

Introduction to Polymer Chemistry

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Chem 369H
Fall 2020
ONLINE

Catalog description: Mechanisms of polymerization reactions of monomers and molecular weight distributions of products; principles, limitations and advantages of important reactions; relationship of physical properties to structure and composition; correlations of applications with chemical structure. Prerequisite: Organic Chemistry 2 (CHEM 224)

Objective: As a senior-level honors course, it will combine what you learned in basic courses with concepts in polymer chemistry involving synthesis, characterization and utilization. The objective is met through lectures, readings from the literature, an oral assignment, a written assignment, two exams and a final examination.

Learning Outcomes: Polymers are components of common materials and advanced devices. The wide range of applications of polymers is derived from their variability in compositions and structures that lead to highly diverse properties. Students will gain a fundamental knowledge of polymer chemistry. They will be able to:

- (1) Describe the structural features of polymers
- (2) Describe key chemistries, especially step-growth and chain-growth polymerizations
- (3) Understand how the basics of organic and physical chemistry underlie polymer chemistry
- (4) Understand how to prepare polymers from given reagents and conditions
- (5) Write reaction mechanisms for important polymerization reactions
- (6) Understand polymer modification reactions
- (7) Apply concepts in polymer chemistry to propose synthesis of complex polymeric materials

Oral assignment: Choose a topic from papers posted on Blackboard as Paper_xy_aaaaa.pdf. Paper_01 – Paper_14 are from the *ACS Journal of Chemical Education* + aimed at chem majors. Working in groups, choose a paper that interests you. Study and present it to your classmates in a way that emphasizes the organic + physical chemistry. There will be 1 or 2 topics per given day (**22 students (4 groups of 4, 2 groups of 3) five days**). The syllabus has the dates of the presentations. Each team is to e-mail their choice to me by Oct 15; if two teams choose the same topic, the one I receive earlier will be assigned their choice. I will schedule each presentation and post it on Blackboard. Everyone is to come to class having read the paper.

Written assignment: Each group will expand their presentation into **one** six-page single-spaced paper focusing on background information from basic courses to fully understand the work being reported. An e-copy is due Dec 2.

Grade

Oral assignment	15% of final grade
Written assignment	15% of final grade
Exam I	15% of final grade
Exam II	20% of final grade
Final Exam	25% of final grade
Class participation	10% of final grade

EXAMINATION POLICY – *see Announcement*

Topics

Each lecture is the source of knowledge. The book posted on Bb is supplemental (01_Carraher_Polymer_Sixth); the sections noted can be perused before lecture as can the other readings for additional background. When in doubt about what to know, re-read the first sentence above.

1. Overview: terminology and classification (01_Intro, 01_mechanisms, Su_Chap_1)
2. Step – growth polymerization: polyesters (Carraher 6.1 – 6.6; Su_Chap_6)
3. polyamides (Carraher 6.7 – 6.9)
4. phenolics (Carraher 6.15)
5. epoxies (Carraher 6.12; 05_epoxies)
6. polyurethanes (Carraher 6.10)
7. Chain – growth polymerization: introduction (07_chain_freeRad)
8. free-radical reactions (Carraher 8.1 – 8.7; Su_Chap_7)
9. polymerization processes (09_polymnProcesses)
10. copolymers and reactivity ratios (Carraher 9.1; Su_Chap_10)
11. ionic reactions (Carraher 7.1 – 7.2; 11_anionic, Su_Chap_8)
12. coordination polym'n (Carraher 7.4–7.7; 12_coordnPolymn, Su_Chap_9)
13. Characterization: solubility, viscosity (Su_Chap_2, _3, _5), molecular wt (Carraher 3.1 – 3.3)
14. Ion Exchange Resins + Polymer-Supported Reagents (14_Ion_Exch_Resins; 14_polym_Supp_)

Important dates for Fall 2020

Tues Sept 29 – EXAM I

Thu Oct 15 (*all topics for oral assignments must be received*)

Mon Oct 26 *oral (1)*

Thu Oct 29 – EXAM II

Mon Nov 2 *oral (2)*

Mon Nov 9 *oral (3)*

Mon Nov 16 *oral (4)*

Mon Nov 23 *oral (5) (6)*

Wed Dec 2 *written assignment due*

Mon Dec 7 – Review

Wed Dec 16 - Final Examination, 3:00pm - 5:00pm

Hunter College Policy on Academic Integrity (required on all syllabi by Senate resolution)

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

ADA Policy

In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical, and/or Learning) consult the Office of AccessABILITY, located in Room E1214B, to secure necessary academic accommodations. For further information and assistance, please call: (212) 772- 4857 or (212) 650-3230.

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<http://www.cuny.edu/about/administration/offices/la/Policy-on-SexualMisconduct-12-1-14-with-links.pdf>