



## Classification of polymers:

- 1) Natural and synthetic polymers - Based on origin
- 2) Thermoplastic and thermosetting polymers - Based on behaviour of heating
- 3) Addition and Condensation polymers – Based on method of preparation.

## Engineering Plastics:

Plastics are high polymers which are capable of being shaped or moulded. These polymers can be either natural or synthetic organic compounds of high molecular mass with added substances to improve their properties and performance. This allows them to be cast, pressed or extruded into a variety of shapes. The plastics are used in the manufacture of a variety of industrial products such as films, fibres, tubes, plates, bottles, boxes etc.,

Plastics are categorized on the basis of their use as commodity and engineering plastics. **Commodity plastics** have lower mechanical strength and can function under less severe environmental conditions. They have a wide range of uses such as packaging, household products, magnetic tapes etc, and **Engineering plastics** have better mechanical, thermal and physical properties such as heat, impact and abrasion resistance. They are flame retardants and chemically inert. They are expensive and are used in applications as a replacement for traditional engineering materials such as metals and alloys.

## Properties & Uses of Engineering Plastics:

The use of plastics as an engineering material has grown tremendously because of their several advantages over other conventional materials. These include properties such as light weight, high strength to weight ratio, chemical and corrosion resistance, low thermal and electrical conductivities. The following are some of the important properties which make plastics more useful in practice than any conventional material.

- 1) Plastics possess low specific gravity which is much less than that of metals & alloys
- 2) Their strength per unit weight is much greater than those of metals
- 3) They can be fabricated into any desired shape
- 4) Their maintenance cost is very low and they do not require any protective coating such as paints
- 5) They are chemically inert to the action of light, oils, acids and moisture
- 6) They possess low coefficient of thermal expansion and are very good thermal and electrical insulators
- 7) They can be easily moulded to accurate dimensions even to complicated forms and shapes
- 8) They possess good shock absorption capacity
- 9) They have the ability to take variety of colours, shades and excellent finish.
- 10) Some polymers can also conduct electricity as good as metals called conducting polymers

**Uses:** Automobile and aircraft parts, gears, pulleys, electric iron, frying pans, shock absorbers, pipes for underground installations, telephone parts, switches, plugs, holders, spare parts in industries etc.,

## Thermoplastic and Thermosetting Polymers:



Plastics are classified based on qualities that are important for product design and selection as thermoplastic and thermosetting polymers. Thermoplastic polymers are plastics which become soft on heating and hard on cooling. The process of heating and cooling can be repeated for a number of times without affecting their properties. Ex. polyethylene, PVC etc. Thermosetting polymers are plastics undergo chemical changes and cross linking on heating and become permanently hard which cannot be softened on cooling. For example phenol-formaldehyde (Bakelite), Epoxy resin etc

## Difference between thermoplastics and thermosetting polymers

### Thermoplastic Polymer

They are mostly formed by addition

Polymerization

They exhibit linear long chain structures

They undergo reversible changes on heating

They consist polymers of low molecular weight

They are soluble in organic solvents

They readily soften on heating and harden-  
-on cooling

There is no change in chemical composition and structure during moulding process

### Thermosetting Polymer

They are formed by condensation

polymerization

They have three dimensional network structure

They undergo irreversible changes on heating

They consist polymers of high molecular weight

They are insoluble in organic solvents

They do not soften on heating

They undergo chemical changes during moulding process.