

M.Sc. SEMESTER-III
Physical Chemistry
CHNN-603(P)
Paper-III

Unit 1: Introduction to Polymer **25% (15 Hours)**

History, Classification on the Basis of Use and Chemical structure and geometrical structure, degree of Polymerization, Polydispersity, Average Molecular weight and molecular weight distribution, molecular Forces and chemical Bonding in Polymers.

Structure and Property relationship in fibres, elastomers and fibres

Naturally occurring polymers (Rubber, Asphaltenes, Shellac, Cellulose, Starch, Proteins, Nucleic acid, silk, wool)

Synthetic polymers (Buna S, Buna N , Thiokol, Rayon, Polyester Fibres, Inorganic and partially inorganic polymers)

Unit 2: Physical Properties of Polymers **25% (15 Hours)**

Force in polymers: Molecular forces and bonding in polymers (primary and secondary forces), intermolecular forces and physical properties (volatility and molecular weight, miscibility and solubility),

Polymer structure and physical property: Crystalline melting point, properties involving small deformations, properties involving large deformations,

Glass Transition Temperature: Definition of Glass Transition Temp. (state of Aggregate & state of phase), Secondary glass transition temp. (state of Aggregate & state of phase), Secondary glass transition temperature, Factors effecting T_g, Relation Between T_m & T_g, The WLF equation, Methods for determination of Glass Transition Temp.

Unit 3: Mechanism and Kinetics of polymerization **25% (15 Hours)**

Chain polymerization: Mechanism and Kinetics of Free Radical, Cationic & Anionic chain Polymerization,

Co-ordination polymerization: Ziegler –Natta Catalyst, Mechanism Of Ziegler-Natta polymerization (mono-metallic & Bio-metallic), early Kinetics models for Ziegler-Natta catalyst, Active centre.

Step Polymerization: Mechanism of step Polymerization, Polyfunctional step polymerization. Kinetics of Linear polycondensation polymerisation (Acid catalysed & Noncatalyzed) Ring opening Polymerisation: of cyclic ethers and cyclic amides.

Unit 4: Polymer Reactions

25% (15 Hours)

Polymer degradation: Types of degradation, photo degradation, Mechanical degradation, Thermal degradation, oxidation degradation, Hydrolytic degradation.

Polymer Reactions: Acidolysis, Amino lysis, Addition, Substitution, Crosslinking and cyclisation Reaction.

Polymer solution: criteria of polymer solubility, conformations in polymer chains in solution, Entropy and heat of mixing of polymer solutions, phase equilibrium in polymer solutions.

Books:

1. Polymer chemistry: An introduction by Malcom P. Stevens, Indian edition, Oxford university press, London, 2011.
2. Introductory polymer chemistry, G.S. Mishra, New Age international LTD. Publishers, 2008.
3. Text book of polymers 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, London1998.
6. Polymer science, V.R. Gawarikar, N.S. Viswanathan and J. Sreedhar, Wiley eastern.
7. Physical and Chemistry of Polymers J.M.G. Owe, Blackie Academic and professional.
8. Functional monomers and polymers, K. Takemotto, Ontabritte.