B.SC PART III PAPER ORGANIC

TOPIC:- Synthetic Polymer

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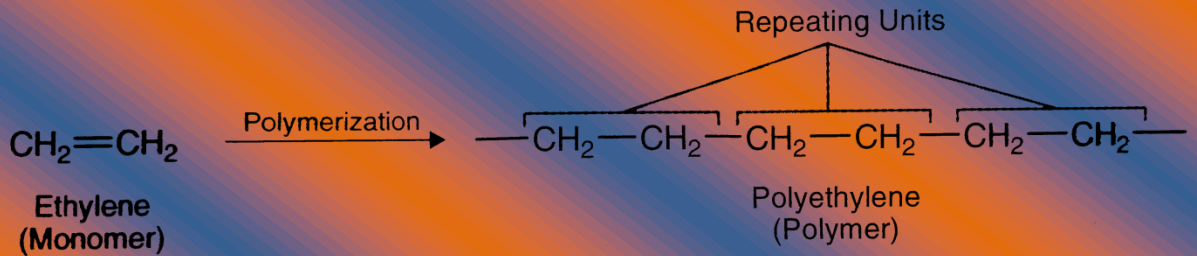
SYNTHETIC POLYMERS

Polymers are high molecular weight compounds whose structures are made up of a large number of simple repeating units. The repeating units are usually obtained from low molecular weight simple compounds referred to as monomers. The reaction by which monomers are converted into polymers is known as polymerization. The Formation of polyethylene from ethylene is an example of polymerization reaction.



Polymers which are synthesized from only one kind of monomer are called Homopolymers. Polymers which are prepared from more than one kind of monomers are called copolymers.

CLASSIFICATION OF POLYMERS

There are two main types of polymers:-

(1) Addition polymers
(2) Condensation polymers

(1) ADDITION POLYMERS (Chain-Growth Polymer):-

Addition polymers are formed by combination of alkene monomers to produce a single huge molecule only.

These reaction are catalyzed by peroxide or acids.The reaction require pressure of 1000 atmospheres at 200°C. Much lower temperatures and pressures can be used with so called **Ziegler Catalysts** which consists of a trialkyl aluminium and titanium tetrachloride in an inert solvent.

(1) Polyethylene (polythene)-

It is obtained by polymerizing ethylene. Polyethylene has been produced commercially since 1943. It is used in the manufacture of houseware such as buckets and dustbins, carpet backing, packaging materials, and cable insulation.

Monomer (ethylene) contains a double bond and the polymer does not. The electrons of the monomer π bond have moved and are used to link one monomer unit to another by σ bonds as indicated by extended lines in abbreviated polymer formula. The backbone of the polymer consists of the carbon atoms that originally formed the double bonds. Nothing is lost. The monomers simply add to each other.

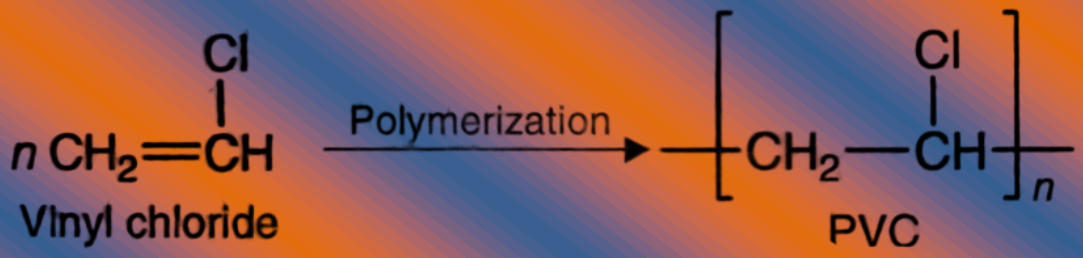
(2) Polypropylene-

It is obtained by polymerizing propylene. Polypropylene is used in the manufacture of houseware (pans, drinking glasses), medical equipment (can be sterilized), toys, electronic components, tubes, pipes, and fibres.

