

**UNIVERSITY OF MADRAS**  
**B.Sc. DEGREE COURSE IN CHEMISTRY**  
**SYLLABUS WITH EFFECT FROM 2020-2021**

**BCY-DSE2B**

**ELECTIVE-II(B): POLYMER CHEMISTRY**

Learning Outcome

Introduction to types of polymers and their properties; mechanism of polymerization, polymerisation techniques; Polymer processing; Chemistry of industrially important polymers

Semester	Subject Title	Total Hours	Credit
V	Polymer Chemistry	60	5

**UNIT - I** **(12 hrs)**

Introduction to polymers –general characteristics of polymers in comparison with common organic compounds. Basic concept of monomers and polymers. Classification of polymers - natural and synthetic polymers. Distinction between plastics, elastomers and fibres. Types of polymers thermoplastics and thermosetting plastics. Geometrical structures of polymer molecules - microstructures - chemical structures - geometrical structures - Cross-linked polymers - stereoregular polymers

Mechanism of polymerization: chain polymerization, free radical polymerization, ionic and coordination polymerization. Polyaddition and polycondensation polymerization, ring opening and group transfer polymerization.

**UNIT - II** **(12 hrs)**

Molecular weight of polymers - number average, weight average and viscosity average. Determination of polymer molecular weights - Osmometry (membrane, vapour phase), Viscometry methods. Light scattering and ultra centrifugation methods. Molecular weight and degree of polymerization - practical significance of polymer molecular weight.

Glass transition temperature - transition and associated properties - factors affecting Glass transition temperature- importance - glass transition temperature of copolymers.

Polymer crystallinity - crystallisability- effect of crystallinity on properties.

**UNIT - III** **(12 hrs)**

Industrially important polymers - preparation, properties and applications. Polyethylene, polypropylene, polyamides, polyvinylchloride, polymethylmethacrylate, polyesters, polycarbonates, polyurethanes, phenol - formaldehyde, melamine - formaldehyde, polysilanes, polyaniline

**UNIT - IV** **(12 hrs)**

Degradation of polymers by thermal - oxidative, mechanical and photodegradation methods. Polymerisation techniques - bulk, solution, suspension, emulsion, polycondensation and interfacial polycondensation.

Polymer processing - compression moulding, casting, extrusion, fibre spinning, injection moulding, thermoforming, vulcanization of elastomers.

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**UNIT - V**

**(12 hrs)**

Polymer reactions - hydrolysis, Acidolysis, Aminolysis, hydrogenation, addition and substitution - cyclisation reactions - crosslinking reactions.

Natural polymers - Rubber, Silk, Cellulose - structure and applications Supramolecular polymers - introduction - properties - applications.

**REFERENCES**

1. BillmeyerFW, Textbook of polymer Science, 3<sup>rd</sup> ed., John Wiley and Sons, 1984.
2. GowarikerV R, ViswanathanNV and SreedharJ, Polymer Science, 3<sup>rd</sup> ed., New Age International Publishers, New Delhi, 2015.
3. SharmaBK, Polymer Chemistry, Goel Publishing House, Meerut, 2014.
4. Odian, G., Principles of Polymerization, 4<sup>th</sup> ed., John Wiley, 2004.