

MCYC 402 Polymer Chemistry (3-0-0)

Module I

(12 hours)

Fundamental concepts - functionality - principle of polymerisation - addition, condensation polymerisation - ring opening polymerisation - classification - production from coal tar and petrochemicals - Techniques of polymerisation - gas polymerisation, - bulk, solution, suspension and emulsion - melt condensation.

Mechanism of polymerisation and general characteristics - free radical - cationic, anionic and coordination polymerisation (Ziegler-Natta catalyst) autoacceleration - Kinetic chain length - degree of polymerisation kinetics of polymerisation (Detailed study) - copolymerisation.

Module II

(14 hours)

Polymer characterisation - molecular weight, MWD - M_n , M_w , M_v and M_z - end group analysis - viscometry - osmometry - Light scattering - spectral analysis-Thermal properties – Electrical properties, Mechanical and dynamic properties - polymer degradation. Phase transitions of polymers, crystallization and glass transition, mechanism of glass transition , methods of determining T_g .

Module III

(12 hours)

Studies of individual polymers - plastics - polyolefins, polystyrenes, acrylics, polyesters, polyamides, cellulose, polyurethanes, Inorganic polymers, FIR plastics - GRplastics. alkyd resins, epoxy resins - phenolics - Melamine resins - compounding of plastics - rubber - elastomer - vulcanisation, compression mouldings - injection mouldings - lamination . Biopolymers - Biomaterials - medicinal applications of polymers - High temperature and fire resistant polymers. Polymer concrete - polymer impregnated concrete - conducting polymers - polymeric reagents.

Text books

1. P.J. Flory, 'Principles of Polymer Chemistry' , Cornell Press,(Recent Edition).
2. Jr. Billmeyer, ' Test Book of Polymer Science', Fred, W. John Wiley & Sons, New York, 1984.
3. Dan Campbell, Richard A. Pethrick, Jim R. White, Polymer Characterization: Physical Techniques, 2nd Edition, CRC Press, 2012.

References

1. F. Rodrigues, 'Principles of Polymer Systems', M. Elpaw Hill Book Company, 2nd Edn., 1982.
2. K.J.Saunders, , 'Organic Polymer Chemistry', Chapman & Hall, London, 1973.
3. [Sabu Thomas](#) & [Dominique Durand](#), Handbook of Biopolymer-Based Materials: From Blends and Composites to Gels and Complex Networks , **Wiley – VCH**, 2013