Addition polymerization

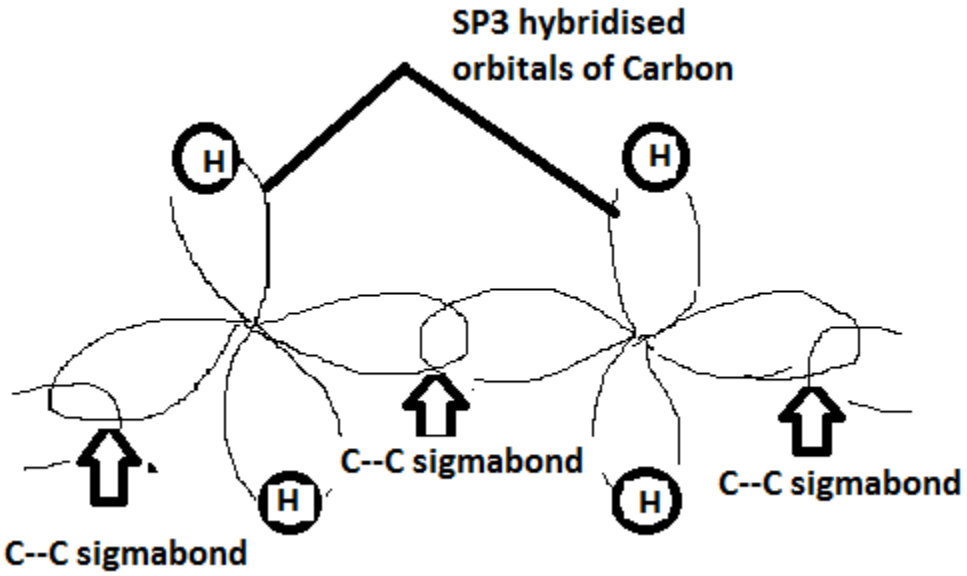
- The monomer must have least one multiple bond
- Radical initiator, Lewis acid or Lewis base catalyst are used
- It is an exothermic process
- It is a fast process
- Molecular wt is low
- Monomers add on to give macromolecules no other byproducts formed
- Generally, produce linear polymers
- Mostly thermoplastic is obtained by this process.

Condensation polymerization

- The monomers should have at least two identical or different functional groups
- Mineral acids or bases are used as catalyst
- It is an endothermic process
- It is slow process
- Molecular wt is high
- Monomer condense to give polymer with elimination of H2O NH3 HCl
- Generally, produces three dimensional polymer
- Mostly thermosetting plastic are obtained by this process

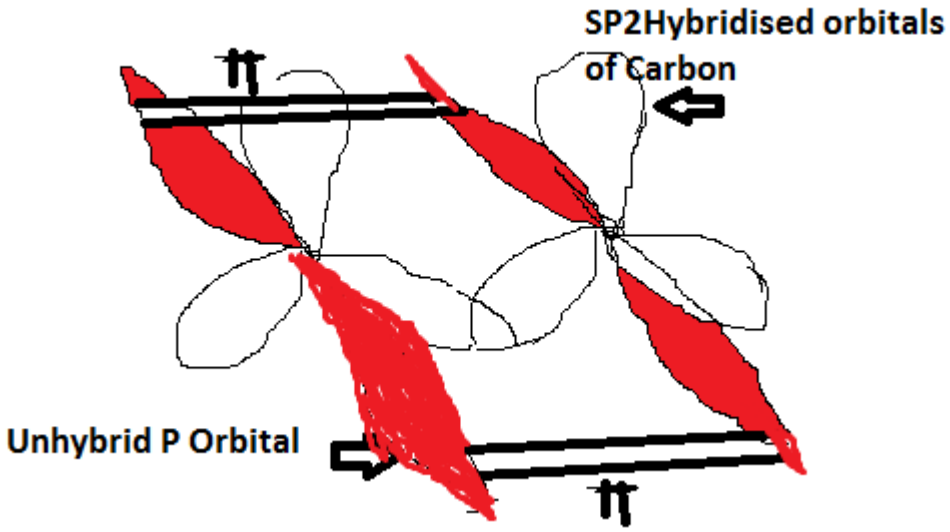
Conducting Polymer: -

Most polymeric materials are poor conductors of electricity because of non-availability of large no of free electrons required for conducting process.



Sigma bonded electrons have low mobility and do not contribute to electricity.

Presence of relatively free electrons is possible in a polymer chain if it has a system of conjugated (alternate) double bonds. In an electric field, conjugated pi electrons of a polymer get excited and hence can be transported through solid polymeric material. There is a formation of valence bands as well as conduction bands. e.g polyacetylene, polyanilines, polythiophene.



1)Intrinsically conducting polymers-: It is a polymer whose back bone or associated groups consist of delocalized electron pair or residual charge. Polyacetylene, polypyrrole, polythiophene.

2)Extrinsically conducting polymers.

It is the conductivity is due to presence of externally added ingredient in them they are of two types

a) Filled polymers-: It is resin filled with conducting elements such as carbon black or metal oxides. In which the polymer acts as binder to hold the

conducting elements. Along with conductivity these polymers are low in cost. Light in weight. Mechanically durable and strong.

b) Blended conducting polymers:-It is polymer obtained by blending conventional polymer with conducting polymer.

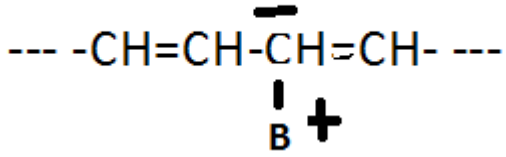
3) Doped conducting polymers

It is obtained by exposing the polymer to a charge transfer agent in the gas phase or solution phase. The conductivity of the intrinsically conducting polymer can be increased by creating either positive or negative charges on polymer

backbone by oxidation or reduction known as doping.

a) P- doping -: In this ICP is treated with a Lewis acid where oxidation process takes place positive charges on the polymer backbone are created I_2, Br_2, A_SF_5, naphthyl amine
$(C_2H_2)_n + 2FeCl_3 \rightarrow (C_2H_2)_n^+FeCl_4^- + FeCl_2$
$2(C_2H_2)_n + 3I_2 \quad 2(C_2H_2)_n^+I_3^-$
b) N-doping-: In this ICP is treated with a lewis base where reduction takes place and negative charges are created on the polymer backbone. Commonly N dopants are (Li) (Na) Calcium (Ca)

--- -CH=CH-CH=CH- ---+B (Lewis Base)



3) Coordination conducting polymer- It is a charge transfer complex containing polymer obtained by combining a metal atom with polydentate ligand.

Polymers in medicine and surgery

Biomaterials are materials that can be imparted in the body or used in diagnostic, surgical and therapeutic applications without causing adverse effects on blood or other tissues. Use of biomaterial made from polymers is increasing day by day.

Characteristics of biomedical polymer->

- Biocompatible
- Purity and reproducibility
- Sterilized with no alteration of properties
- Optimum physical and chemical properties.

- They should not destroy cellular elements of blood, enzymes and produce toxic or allergic reactions.
- Should not deplete electrolyte in body

Polyethylene	Disposable syringe
polypropylene	Heart walls blood filters
Polyvinyl chloride	Disposable syringe
Acrylic hydrogels	Grafting
PMMA	Contact lenses
Poly Alkyl sulfone	Membrane oxygenator