

8. POLYMERS

IMPORTANT POINTS

1. **'Poly'** means 'many' and **'mer'** means 'part'. Polymer is a large molecule of a **monomer**.

2. In this chapter we study i) Polymers-Classification ii) Polymerization iii) Rubber iv) Molecular weights of Polymers v) Biopolymers, Biodegradable polymers.

3. Basic terminology:

Polymer is a very high molecular weight macromolecule consists of repeating structural units (monomer) joined by covalent bonds.

A **polymer** is a substance consisting of many molecules of high molecular weight obtained from simple molecules of low molecular weight.

The simple molecules from which the polymeric molecule is derived are called **monomers**.

The process of formation of polymer from its constituent monomer(s) is called **polymerisation**.

The structural unit of the polymeric molecule, which repeats and which is derived from monomeric molecules is called **repeating unit**.

The number of repeating units present in a polymeric molecule is called **degree** of polymerisation.

Condensation polymerisation: A condensation polymer is a polymer which is obtained from monomers having poly functional groups with the elimination of simple molecules like NH_3 , CH_3OH , H_2O .

Copolymerisation: A copolymer is a polymer consisting of two or more chemically different types of monomer units in the chain.

4. **Poly Dispersity Index (PDI):** PDI is the ratio of the weight average mol.wt. to the number average mol.wt. of a polymer.

$$\text{PDI} = \frac{\overline{M}_w}{\overline{M}_n}$$

PDI > 1 for synthetic polymers.

5. **Biodegradable polymers:** Synthetic polymers do not undergo biodegradation to the starting materials. This creates environmental problems and ecological imbalance.

Biodegradable polymers degrade quickly in living systems by enzymatic reactions like oxidation, hydrolysis etc. Hence biodegradable polymers are preferred in recent times.

Ex: Aliphatic polyesters like Terylene.

6. Poly β -hydroxybutyrate-Co- β -hydroxy valerate(PHBV):

It is a copolymer of β -hydroxy butanoic acid and β -hydroxy pentanoic acid.

Excess amount of β -hydroxy butanoic acid makes the polymer tougher and excess amount of β -hydroxy pentanoic acid makes it more flexible.

- 1) PHBV is used for making medicine capsule.
- 2) It is used in orthopaedic devices and special packing.

7. **Polyglycolic acid:** This is a polyester obtained from glycolic acid (α -hydroxy acetic acid)

This is used as a biodegradable polyester for post operative stitches.

8. **Poly lactic acid:** This is a polyester obtained from lactic acid (α -hydroxy propanoic acid).