



MANGALORE UNIVERSITY

DEPARTMENT OF CHEMISTRY

M.Sc. APPLIED CHEMISTRY

AC H 503: POLYMERS AND PHOTOCHEMISTRY

COURSE OUTCOME:

- This consists of two units of polymer chemistry and one unit of photochemistry topics. In the first two units, students get knowledge on highly useful materials, namely polymers.
- It deals with types, techniques of preparation and characterization of polymer materials. The applications of these materials in daily life, engineering and biomedical field have been emphasized.
- The students are exposed to the methods of polymer waste management which is essential to minimize plastic pollution
- Students learn various physical chemistry aspects of electronic spectroscopy and examples for different category of photochemical reactions.

UNIT- I:

[15 Hours]

Terminology and basic concepts: Monomers, Functionality, repeat units, degree of polymerization. General structure and naming of polymers.

Classification based on various considerations-source, preparation methods, thermal behavior, chain structure etc. Homopolymers and copolymers, Linear, branched and network polymers. **Techniques of polymerization:** Techniques of preparation of addition and condensation polymers. **Kinetics of polymerization:** Kinetics of addition and condensation polymerization. Kinetics of copolymerization, reactivity ratio and composition of copolymers.

Expressions for average molecular weights. Molecular weight distribution and Polydispersity. **Determination of molecular weight:** Osmometry, viscometry, ultracentrifugation and GPC methods

UNIT- II:

[15 Hours]

Stereochemistry of polymers: Geometric and optical isomerism in polymers. Structure, properties and preparation of stereoregular polymers.

Thermal Characterization: Glass Transition and melting-correlation with structure- Factors

affecting T_g and T_m . Techniques of thermal characterization: DSC, DTA, DTG and TGA techniques.

Structural features, properties and uses of commercial polymers: Vinylic and acrylic polymers, polyesters, polyamides, polyurethanes, polycarbonates, phenolic and amino resins, and regenerated cellulose.

Properties and uses of Specialty polymers- Composites, Conducting polymers and Biomedical polymers.

Polymer processing Techniques - Compounding- role of additives. Casting, moulding and spinning techniques. Plastic waste management techniques.

UNIT- III:

[15 Hours]

Photochemistry: Introduction to photochemistry. Determination of quantum yield- Actinometry. Frank-Condon principle and its implications in predicting shapes of absorption and emission spectra. Effect of solute solvent interactions on electronic spectra-spectral shifts. Physicochemical properties of electronically excited molecules-excited state dipole moments, acidity constants. Flash photolysis technique.

Photophysical pathways- Jablonski diagram, Radiative and Radiationless transitions, selection rules. Photochemical kinetics of unimolecular and bimolecular processes. Quenching-collisions in the gas phase and in solution (Stern-Volmer equation). Photoisomerization, photo Fries rearrangement and Norrish type cleavage reactions with specific examples.

REFERENCES:-

1. Text book of Polymers- F.W. Billmeyer (Wiley)
2. Contemporary Polymer Chemistry-H.R. Allcock and F.W. Lampe (Prentice Hall).
3. Polymer Science and Technology-J.R. Frird (Prentice Hall).
4. Polymer Science: V.R. Gowariker, N.V. Viswanathan & T. Sreedhar.
5. Principles of Polymer Science- P. Bahadur and N. V. Sastry (Narosa Publishers)
6. Fundamentals of Photochemistry – Rohatgi and Mukherje (New Age Bangalore), 2000.
7. Physical Chemistry, 5th Ed., - Atkins (ELBS) 1995.
8. Photochemistry-Gurdeep Raj, Goel Publishing House, 2nd Edition, 1991.
9. Photochemistry, Carol E Wayne & Richard P. Wayne, Oxford Univ Press, 1996