Polymers and its applications

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HISTORY:-

Polymers were discovered long before anyone understood what they were. It wasn’t until 1920 that German chemist Hermann Staudinger (1881-1965) made his macromolecular hypothesis, suggesting that polymers are actually giant molecules formed by the permanent attachment of countless smaller molecules.

INTRODUCTION:-

A polymer is a large “ MOLECULE” composed of repeating structural typically connected by chemical bonds like covalent bonds. Polymers are composed of

very high molecular masses formed by the combination of large number of simple molecules.

GEOMETRY:-

Polymers (or macromolecules) are very large molecules made up of smaller units called monomers or repeating units, covalently bonded together.

1. Monomers / Repeat Units
2. The identity of the monomer residues (repeat units) comprising a polymer is its first and most important attribute.
3. Microstructure:-
4. The microstructure of a polymer (sometimes called configuration) relates to the physical arrangement of monomer (which I have explained above) residues along the backbone of the chain.

CLASSIFICATION OF POLYMERS:-

On the basis of structure-

1. LINEAR POLYMERS
2. BRANCHED POLYMERS
3. CROSS-LINKED POLYMERS

On the basis of molecular forces

- Elastomers
- Fibers
- Thermoplastics
- Thermosetting polymers

1. Thermoplasts:

2. These are the polymers which can be easily softened repeatedly when heated and hardened when cooled with little change in their properties. When heated due to the absence of cross links, they become free to move and and can be moulded into any desired shapes.

    - EXAMPLES- Polyvinyl Chloride (PVC) and Polystyrene and Polymethyl methacrylate

3. Thermosets:-
4. These are the polymers which undergo permanent change on heating and can not be remoulded into our desired shape. On heating their cross links get highly linked with each other and becomes hard and infusible.

    - EXAMPLES-Bakelite, formaldehyde etc.

PROPERTIES:-

1. Tensile strength
2. Higher tensile strength holds a greater weight before snapping. Tensile strength increases with polymer chain length and crosslinking of polymer chains.

3. Melting point
4. The term melting point when applied to polymers, suggests not a solid-liquid phase transition but a transition from a crystalline or semi-crystalline phase to a solid amorphous phase.

5. Boiling point

6. The boiling point of a polymeric material is strongly dependent on chain length. The polymers with a large degree of polymerization do not exhibit a boiling point because they are decomposed before reaching their respective theoretical boiling point.

FUN FACT: – The polymer inside disposable diapers is called sodium polyacrylate. It can instantly absorb about 800 times its mass in water.

APPLICATIONS OF POLYMERS:-

Molecular science has developed enormously in recent eras. Molecular science has a major role in our lives. It has become a necessity in our daily routines we shall talk now about the basic applications of polymers without which life wasn't that easy. We are going to discuss some of the main polymers used in our lives.

RUBBER:-

HISTORY OF RUBBER: – Natural rubber, obtained from the sap of the hevea tree. Rubber was named by the chemist Joseph Priestley who found that a piece of solidified latex gum was good for rubbing out pencil marks on paper.

TWO TYPES OF RUBBER ARE THERE:-

- NATURAL RUBBER
- VULCANIZED RUBBER (SYNTHETIC RUBBER)

NATURAL RUBBER:-

Natural rubber is a polymer of isoprene (2-methyl-1, 3-butadiene), with a joined network structure. There is no cross links between the polymer chains. It is not hard and tough. It becomes sticky and soft when heated. It can be easily deformed but regains its original shape after the stress is released. It

involves a addition reaction in which one double bond in isoprene open to form a new bond with next unit forming a large chain.

VULCANIZED RUBBER:-.

A chemical reaction of sulfur (or other vulcanizing agent) with rubber or plastic to cause cross-linking of the polymer chains; it increases strength and resiliency of the polymer chemically; the process involves the formation of cross-linkages between the polymer chains of the rubber's molecules. It was invented by Charles Goodyear in 1839. The formation of cross links formed at the time of vulcanization at the reactive sites makes rubber hard, tough with greater tensile strength. It has very high elasticity, resistance to oxidation and organic solvents. The sulphur bridge in this figure prevents the slip of the chains and rubber can be stretched to a limited extent and when tension is removed the chains try to coil up regain its original shape.

