

## POLYMER

**Polymerisation:** The chemical process in which a large number of smaller molecular units are unite or joint together to form a bigger molecule of high molecular weight is called polymerization.

**Polymers:** Compounds of very high molecular masses formed by the combination of a large number of simple molecules are called polymers. For example: Polythene

**Monomer:** Monomer is the single repeating unit which on polymerization gives a polymer.  
For example: Ethene is the monomer unit of polyethene.

### **Classification of Polymers**

Polymers may basically be classified in to two types, they are:

**i. Homo-polymer**

**ii. Co-polymer**

#### **Homo-polymer**

The polymer containing monomer units of identical chemical composition is called a homo-polymer. In other words the polymer formed from one type of monomer is called a homo-polymer.

Example: polythene, PVC, Polystyrene etc.

-----M – M – M – M – M – ----- where, "A" is the monomer unit.  
(homopolymer)

#### **Copolymer**

A polymer containing monomer units of different chemical composition is called **co**-polymer or mixed polymer. For example: Bakelite, Nylon-6,6, Nylon-6,10, Buna-S, Buna-N etc.

-----M1 – M2 – M1 – M2 – M1 –M2 -----  
(Copolymer)

## **Degree of polymerization:**

Number of monomeric units in a polymer is called degree of polymerization.

## **Polythene:**

Ethylene undergoes polymerization at 1500 atm pressure to form polythene.

### Uses

It is used for making

- High frequency insulator parts.
- Packing materials in the form of thin films, bags etc.
- Bottles, kitchen and domestic appliances.

## **PVC (Poly Vinyl Chloride)**

When Vinyl-Chloride undergo polymerization in presence of a small quantity of benzyl peroxide, Poly Vinyl Chloride is formed.

### Uses

It is used for making:

- Sheets for tank lining
- Safety helmets
- Refrigerator components
- Tyres, cycle and motor cycle mudguards
- Rain coat packing
- Table cloths
- Electrical insulators
- Chemical containers

## **Bakelite (Phenol-Formaldehyde Resin)**

It is a co-polymer of phenol and formaldehyde. When phenol and formaldehyde are reacted together two isomeric compounds O-hydroxy methylphenol and P-hydroxy methylphenol are obtained.

**Uses:** It is used in the manufacture of:-

- i. Electrical insulators like plug, switch etc.
- ii. Cabinets for Radio and TV
- iii. Telephone parts
- iv. Paints, varnishes
- v. Hydrogen exchange resin for softening of hard water.

## **Thermoplastic polymers**

- These are formed by addition polymerization.
- Linear structure.
- These soften and melt on heating and harden again on cooling.
- These can be remoulded, recast and reshaped.
- These are less brittle and soluble in some organic solvents.
- Examples- Polythene, PVC, Teflon etc.

## **Thermosetting Polymers**

- These are formed by condensation polymerization.
- Three dimensional cross-linked structure.
- These do not soften on heating but rather become hard.
- These cannot be remoulded and reshaped.
- These are more brittle and insoluble in organic solvents.
- Examples- Bakelite, Urea formaldehyde resin, Terylene etc.

### **Natural Rubber:**

Natural rubber is a polymer of isoprene ( 2-Methyl buta-1,3 –diene).  
Natural rubber is a cis-isomer.

### **Vulcanization of Rubber:**

Vulcanisation is the process of heating raw rubber with varying amounts of sulphur (3.5%) to 140<sup>0</sup> C for some time.

### **Advantages of vulcanized rubber over raw rubber:**

Vulcanized rubber has the following advantages:

- It has resistance to oxidation, abrasion, wear etc.
- It has chemical resistance to organic solvents.
- It has much better electrical insulation power.
- It has good tensile strength and load bearing capacity.
- It has useful temperature range i.e. -40 to 100<sup>0</sup> C.