



Mula Education Society's  
**Arts, Commerce and Science College**  
Sonai, Tal. Newasa, Dist. Ahmednagar - 414 105

Reaccredited with 'A' Grade by NAAC, Bangalore & Certified by ISO 9001 : 2015



## Department of Chemistry

Topic- Introduction to Polymer Chemistry

Subject – Polymer Chemistry (CH-363B)

Class – T.Y.B.Sc.

Mr. Mahesh S. Jangale  
Assistant Professor,  
M.Sc. NET



## Brief History

Polymers have been with us from the beginning of time; they form the very basis (building blocks) of life. Animals, plants — all classes of living organisms — are composed of polymers. However, it was not until the middle of the 20th century that we began to understand the true nature of polymers.



Mula Education Society's  
**Arts, Commerce and Science College**  
Sonai, Tal. Newasa, Dist. Ahmednagar - 414 105

Reaccredited with 'A' Grade by NAAC, Bangalore & Certified by ISO 9001 : 2015



## Brief History

Since the formation of the earth over 4 billion years ago, in its giant 'laboratory', elements like carbon, nitrogen, oxygen and hydrogen have been combined and formed complex molecules. The polymer named protein got synthesized in nature, they also appeared in their other natural forms like wood, cotton, cellulose, starch, etc.

## Brief History

In fifteenth century, a famous discoverer, **Christopher Columbus** reported a solid mass collected from the exudates of a tree (weeping wood) is **Rubber**.

The scientist **Joseph Priestly** reported that this solid could rub pencil marks from paper and hence named as **Rubber**.

The **Christian Schonbein**, a Swiss scientist discovered gun cotton a **nitrocellulose derivative** of a naturally occurring polymer cellulose, in the mid nineteenth century.



## Brief History

**John Wesley Hyatt** (in the U.S.) mixed pyroxin made from cotton (a natural polymer) and nitric acid with camphor. The result was cellulose nitrate, which he **called celluloid**. Cellulose nitrate is derived from cellulose, a natural polymer.

The **Dr. Leo Hendrick Baekeland** developed phenol-formaldehyde plastics (phenolics), which is named as **Bakelite**.

In 1912 **Jacques Brandenburger** introduced a famous transparent material, **Cellophane**.



## Today's Age is the Polymer Age

The synthetic polymer development made impact on our life. From polymer fancy decoration articles, textiles, building material, packaging materials are made with wide range of attractive choices.

The polymer become so much part of our society.

The polymer having high strength, light weight, good flexibility, special electrical properties, resistance to chemicals, amenability for quick and mass production and for fabrication into complex shapes in wide variety of colors. These properties make them very useful.



## Today's Age is the Polymer Age

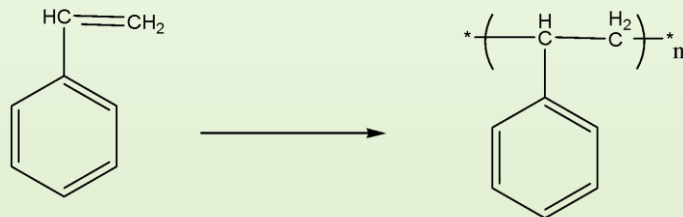
Polymers can be converted into strong solid articles, flexible rubber like masses, soft and resilient foams, smooth and fine fibres, clean and clear glass like sheets, swollen, jelly like food material and so on.

They can be used to bond objects, seal joints fill cavities, bear loads in-fact anything from clothing the naked to powering a space vehicle to even replacing human organ so this age is called **polymer age**.

## Polymer definition

The word *polymer* is derived from classical Greek **poly** meaning "many" and **meres** meaning "parts." Thus a polymer is a large molecule (macromolecule) built up by the repetition of small chemical units.

For ex.



Styrene (Monomer)

Polystyrene (Polymer)

**A Polymer is giant molecule built up from large number of same type of small molecules (monomers) joined together through covalent bond.**



## Classification

Polymers can be classified different ways. The most obvious classification is based on the origin of the polymer, i.e., natural vs. synthetic. Other classification is based on the polymer structure, polymerization mechanism, preparative techniques, or thermal behavior.

- A. Natural and Synthetic Polymer**
- B. Organic and Inorganic Polymer**
- C. Thermoplastic and Thermosetting Polymer**
- D. Plastic, Fibre, Rubber, Resin**



## Classification

### A. Natural and Synthetic Polymer

Polymers may either be naturally occurring or purely synthetic.

**Natural Polymers :-** The Polymers isolated from natural materials are called natural polymers eg. Cotton silk, wool, rubber enzymes and proteins . Cellophane, cellulose rayon, leather etc. are chemical modification of natural polymers.

**Synthetic polymers :-** Polymers synthesized from low molecular weight compounds are called synthetic polymers. eg. Polyethylene, PVC, Nylon and Terylene.



## Classification

### B. Organic and Inorganic polymers

**Organic Polymers** : - A polymer whose backbone chain is essentially made of carbon atoms is called as organic polymer. The majority of synthetic polymers is organic eg. Polyethylene, Polystyrene, PVC, Polyepoxide, Polyamide etc.

**Inorganic polymers** :- The polymer whose backbone chain made up from other than carbon atom are called as Inorganic Polymers. Eg. Glass and Silicone rubber.



## Classification

### C. Thermoplastic and Thermosetting Polymers

**Thermoplastic Polymers :-** The polymers soften on heating and can be converted into any shape that they can retain on cooling (stiffen) and this process can be repeated several times is called as thermoplastics. Eg. PVC, Nylon etc.

**Thermosetting Polymers :-** The polymers on heating undergo some chemical change and become infusible and insoluble mass are called thermosetting polymers.

## Classification

### **D. Plastics, Elastomers, Fibres and Liquid Resins**

Depending on its ultimate form and use, a polymer can be classified as,

**Plastics** :- Polymers on applications of heat and pressure, shaped into hard and tough utility articles are called as Plastics. Eg. PVC Polymethyl methacrylate, Polystyrene etc.

## Classification

**Elastomers** :- When Polymers vulcanized into rubbery products exhibiting good strength and good elongation property are called as Elastomers. eg. natural rubber, synthetic rubber, silicone rubber

**Fibres** :- When drawn into filament – like material whose length is at least 100 times its diameter are called as fibres. Eg. Nylon, Terylene etc.

**Resin** :- Polymers used as adhesives, potting compounds, sealants, etc., in a liquid form are called as liquid resins. Eg. Epoxy adhesives, polysulphide sealants, etc.



Mula Education Society's  
**Arts, Commerce and Science College**  
Sonai, Tal. Newasa, Dist. Ahmednagar - 414 105

Reaccredited with 'A' Grade by NAAC, Bangalore & Certified by ISO 9001 : 2015



# Thank you