(3) Polyvinyl Chloride (PVC):-

It is obtained by polymerizing vinyl chloride.

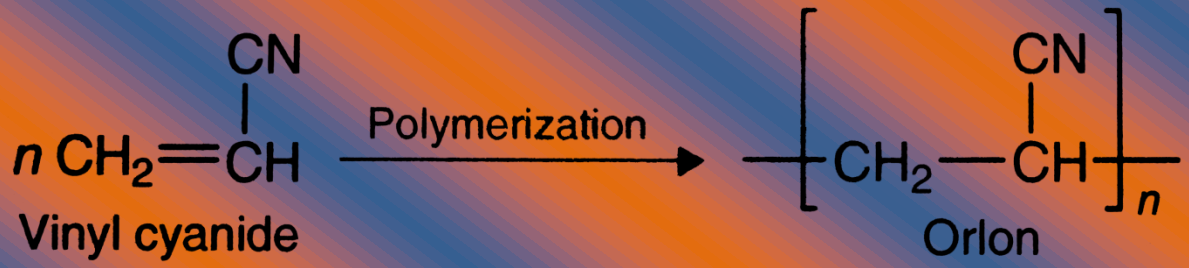
PVC is used in the manufacture of imitation leather, floor covering, corrugated roofing material, and gramophone records.



Vinyl chloride is obtained from acetylene by treatment with HCL in the presence of $Hgcl_2$.

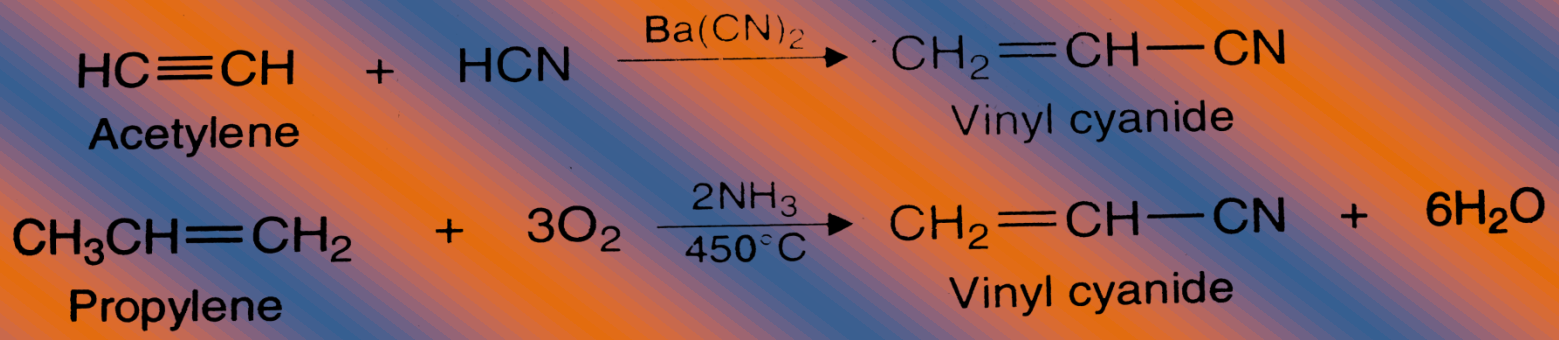
(4) Orlon:-

It is obtained by polymerizing vinyl cyanide (acrylonitrile). Orlon is used as a synthetic textile fiber in clothing and capeting.



