POLYMERS

Very large molecules having high molecular mass.
(10^3 – 10^7u)

Classification

Based on Source

Natural Polymers: Found in plants and animals.
Examples: Proteins, Cellulose.

Semi-Synthetic Polymers:
These are Cellulose Derivative.
Examples: Cellulose Nitrate.

Synthetic Polymer: Man-made polymer.
Examples: Polythene, Buna-S, Nylon-6,6.

Based on Structure

Linear: Long and Straight chains
Examples: Fibres and Plastics.

Branched: Linear chains with branches.
Examples: Amylopectin, glycogen.

Cross linked or Network Polymer:
Strong covalent bonds between various linear polymer chains.
Examples: Bakelite, Melamine.

Based on Polymerization

Addition Polymer: Repeated Addition of Monomers containing Double or Triple bond.

Homopolymer: Formed by polymerisation of Single monomeric species E.g. Polythene

Copolymer: If Two Different Monomers. are used, then it is known as copolymers.

Condensation Polymer: Repeated Condensation between two differnt bi-functional or Tri-functional monomers forms condensation polymer.
Examples: Terylene, Nylon 6

Biodegradable Polymers

Non-resistant to environmental degradation and have functional group similar to functional group of Biopolymers.

Examples: Poly-β-hydroxy butyrate-co-β-hydroxy valerate (PHBV).
Nylon-2-Nylon-6.

Types of Rubber

(i) Natural Rubber: Linear polymer of Isoprene (2-mettiyl-1, 3-butadiene)

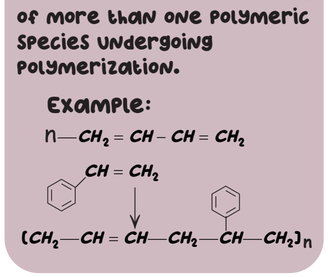
Vulcanisoltion of rubber:
Raw RUBBER + SULPHUR
$\xrightarrow[373-415\ K]{\Delta}$
Stiffened rubber

Synthetic Rubber:
Homopolymer of 1, 3-butadiene Derivative.
Example: Buna-S, Buna-N

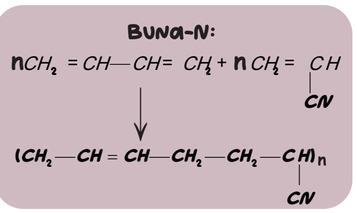
Neoprene

Copolymerization: A mixture of more than one polymeric species undergoing polymerization.

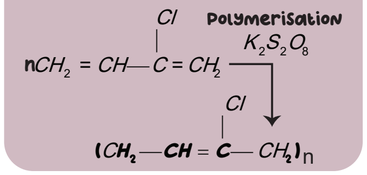
Example:



Buna-N:



Neoprene:



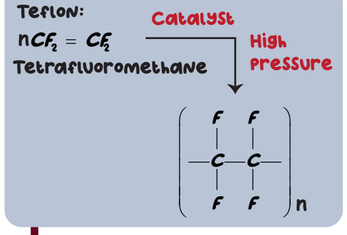
Molecular mass of polymers

- Expressed as an average
- Determined By physical and chemical method.

Polymers of Commercial Importance

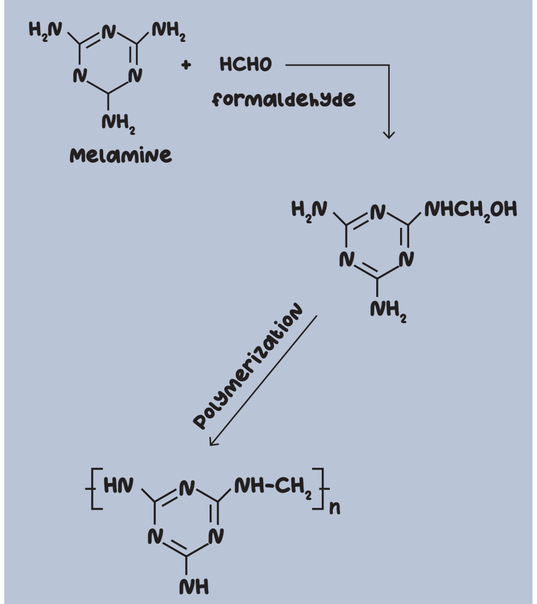
(1) Polypropene used for Manufacturing of Ropes,and Toys.
(2) Baklite is use for Making Electrical Switches

Teflon:



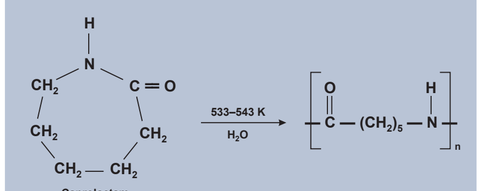
Tetrafluoromethane

Melamine - Formaldehyde Polymer



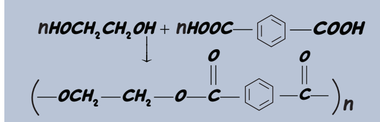
Preparation

Nylon-6: Homopolymer of Caprolactan



Polyesters

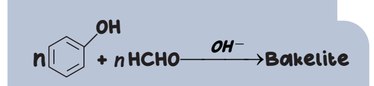
Terylene (dacron)



Terylene

Thermosetting Resin

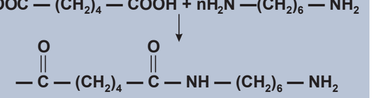
Bakelite: Phenol Formaldehyde resin.



Phenol

Polyamides

Nylon-6,6: Copolymer of Adipic Acid and Hexamethylene Diammine.



Nylon-6,6

Elastomer:
Rubber Like Solids with Elastic properties.
Examples: Buna-S, Buna-N

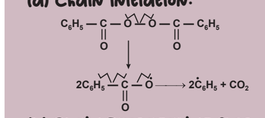
Thermoplastic Polymer:
Linear or Slightly branched chain capable of repeated softening on heating.
Examples: Polythene, Polystyrene.

Fibers:
Thread forming Solids.
Examples: Nylone 6,6, Terylene.

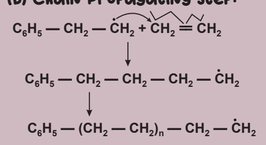
Thermosetting Polymer:
Cross linked or heavily branched molecules which on excessive heating cross link in mould and become infusible.
Examples: Bakelite

Types of Polymerization Reaction

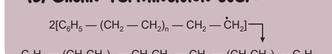
Addition/Chain Growth: Governed by free Radical Mechanism.
Steps Involved:
(a) Chain Initiation:



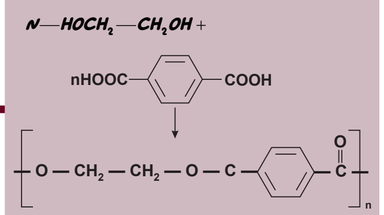
(b) Chain Propagating Step:



(c) Chain Termination Step:



Condensation Step Growth:
Involves Stepwise Intermolecular Condensation:



Terylene or Dacran