

**GROUP - (C) ELECTIVE PAPER
PAPER IV. POLYMERS**

M.M. - 75

| Units | Topics |
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| I | Basics: Importance of polymers. Basic concepts: Monomers, repeat units, degree of polymerization. Linear, branched and network polymers. Classification of polymers. Polymerization: condensation, addition, radical chain-ionic and coordination and co-polymerization. Polymerization conditions and polymer reactions. Polymerization in homogeneous and heterogeneous systems. |
| II | Polymer Characterization: Polydispersion - average molecular weight concept. Number, weight and viscosity average molecular weight. Polydispersity and molecular weight distribution. The practical significance of molecular weight. Measurement of molecular weights. End-group, viscosity, light scattering, osmotic and ultracentrifugation methods. Analysis and testing of polymers-chemical analysis polymers, spectroscopic methods, X-ray diffraction study. Microscopy. Thermal analysis and physical testing-tensile strength. Fatigue, impact. Tear resistance. Hardness and abrasion resistance. |
| III | Structure and Properties: Morphology and order in crystalline polymers - configurations of polymer chains. Crystal structures of polymers. Morphology of crystalline polymers, strain induced morphology, crystallization and melting. Polymer structure and physical properties-crystalline melting point T_m -melting points of homogeneous series, effect of chain flexibility and other steric factors, entropy and heat of fusion. The glass transition temperature, T_g -Relationship between T_m and T_g , effects of molecular weight, diluents, chemical structure, chain topology, branching and cross linking. Property requirements and polymer utilization. |
| IV | Polymer Processing: Plastics, elastomers and fibres. Compounding. Processing techniques: Calendering, die casting, rotational casting, film casting, injection moulding, blow moulding, extrusion moulding, thermoforming, foaming, reinforcing and fibre spinning. |
| V | Properties of Commercial Polymers: Polyethylene, polyvinyl chloride, polyamides, polyesters, phenolic resins, epoxy resins and silicone polymers. Functional polymers - Fire retarding polymers and electrically conducting polymers. Biomedical polymers - contact lens, dental polymers, artificial heart, kidney, skin and blood cells. |