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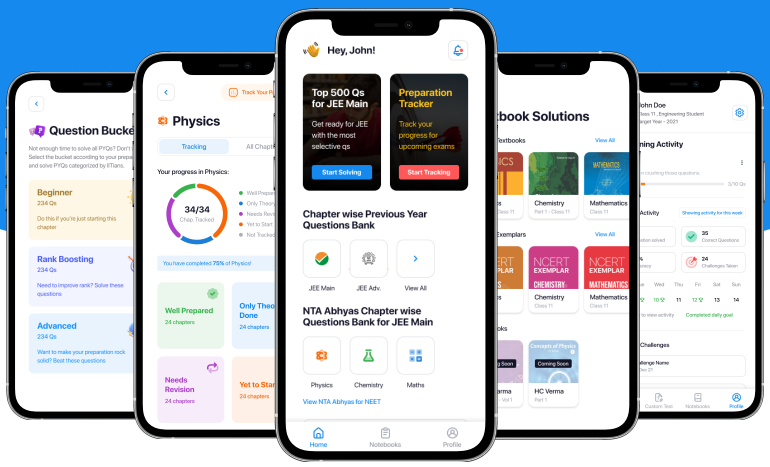

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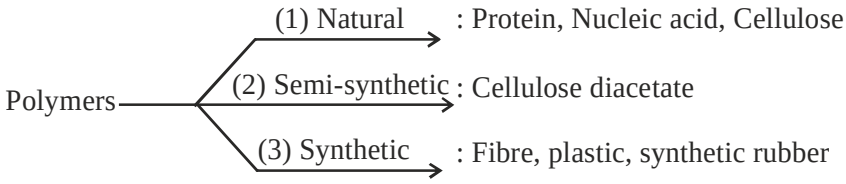
POLYMERS

POLYMERS

The small molecules that combines with each other to form a macromolecule is called monomer, The macromolecule formed is called polymer.

CLASSIFICATION OF POLYMERS :

(a) Based on source of availability :



(b) Based on mode of polymerisation :

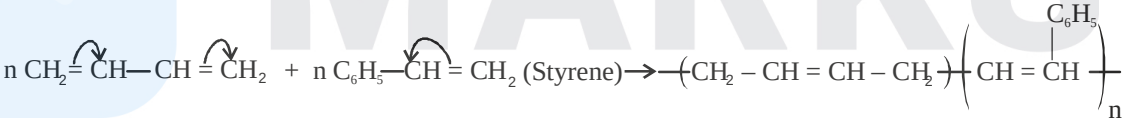
(1) Homo-polymer (2) Addition or Condensation.

Homopolymer and copolymer : Homopolymers one polymers having single type of monomers.

$$n\,CH_2 = CH_2 \longrightarrow (-CH_2 - CH_2-)_n$$

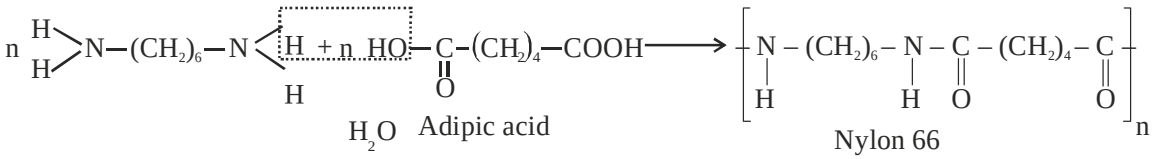
Polythene

- While the polymers of two or more than two types of monomers is called co-polymers.
  e.g.



(3) Addition Polymers : This polymers is formed by monomer molecules having double or triple bond.
e.g. Polythene.

(4) Condensation Polymers : This polymer is formed by condensation of monomer with simultaneous loss of small molecules like. H_2O, NH_3, alcohol etc.
e.g. Nylon 66.



(c) Classification of polymers on the basis of Molecular force:

(i) Elastomers (ii) Fibre (iii) Thermoplast (iv) Thermosetting

(1) Elastomers : Polymers are held by weakest force.

$\Rightarrow$ These weakest force causes stretching of the strected polymer to its normal size.

e.g. $\rightarrow$ valcanized rubber.

(2) Fibre : Has high tensile strength

$\Rightarrow$ Has stronger intermolecular forces like H-bond

$\Rightarrow$ Imparts crystalline nature, due to which it has sharp M.Pt. e.g. $\rightarrow$ Fibre

(3) Thermoplastics : Has intermediate force between elastomer and fibre

$\Rightarrow$ Has no cross-links. e.g. $\rightarrow$ Polyethylene, Polystyrene.

