

## ICP 508: SYNTHESIS, CHARACTERIZATION AND APPLICATIONS OF POLYMERS AND COMPOSITES

### Course objectives

- To synthesize and characterize polymers and composites/nanocomposites
- To determine physical properties of polymers
- To study dye adsorption kinetics, isotherm and thermodynamics of polymers
- To evaluate water retention capacity of polymer
- To synthesize polymer nanofibers through electrospinning process and evaluate to their drug and pesticide release capacities

### List of Experiments (Any twelve experiments to be carried out)

1. Synthesis and characterization of polystyrene
2. Condensation polymerization of Nylon 6 6
3. Preparation of polysaccharide stabilized silver nanoparticles and their characterization
4. Synthesis and characterization of ZnO nanoparticle incorporated polysaccharides/polymers
5. Separation and purification of polymer quantitatively
6. Estimation of viscosity average molecular weight of polymers
7. Determination of glass transition temperature of a polymer by dilatometry
8. Determination of molecular weight of polymer by end group analysis
9. Preparation and characterization of phenol-formaldehyde resin
10. Kinetics of dye adsorption capacity of polymers
11. Dye adsorption isotherm studies of polymers
12. Thermodynamic studies of dye adsorption by polymers
13. Electrospun nanofibers of polysaccharides/polymers
14. Drug release capacities of composites of polysaccharides
15. Water absorption capacities of polymer gels and composites
16. Drug release studies of polymer nanocomposites
17. Comparison of thermal properties of polymers
18. Morphological analysis of polymers/nanocomposites

### Course outcome

- Synthesis of polymers/composites/nanocomposites and learning the physicochemical parameters
- Dye adsorption experiments using polymeric adsorbents
- Learning the electrospinning of polymers and use of thus produced fibers in drug and pesticide release

### References

1. Advanced Practical Physical Chemistry by J. B. Yadav, 5<sup>th</sup> edition, 1989.
2. Experimental Methods in Polymer Science by Toyochi Tanaka, 2000, Elsevier.
3. Polymer Synthesis and Characterization: A Laboratory Manual by S. R. Sandler, W. Karo, J. Bonesteel, and E. M. Pierce, Academic Press, New York, 1998.
4. Polymer Chemistry by S. Koltzenburg, M. Maskos and O. Nuyken, Springer, 2017.