

Polymer Chemistry

UNIT 1 : INTRODUCTION TO POLYMERS :

Importance of polymers : basic concept-monomers and polymers-definition. Classification of polymers on the basis of microstructures, macrostructures and applications (thermosetting and thermoplastics) Distinction among plastics, elastomers and fibers. Homo and heteropolymers. Copolymers. Chemistry of polymerization- chain polymerization, free radical, ionic, coordination step polymerization
Polyaddition and polycondensation- miscellaneous ring-opening & group transfer polymerization. (15Hrs)

UNIT 2 : PHYSICAL PROPERTIES AND REACTIONS OF POLYMERS

Properties : Glass transition temperature (T_g) – Definition – Factors affecting T_g-relationships between T_g and molecular weight and melting point. Importance of T_g. Molecular weight of polymers: number average, weight average, sedimentation and viscosity average molecular weights. Molecular weights and degree of polymerization. Reactions : hydrolysis - hydrogenation – addition – substitutions-cross-linking vulcanization and cyclisations reaction. Polymer degradation. Basic idea of thermal, photo and oxidative degradation of polymers

UNIT 3 : POLYMERIZATION TECHNIQUES AND PROCESSING

Polymerisation techniques : Bulk, solution, suspension, emulsion, melt condensation and interfacial polycondensation polymerizations. Polymer processing: Calendering – die casting, rotational casting –compression. Injection moulding. (15Hrs)

UNIT 4 : CHEMISTRY OF COMMERCIAL POLYMERS

General methods of preparation, properties and uses of the following
Polymers: Teflon, polymethylmethacrylate. Polyethylene, polystyrene, PAN, polyesters, polycarbonates, polyamides, (Kevlar), polyurethanes, PVC, epoxy resins, rubber – styrene and neoprene rubbers, Phenol – formaldehydes and urea-formaldehyde resins (15Hrs)

UNIT 5 : ADVANCES IN POLYMERS

Biopolymers-biomaterials. Polymers in medical field. High temperature and fire-resistant polymers. Silicones. Conducting polymers-carbon Fibers. (basic idea only). (15Hrs)

TEXT BOOK :

Billmeyer F.W., Text book of polymer science, Jr. John Wiley and Sons, 1984.

Books for Reference :

1. Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi, 1978.
2. Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.
3. Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, anmol Publications Private Ltd., New Delhi, 1989.