

M.Sc. Semester -IV
Physical Chemistry
CHNN-703(P)
Paper-III

Unit:-1; Structure of Polymers

25% (15 Hours)

Chemical structure and properties of polymers: Mechanical properties, Thermal stability, flammability and flame resistance, chemical resistance, degradability, electrical conductivity, Optical properties.

Copolymerization: Nomenclature of Co-Polymers with examples (Unspecified, Statistical, Alternate, Ideal, Random, Block and Graft) Kinetics of free Radical copolymerization, Binary co-polymerization equation, Composition of copolymers, Reactivity Ratios, Q-e scheme. Polymer blends, some common copolymers (Ethylene copolymers, styrene copolymers, vinyl chloride copolymers)

Unit:-2: Synthesis of Polymers and Molecular Weight determination

25% (15 Hours)

Methods of Synthesis: Bulk polymerization, precipitation, Emulsion polymerization, Suspension polymerization, Interfacial polymerization,

-Methods for determination of average molecular weight of polymer: Colligative Property measurement, Light scattering methods, dilute solution viscometry, ultra-centrifugation, mass spectrometry, refractive index measurements.

-Weight Distribution Methods: Gel permeation chromatography, fractional solution, fractional precipitation, gradient elution, TLC.

Unit :- 3; Polymer Morphology and Processing

25% (15 Hours)

Crystallinity in polymer: Degree of crystallinity, determination of crystallinity, morphology of crystalline polymer (Lamellae, Spherulites, Helix)

-Rheology of polymers: Hook's equation, Newton equation, Maxwell, Voigt model, Burger Model, Deformation behaviour of materials, relaxation and retardation.

-Polymer processing: Compounding, Casting, Moulding, Foaming, Reinforcing, Fibre spinning,

Unit :- 4; Characterisation, Analysis and Testing of Polymers

25% (15 Hours)

Chemical Analysis, -Spectroscopic Analysis (IR, Raman, NMR, ESR, UV visible, fluorescence), -X-Ray Diffraction Analysis, -Thermal Analysis (TGA, TMA, DSC, DTA), -Physical Testing (Mechanical Properties, Thermal Properties, Optical properties, Electrical Properties)

Books:

1. Polymer chemistry: An introduction By Malcom P. Stevens, Indian edition, 3rd edition, oxford university press, London, 2011
2. Introductory polymer chemistry, G.S. Mishra, New age international LTD. Publishers, 2008
3. Textbook of polymer science, Fred W. Bill Meyer, a Wiley inter cience, Canada, New Delhi, 1984
4. Advanced polymer chemistry, Manas Chandra, Marcell Dekker, New York, 2000
5. Speciality polymers, R.W. Dyson, Blackie Academic and professional, London, 1998
6. Polymer science, V.R. Gawarikar, N.S. Viswanathan and J. Sreedhar, Wiley Eastern
7. Physics and chemistry of polymers, J.M.G. Cowe, Blackie Academic and professional
8. Functional monomers and polymers, K. Takemotto, Ontabritte, Introduction Of polymers, R.J. Yuan and P.A .Lovell, 2nd edition, nelso thrones LTD, 2002.