(4) Thermosetting : This is relatively low molecular mass polymers of semi-fluids which on heating in a mould becomes infusible hard mass.

$\Rightarrow$ This happen due to extensive cross linking.

$\Rightarrow$ Has three dimensional network of bonds. e.g. $\rightarrow$ Bakelite.

General Methods of Polymerisation :

1. Addition 2. Condensation

1. Addition :

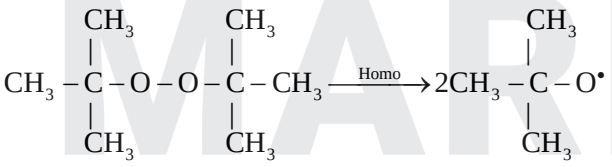
The monomers are unsaturated alkene, alkadiene or their derivatives.

$\Rightarrow$ The addition polymers can be classified into three types on the basis of its monomers.

1. Radical 2. Carbocation 3. Carbanion

- The addition polymerisation is also called as chain growth polymerisation, because it takes place through stages leading to increase in chain-length and the each stage produces relatively reactive intermediate which is used in next step.

(1) Free-Radical Addition Polymers : The free-radical polymers take place through initiator. Initiator generates radical. e.g.

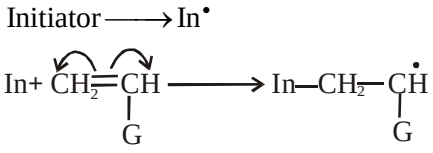


Initiator (In)

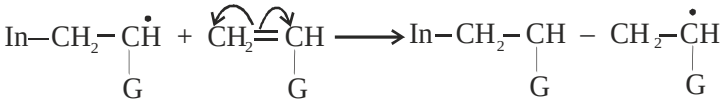
Vinyl Polymensation : Obtained from $CH_2=\underset{\underset{G}{|}}{CH}$

Its formation can be depicted by given mechanism

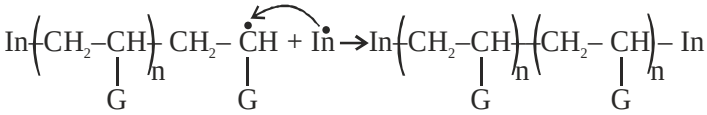
1st Step: Chain initiator step :



2nd Step: Chain Propagation :



3rd Step : Termination :

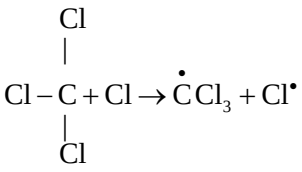


Concept of chain transfer agents :

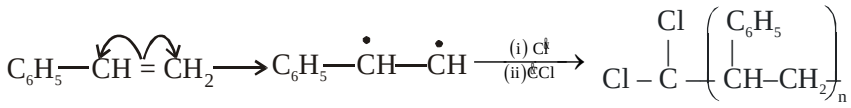
Some times some other compounds present may compete with the parent addition chain reactions and it initiates its non chain growth to simultaneously stop the normal polymerisation. Such reagents are called chain transfer agents and it includes CCl_4.

$\underset{\text{(Styrene)}}{C_6H_2-CH=CH_2}$, with normal initiator will form polystyrene but due to the presence of CCl_4 the different polymeric product is formed.

1st Step :



2nd Step :

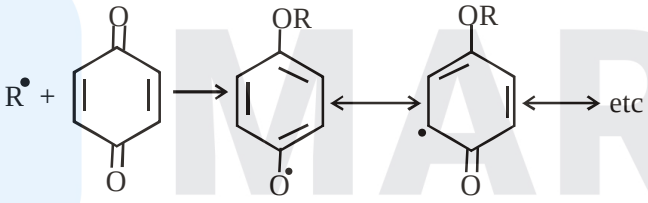


Chain Inhibitors :

If the chain transfer agent forms a radical which is highly unreactive, the reaction chain gets terminated. Such compounds inhibit the polymerisation and they are -

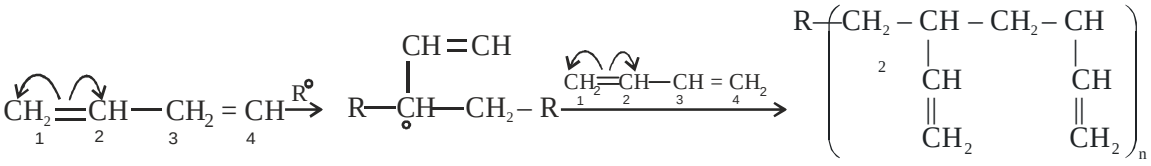
(a) Phenol (b) Some amines (c) Quinoline