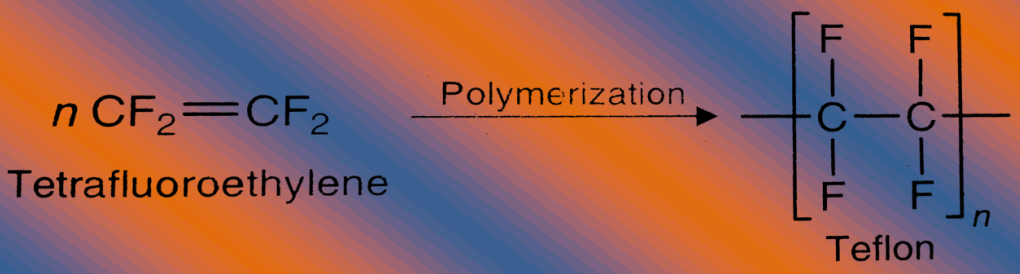
Vinyl cyanide can be prepared:-

(a) By treating acetylene with HCN in the presence of $Ba(CN)_2$;
(b) By catalytic oxidation of propylene in the presence of ammonia.

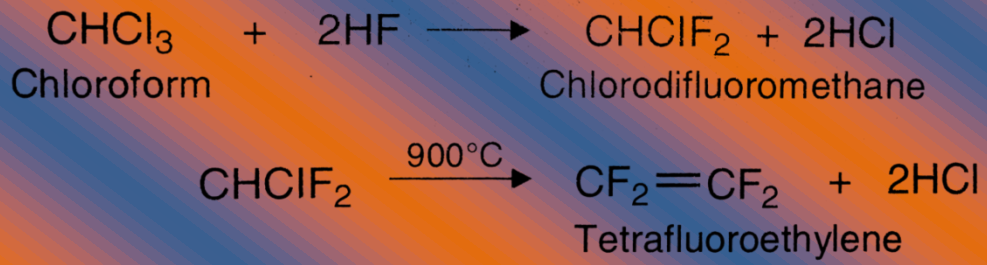


(5) Teflon (PTFE):-

It is obtained by polymerizing tetrafluoroethylene. Teflon is familiar because of its use as nonstick coating particularly for cooking utensils. Nonstick frying pans have Teflon coating. Because of its low chemical reactivity, excellent toughness, electrical and heat resistance, Teflon is used as insulation for electrical items and in the manufacture of gaskets and valves.



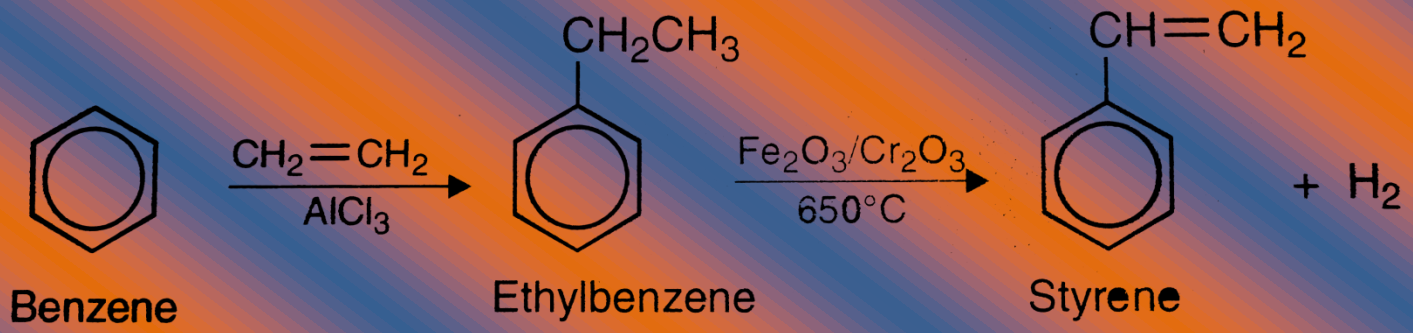
Tetrafluoroethylene is obtained from chloroform as follows:



(6) Polystyrene:-

It is obtained by polymerizing styrene. Polystyrene is used in the manufacture of food containers, cosmetic bottles, television cabinets, plastic cups, packaging, and toys.

Styrene is prepared from benzene as follows:




Thank You