OTHER TYPES OF RUBBER:-

- NEOPRENE RUBBER:-
- USES: – used as insulator, making conveyor belts, printer roller belts are also made from it.
- SBR (Styrene Butadiene Rubber):-Known as BUNA-S
- USES: – it is used for making automobile tyres and footwears.
- NITRILE RUBBER:- Recognized as BUNA-N
- USES:-it is used for making oil seals, manufacture of hoses and tank linkings.

REACTIONS INVOLVING IN THERE FORMATIONS:-

- PLASTICS OR POLYHALO-OLEFINS:-

- A very useful but common commodity of our life. But nowadays it has become a serious problem due to its problem of degradation which is a process which is a time consuming process. These are called polyhalo-olefins because they are derived from halogen substituted olefins.
- POLYVINYLCHLORIDE-(PVC):-
- Its monomer is unit is vinyl chloride. it is prepared by heating vinyl chloride in an inert solvent in the presence of peroxides (eg. dibenzoyl peroxides). It isa hard horny material. It is a thermoplastic polymer and its plasticity can be increased . Fig 15. 0

USES:-

1. It is used in manufacturing of rain coats, hand bags, curtain clothes, toys
2. Artificial flooring.
3. As a good insulating material in wires and other electrical goods.
4. For making gramophone records.

- TEFLON:-(POLYTETRAFLOUROETHYLENE):
- Tough material resistant to heat and chemical actions such as acids and bases. It is an addition polymer of tetraflouroethylene. It is bad conductor of heat.

USES:

1. It is used as a material resistant to heat and chemical attack in household works.
2. For coating articles and cookware to make them non-sticky as non stick utensils

3. For making gaskets, pump packaging, valve, seals, non-lubricated bearings, etc.

- POLYESTERS:-
- Fibers represent a very important application of polymeric materials, including many examples from the categories of plastics and elastomers. It involves ester linkages

TYPES OF POLYESTERS(FIBRES):-

- TERYLINE:-It is a polymer of ethylene glycol and terephthalic acid. Also known as Dacron.
- USES:-

1. For making cloth by mixing with cotton.
2. For making magnetic recording tapes.

- NYLON66:-Monomers are hexamethylenediamine and adipic acid.
- USES:-

1. Used for making bristles of brushes.
2. In textiles and also for making sheets. It is blended with wool to make socks and sweaters.

- NYLON 6:- its monomer is caprolactum made up of cyclohexane.
- USES:-

It is used in the manufacture of tyre , cords, fabrics, and ropes.

CONCLUSION:-

We have tried to give a brief information on polymers . Polymers are everywhere around us and we tried to show a glimpse of polymers

applications which are commonly used in our lives like plastics nylon and day to day used commodities.

MATERIAL AND FIGURE REFRENCES:-

- http://www. plastiquarian. com/top. htm
- http://www. csua. berkely. edu/~ranga/school/me223/nylon. gif
- http://www. openlearn. open. ac. uk/course/view. php? id= 2937
- http://www. britanica. com/EBchecked/topic/468696/polymer
- http://www. polymertalk. com/history_of_polymers. php
- http://en. wikipedia. org/wiki/silicone
- http://en. wikipedia. org/wiki/branching_%28chemistry%29
- http://www. polymertalk. com/classification_of_polymers. php
- http://docs. google. com/viewer? a= v&q= cache: Wbn5XOJDt: www. cmse. ed. ac. uk/MSE3/Topics/MSE3-polymers. pdf+intoduction+of+polymers&hl= en&gl= in&sig= AHIEtbQ22RNSIoIyoXUP9HtDd-nakz-w
- http://www. cem. msu. edu/~reusch/VirtualText/polymers. htm