If the chain transfer agent is, Banzoquinone,

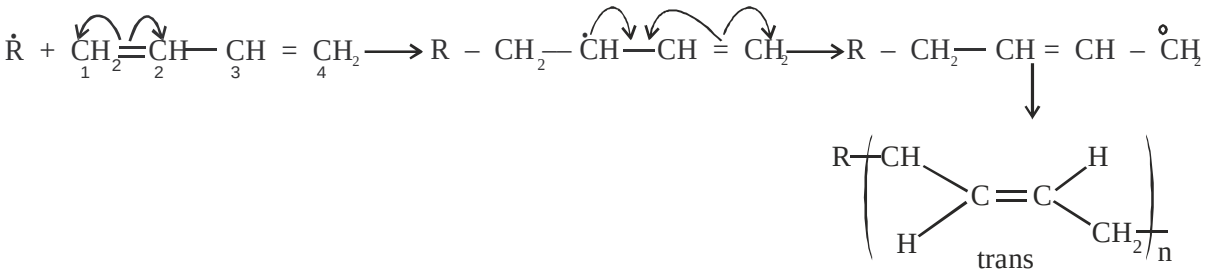


Conjugated dienes : (1) 1, 2 diene (2) 1, 4 diene

(1) 1, 2 Polymerisation :

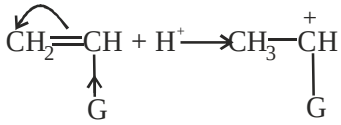


2. 1, 4 Polymers

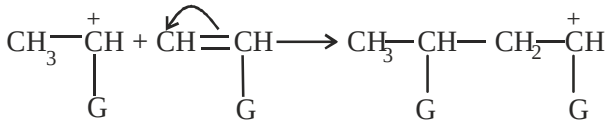


Cationic Addition Polymers :

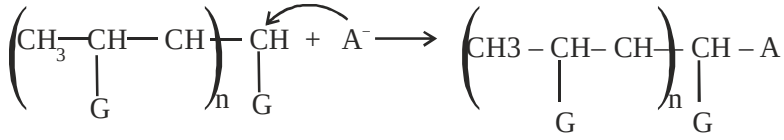
(a) Chain reaction :



(b) Chain Propagation :



(c) Chain termination : By Anions



SOME COMMERCIALLY IMPORTANT

S.No.	Name of Polymer	Structure	Monomer	Uses
1.	Polythene	$(CH_2 - CH_2)_n$	$CH_2 = CH_2$	As insulator, anticorrsoive, packing material, household and laboratory wares.
2.	Polyvinylchloride (PVC)	$\left(\begin{array}{c} Cl \\ \vert \\ CH_2 - CH \end{array}\right)_n$	$CH_2 = CHCl$	In manufacture of raincoats, hand bags, vinyl flooring and leather clothes.
3.	Polytetrafluoro ethylene (PTFE) or Teflon	$(CF_2 - CF_2)_n$	$CF_2 = CF_2$	As lubricant, insulator and making cooking wares.
4.	Neoprene	$\left(\begin{array}{c} CH_2 - C = CH - CH_2 \\ \vert \\ Cl \end{array}\right)_n$	$\begin{array}{c} CH_2 = C - CH = CH_2 \\ \vert \\ Cl \end{array}$	As insulator, making conveyor belts and printing rollers.

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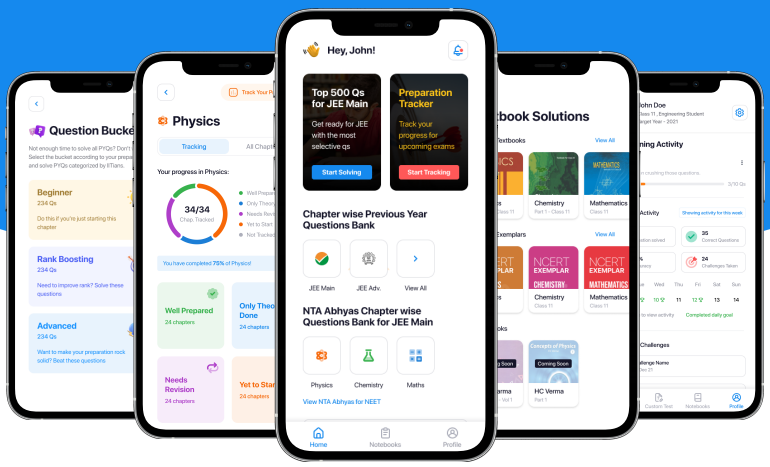

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