



बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsamunda Tribal University

राजपिपला, जि० नर्मदा Rajpipla, Dist. Narmda

Established by Tribal Development Department, Govt. of Gujarat

School of Science

M.Sc. (Chemistry) Programme

Subject Code & Name: - MS01SCHE01 & Polymer Chemistry

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				Internal		External	
L	T	P	Total	TH	PWE	TH	PWE
-	-	2	2	-	25	-	25

Programme Name	M.Sc. Chemistry
Semester	I
Course Code	MS01SCHE01
Course Title	Polymer Chemistry
Course Content Type (Th./Pr.)	Practical
Course Credit	2
Sessions+ Lab. Per Week	4
Total Teaching/Lab. Hours	30 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. Learn how formaldehyde undergoes addition reactions
2. Differentiate between acidic and basic conditions. Observe how an excess of phenol with an acid catalyst yields Novolak (a linear, thermoplastic resin), while an excess of formaldehyde with a base catalyst yields Resol.
3. Learn how Novolac requires the addition of a curing agent like hexamethylenetetramine to fully cross-link and cure into a rigid plastic.
4. Learn the laboratory techniques required to quantify the active aldehyde content in a commercial formalin solution.
5. Learn how to utilize redox titrations (often employing the sodium bisulfite addition method or the alkaline peroxide method) to determine the percent purity.

Prerequisites (if any)

Learning Outcomes

On the Completion of this course, students will be able to:

1. Understand Step-Growth Polymerization.
2. Distinguish the structural differences between linear, fusible Novolaks (acid-catalyzed, excess phenol) and highly crosslinked Resoles (base-catalyzed, excess formaldehyde).



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3. Differentiate the behavior of crosslinked thermosetting resins versus thermoplastic linear polymers.

Apply chemical formulas and stoichiometry to find the active formaldehyde content and understand how impurities affect the yield and curing times of resulting resins.

Detailed Contents

UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I & II	1) Phenol-formaldehyde resin (Ammonia catalyst) 2) Phenol-formaldehyde resin (Acid catalyst) 3) Urea-formaldehyde resin 4) Epoxy resin (Solid) 5) Epoxy resin (Liquid) 6) Poly(ethylene tetrasulfide) 7) Emulsion polymerization of Methyl Acrylate 8) Suspension polymerization of Methyl Methacrylate 9) Slurry polymerization of Acrylonitrile 10) Emulsion polymerization of Styrene 11) Solution polymerization of Vinyl Acetate 12) Unsaturated Polyester resin (Wet process) 13) Unsaturated Polyester resin (Dry process)	30

Text Book(s)

1. Polymer Science by V. R. Gowariker, N. V. Viswanathan and Jayadev Sreedhar, New Age International Publishers.
2. Principles of Polymer Science (Second Edition) by P. Bahadur and N. V. Sastry, Narosa Publishing House, New Delhi

Reference Books

1. Textbook of Polymer Science by F. W. Billmeyer, Wiley – Interscience, New York
2. Introduction to Polymer Chemistry by R. B. Seymour, McGraw – Hill, New York
3. Introduction to Polymer Chemistry by R. J. Young and P. A. Lovell

Web Resources

1. www.nptel.ac.in
2. www.swayam.gov.in
3. www.epgp.inflibnet.ac.in (e-PG pathshala)
4. www.ndl.iitkgp.ac.in (National Digital Library)

Required Software(s) (if any)



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Practical(s) (if any)

L:: Lecture, **T::** Tutorial , **P::**Practical

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

