

POLYMER SCIENCE

Prepared By →
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1. CONCEPT OF MONOMERS & POLYMERS

1. Monomer Concept, types of monomer, Functionality importance, Functionality of Carboxylic acids, Alcohols, Amines, Isocyanates, Amino acids, Hydroxy acids.
2. Polymer, Polymer concept.
3. Classification of Polymers.
 - (i) Natural polymer & Synthetic polymer
 - (ii) Organic Polymer & Inorganic polymer.
 - (iii) Commodity polymer & Engineering Polymer.
 - (iv) Thermoplastic & Thermosetting polymer.
 - (v) Depending on its ultimate form & use, a polymer can be classified as :-
Plastic, Elastomer, Fibre & Liquid resin.
 - (vi) Classification on the basis of structure
Linear polymer, branched polymer, crosslinked Polymer.
4. Copolymer
Types of Co-polymers
 - (i) Alternate co-polymer
 - (ii) Random co-polymer
 - (iii) Block-co-polymer
 - (iv) Graft co-polymer.

2. CHEMISTRY OF POLYMERS

1. Polymerization Techniques
 - (i) Bulk Polymerisation
 - (ii) Solution Polymerisation
 - (iii) Suspension Polymerisation
 - (iv) Emulsion Polymerisation

2. Roles of

- (i) Initiators,
- (ii) Retarders
- (iii) Chain transfer agents
- (iv) Accelerators.

3. Isomerism Concept,

Types of Isomerism

- (i) Optical Isomerism
- (ii) Geometric Isomerism
 - (a) Isotactic
 - (b) Syndiotactic
 - (c) Atactic or Heterotactic

3. MOLECULAR WEIGHT

1. Molecular Weight

- (i) Concept of average molecular weight
- (ii) Concept of Number average molecular weight
- (iii) Concept of Weight average molecular weight.

2. Molecular weight & Degree of Polymerization.

3. Polydispersity & Molecular weight distribution.

4. Effects of molecular weight on polymer processing.

5. Molecular Weight Determination Techniques.

- (i) Viscometry
- (ii) Ultracentrifugation
- (iii) Cryoscopy
- (iv) End group analysis
- (v) Ebulliometry
- (vi) Osmometry.

4. PROPERTIES OF POLYMERS

1. Amorphous Polymer
2. Crystallinity
3. Degree of Crystallinity
4. Melting Temperature
5. Glass transition Temperature
6. Relation between glass transition temperature & molecular weight.
7. Relation between glass transition temperature & melting point.
8. Degradation of Polymers.
 - (i) Types of degradation
 - (ii) ~~Pre~~ Prevention of degradation.

5. CHARACTERIZATION OF POLYMERS

1. Techniques of characterization.

- (i) Ultra-violet & visible spectroscopy
- (ii) Infra-Red Spectroscopy
- (iii) Nuclear Magnetic Resonance Spectroscopy
- (iv) DSC
- (v) TGA
- (vi) TMA

LIST OF EXPERIMENTS

1. Identify the given plastic material by flame test.
(PE/PP, PVC/PVA, PS/SAN, PE/UF, MF)
2. Preparation of Phenol formaldehyde resin.
3. Preparation of Urea formaldehyde resin.
4. Preparation of Melamine formaldehyde resin.
5. Determination of Density of polymers.
6. Determination of flash point of organic compounds.
7. Determine the melting point & degradation temperature of given polymer by using melting point apparatus.

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