Na^+Cl^-, $Mg^{2+}O^{2-}$, K^+Cl^-

⇒ <u>Constituent Particles</u> → <u>Oppositely charged ions.</u>

⇒ <u>Force of Attraction</u> → <u>Ionic force Attraction</u>

- They are brittle
- High melting point due to strong force of attraction.
- Non conductor of electricity in Solid State but Conductor in molten or aqueous state.

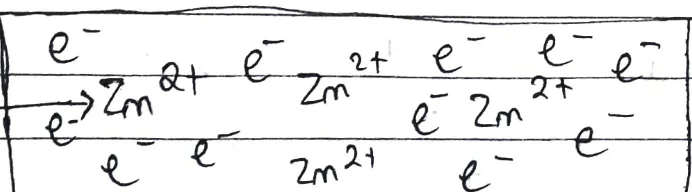
2) <u>Metallic Solids</u> :→

⇒ Examples → Zn, Na, Cu

$$Zn \longrightarrow Zn^{+2} + 2e^-$$

⇒ The metal cations are placed in sea of mobile electrons.

Kernals →



- The melting point is fairly high but it is comparatively less than ionic solids.

- Unlike the ionic solids, they are ductile and malleable.

- When the potential difference is applied, the mobile electrons can move, making the metallic solid a good conductor.

MOLECULAR SOLIDS

- Polar Molecular Solids
- Non-Polar Molecular Solids
- H-Bonded Molecular Solids.

a) Polar Molecular Solids :→

⇒ Examples → HCl, SO_2

⇒ Dipole moment → $\mu \neq 0$

⇒ Melting point → Less

⇒ Hardness → Soft
⇒ Force of Attraction → Dipole - Dipole

b) Non- Polar Molecular Solids :->

⇒ Examples → SO_3, CO_2, Ar

⇒ Dipole moment → $\mu = 0$

⇒ F.O.A → London forces

⇒ Melting point → Less

⇒ Hardness → Soft

c) H- Bonded Molecular Solids :->

⇒ Examples → HF, NH_3, H_2O

⇒ F.O.A → H- Bonding.

⇒ Melting point → Comparitively High

⇒ Hardness → Hard

#

$$H \longrightarrow \begin{matrix} O \\ N \\ F \end{matrix}$$

4) Covalent Solids :→

⇒ Melting point → Very, Very high

2) Hardness → Bhot Hard

⇒ Conductivity → Bad Conductors of Electricity.

✓ Imp

EXCEPTION → Graphite

1) good Conductors
2) Soft solid
3) ~~Random~~ Low M.P