CHAPTER

15

Polymer

- **Polymers:** Polymers are high molecular mass macro molecules.
- **Polymerisation:** The process by which the monomers (simple molecules) combine with each other and transform into polymers, is known as polymerisation.
- **Natural polymers:** Those polymers which occur in nature, i.e., in plants or animals, are called natural polymers, e.g. starch, cellulose, proteins, natural rubber.
- **Synthetic polymers:** The polymers which are prepared in the laboratory are known as synthetic polymers or man-made polymers, e.g. polythene, synthetic rubber, PVC, nylon 6,6, teflon, orlon etc.
- **Semi-synthetic polymers:** Polymers obtained by making some modification in natural polymers by artificial means, are known as semisynthetic polymers, e.g. cellulose acetate (rayon), vulcanised rubber etc.
- **Linear polymers:** These are the polymers in which the monomer units are linked to one another to form long linear chains, e.g., high density polyethene, nylon and polyesters are linear polymers.
- **Branched chain polymers:** In such polymers, the monomer units are linked to form long chains with some branched chains of different lengths attached to the main linear chain. Some common examples of such polymers are low density polyethene, starch, glycogen etc.
- **Cross-linked polymers or network polymers:** These are formed from bi-functional and tri-functional monomers. Examples of cross linked polymers are bakelite, glyptal, melamine-formaldehyde polymer etc.
- **Addition polymers:** The polymers formed by the polymerisation of monomers containing double or triple bonds (unsaturated compounds) are called addition polymers. e.g. polythene, orlon, PVC, Buna-S, etc.
- **Condensation polymers:** The polymers which are formed by the combination of monomers with the elimination of small molecules such as water, alcohol, hydrogen chloride etc., are known as condensation polymers, e.g. nylon 6,6, Dacron, Bakelite etc.
- **Elastomers:** These are rubber like solid polymers in which the polymer chains are held together by weakest intermolecular forces, e.g. natural rubber, Buna-S, Buna-N etc.
- **Fibres:** Fibres belong to a class of polymers which are thread-like and can be woven into fabrics. A few examples of this class are nylon 6,6, terylene and polyacrylonitrile (PAN).
- **Thermoplastics:** These are linear polymers and have weak van der Waals' forces acting in the various chains, e.g. polyethene and polystyrene.
- **Plasticizers** are high boiling esters or haloalkanes. These are added to plastics to make them soft like rubber.
- **Thermosetting plastics:** These are normally semifluid substances with low molecular masses. e.g., Bakelite, melamine-formaldehyde resin and urea-formaldehyde resin.
- **Free radical addition polymerisation:** The monomers used are generally monosubstituted alkenes.
- **Cationic polymerisation:** It involves formation of carbocation
- **Anionic polymerisation:** It involves formation of a carbanion.
- **Polyamides:** The polymers which contain an amide linkage in chain are known as polyamide, e.g. nylon 6,6.
- **Natural Rubber:** Natural rubber is a coiled linear of 1,4-polymer of isoprene.
- The process of introducing –S–S– crosslinks in the structure of rubber by heating with sulphur at 110°C is called vulcanisation of rubber.
- **Polyesters:** The polymers which contain an ester linkage are known as polyester, e.g. dacron.
- **Biopolymers and Biodegradable Polymers:** Synthetic polymers are mostly non-biodegradable. Natural polymers are called biopolymers, e.g. polysaccharides, proteins, nucleic acids, etc. Biodegradable polymers can be easily degraded by microorganism with in a reasonable period. Aliphatic polyesters are the common examples of biodegradable polymers.

Important Polymers

- Saran is a copolymer of vinyldene chloride and Vinyl chloride and is used for wrapping food materials.
- ABS rubber is a copolymer of acrylonitrile, buta-1,3-diene and styrene.
- Bubble gum contains styrene butadiene (Buna-S) rubber.
- Dynel is a copolymer of vinyl chloride and acrylonitrile and is used for making human hair wigs.
- Silk is a thread like natural polymer which is obtained from cocoons of silk worms. It is a natural polyamide fibre.
- Thermocol is a foamed plastic obtained by blowing air through molten polystyrene or polyurethane.