

## Polymer Chemistry & Applications

### Unit 1

Polymerization Processes - free radical polymerization, free radical living polymers, cationic and anionic polymerization. Chain & Step Growth Polymerization, Copolymerization, Polymerisation Techniques-bulk, solution, suspension, emulsion, melt and interfacial polymerization.

### Unit 2

Polymer Stereochemistry-tacticity, Molecular Weight-number average, weight average, sedimentation and viscosity average, Degree of Polymerization, Polydispersity, Glassy and Rubbery States, Glass transition, Polymer Characterization- molecular weight determination, thermal analysis of polymers- TG,DTG, DTA,DSC, DMTA.

### Unit 3

Polymer Solutions - Flory-Huggins equation, chain dimension, chain stiffness, end-to-end distance, conformation-random coil, Solvation and Swelling- Flory-Reiner equation, Determination of degree of cross linking and molecular weight between cross links. Bio-polymers, Enzyme mechanism, Active Site, Transition State, Catalysis, Lock and Key mechanism, Enzyme kinetics, Michaelis-Menten Equation, Inhibition.

### Unit 4

Molecularly Imprinted Polymers (MIP), Different approaches to MIP - covalent, non-covalent, semicovalent, stoichiometric non-covalent, Flow chart of molecular imprinting, Evaluation of imprinting efficiency.

### Unit 5

Applications of MIP-enzyme mimics, antibody mimics in immunoassays, molecular recognition in bio-sensors, molecularly imprinted membranes, molecularly imprinted catalysts. Challenges in MIP- molecular imprinting in water.

### Text books

1. V.R. Gowariker, N.V. Viswanathan, Jayadev Sreedhar, Polymer Science, 1<sup>st</sup> edition, New Age International Publishers.
2. George Odian, Principles of Polymerisation, 4<sup>th</sup> Edition, A John Wiley & Sons, Inc., Publication
3. J.A. Brydson, Polymer chemistry of Plastics and Rubbers, ILIFFE Books Ltd., London, 1966
4. Makoto Komiyama, Toshifumi Takeuchi, Takashi Mukawa, Hiroyuki Asanuma, Molecular Imprinting : From Fundamentals to Applications
5. Mingdi Yan, Olof Ramström, Molecularly Imprinted Materials: Science & Technology