

Plastics Uses, Types and Properties

Introduction

The word 'polymer' is made from two Greek words: *poly* means many and *mer* means unit or part. It is defined as when many monomers combine together they form a large molecule called polymer. These are also called as **macromolecules**, which are formed by joining of same repeating units. The monomers are linked to each other by covalent bonds to form long chain of polymers. This process of formation of polymers from monomers is called **polymerization**.

E.g. Polythene, Nylon 6, 6, Bakelite, rubber etc. are examples of polymers.

Polymers are classified into several ways based on some special considerations. The following are some of the common classifications of polymers:

Classification based on source

1. Natural polymers

The polymers which are found in plants and animals.

E.g. Proteins, cellulose, starch, and rubber.

2. Semi-synthetic polymers

The naturally occurring polymers when processed by certain chemical reactions are called semi-synthetic polymers.

E.g. Rayon, vulcanized rubber and cellulose nitrate, etc.

3. Synthetic polymers

The polymers which are prepared in laboratory or manmade polymers are known as synthetic or artificial polymers.

E.g. polythene, nylon 6,6, synthetic rubbers (Buna - S), PVC etc.

Difference between thermoplastics and thermosetting plastics

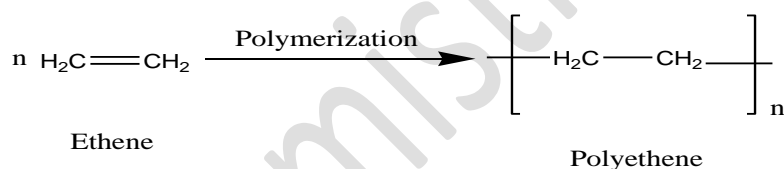
Sr. no.	Thermoplastic polymer	Thermosetting polymer
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1	They are generally formed by addition polymerization.	They are generally formed by condensation polymerization.
2	Thermoplastic materials can be soften on heating and becomes hard on cooling.	Thermosetting materials cannot be soften on heating and hard on cooling.
3	They generally have long chains in their structure and sometimes branching.	They generally have network like structure.
4	They can be reduced, reused and recycled.	They cannot be reduced, reused and recycled.
5	E.g. PVC, Polyethene, polypropylene etc.	E.g. Bakelite, melamine resins, nylon 6,6 etc.

Preparation reaction of some common polymers

1. Preparation of Polyethene

Polyethene is prepared by addition polymerization of ethene molecule.



Properties of polyethene

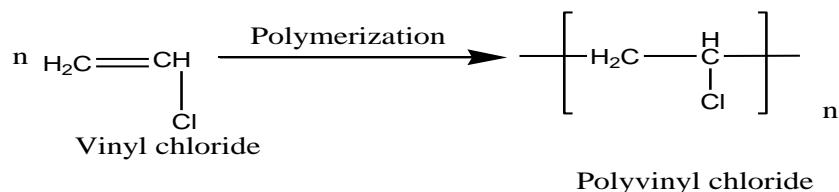
1. It is soft and weak.
2. It is good electrical insulator.
3. It has better chemical resistance.
4. This on heating becomes soft and on cooling becomes hard.

Uses of polyethene

1. It is widely used in packing industry.
2. Used for making pipes, insulator wires, tubes etc.
3. It is used in making carry bags, water tanks, and containers.
4. Used in making squeeze bottles, tubes, and lamination papers etc.

2. Preparation of Polyvinyl chloride

Polyvinyl chloride is prepared by addition polymerization of vinyl chloride molecule.



Properties of PVC

1. It is colourless, odorless and non-inflammable.
2. It is chemically inert and resistant to light, inorganic acids.
3. Pure resin of PVC has high m.p.
4. It has greater rigidity as compare to PE.

Uses of PVC

1. It is used in manufacturing of pipes.
2. It is also used in making toys, tubs, buckets etc.
3. It is used in making insulation for electrical wires.
4. Used in manufacturing of car and two wheeler parts.

3. Bakelite

It is also called as phenol- formaldehyde resin. Bakelite is thermosetting polymer. It is prepared by condensation polymerization process.

Monomers of phenol and formaldehyde are condensed in presence of acetic acid and HCl gives trimethylol phenol. This on polymerization gives three dimensional polymer of Bakelite. The chain polymer of phenol- formaldehyde is called novolac which has adhesive property.

Properties of Bakelite

1. It is rigid and hard material.
2. It has good insulating property.
3. It is bad conductor of heat and electricity.
4. It can withstand at high temperature.
5. Novolac which has adhesive property.

Uses of Bakelite

1. Used for making handles of cooker and fry pans.
2. It is widely used in making electrical switches, plugs, board etc.
3. Used in making keyboard, mouse and TV cabinets.
4. Used as an adhesive.
5. Used in paints.

Biodegradable polymers

The polymers which are degraded biologically or by action of enzymes or micro-organisms called biodegradable polymers.

To reduce use of non-biodegradable polymers which affect the environment, biodegradable polymers are very important.

E.g. polyvinyl acetate, polycaprolactone etc.

Properties of polyvinyl acetate

1. This polymer can be degraded biologically.
2. It does not possess required mechanical strength.
3. They are hydrophilic in nature.
4. They have small chain and high porosity.

Applications of polyvinyl acetate

1. It is used in medical field as surgical sutures.
2. It is also used in agriculture in netting, mulching.
3. Also acts as controlled fertilizer and pesticide.
4. Used in making carry bags, bottles, packing, lamination purpose.