

PPE3I001 PHYSICAL CHEMISTRY OF POLYMERS

Module-I

Potential energy and conformational energy of molecules - Staggered and eclipsed states - conformations and configurations, isomeric states and isomerism in polymers - Tacticity, stereoisomerism, geometric isomerism - Unperturbed and Gaussian chains - Random coils and average end to end distance - Freely jointed and freely rotating chain models - Random flight analysis.

Module II

Thermodynamics - First and second law of Thermodynamics, Carnot cycle - Entropy and enthalpy - Energy driven and entropy driven elasticity - Thermoelasticity - Thermodynamic treatment of rubbers - entropic and energetic contributions to the elastic force in rubbers - Stastical mechanical theory.

Module III

Amorphous State - Transition temperatures - Glass transition temperature - Free volume, kinetic, and thermodynamic views of glass transition - Factors influencing glass transition temperature.

Crystalline State - Crystal systems, unit cells, primitive cell, Bravais lattices, polymorphism - Polymer single crystals, lamellae, spherulites, supermolecular structures, fringed micelle model - Degree of crystallinity, factors affecting crystallinity - X-ray diffraction.

Module IV

Chain orientation - Concept of chain orientation - orientation in amorphous and crystalline polymers - Uniaxial and biaxial orientation practical significance - Orientation processes - fibre spinning, blown film extrusion, solid state extrusion, profile extrusion - Properties of oriented polymers - Birefringence.

Text Books:

1. *S. Glasstone and D. Lewis, Elements of Physical Chemistry, Macmillan India Press, Madras, 1995.*
2. *Paul C. Painter and Michael M. Coleman, Fundamentals of Polymer Science, Technomic Publishing Co. Inc., Lancaster, USA, 1994.*

Reference:

1. *Ulf W. Gedde, Polymer Physics, Chapman & Hall, 1995.*