

## Unit

## 1

**The Solid State****Classification of crystalline solids:**

Based on the inter molecular forces operating between constituent particles crystalline solids are classified as – Molecular solids, ionic solids, metallic solids, covalent or Network solids.

**Molecular solids:**

The constituent particles in these solids are molecules based on the force existing between molecules. They are again classified as,

Non-polar molecular solids, polar molecular solids hydrogen bonded molecular solids.

**Non-polar molecular solids:**

The force existing between the constituent particles London (or) dispersion force, which is a weak Vander Waal's force.

Such solids are soft with low melting points usually exist in liquid or gaseous state at room temperature.

Ex.  $I_2$ ,  $CO_{2(s)}$ ,  $Ar_{(s)}$  etc.

**Polar molecular solids:**

The force existing between the constituent particles is dipole-dipole interaction.

- These are also soft but melting points are higher than polar molecular solids.
- They usually exist in liquid or gaseous state.

Ex.  $SO_{3(s)}$ ,  $SO_{2(s)}$ ,  $HCl_{(s)}$  etc.

- **Hydrogen bonded molecular solids:**

The force existing between the constituent particle is Hydrogen bond.

They are generally soft solids or volatile liquids at room temperature.

Ex.  $\text{NH}_3(\text{s})$ ,  $\text{H}_2\text{O}(\text{s})$

Molecular solids are non-conductors of electricity.

- **Ionic solids:**

The constituent particles are ions and force existing between the constituent ions is ionic bond.

- They are generally hard, brittle with high melting and boiling points.
- They don't conduct electricity in solid state but are good conductors in molten or dissolved state.

Ex.  $\text{NaCl}$ ,  $\text{KNO}_3$ ,  $\text{Na}_2\text{SO}_4$  etc.

- **Metallic solids:**

The constituent particles are metal kernels and the force existing between the particles is metallic bond.

- They possess high electrical and thermal conductivity in solid state also.
- They are highly malleable and ductile.
- Generally possess high melting & boiling points.

Ex. All metals like Ag, Au, Cu etc.

- **Covalent or Network solids:**

Constituent particles are atoms. The force existing between the particles is a strong covalent bond.

- Atoms are covalently bonded to other atoms from all directions giving three-dimensional network like structure. Hence they are also called as Network solids.
- They possess usually melting and high boiling points.

Ex. Diamond, Graphite, A/N etc.

