

Department of Chemical Engineering
West Virginia University

ChE 461
Polymer Science and Engineering
Spring 2010

Instructor: Dr. Rakesh Gupta
Room 403 ESB
293-9342
Rakesh.Gupta@mail.wvu.edu

Class: MW 3:00 – 4:50, Room 209 MRB
(Class will not meet every week)

Textbook: A. Kumar and R.K. Gupta, Fundamentals of Polymer Engineering,
2nd edition, Marcel Dekker, New York, 2003.

Objectives: To teach the fundamentals of polymeric materials, how they are
manufactured, characterized and made into useful products.

Grading: 3 Midterm Exams @ 30% 90%
Homework 10%

Homework Grading: Ms. Huanling Liu

Policies: Closed-book exams
No make-up exams
Exam grading appeals in writing only on the day exam is returned
No late homework
Homework submitted must be individual work

ChE 461
Polymer Science and Engineering

Course Outline

Topic	Approximate no. of classes
Introduction and classification of polymers	1
Molecular weight and its distribution	1
The glass transition temperature	1
Step growth polymerization	2
Chain growth polymerization	2
Crosslinking reactions	1
Exam I	
Measurement of molecular weight	1
Thermodynamics of polymers	1
Rubber elasticity	1
Polymer crystallization	2
Dynamic properties and time-temperature superposition	2
Exam II	
Diffusion through solid polymers	1
Rheology	2
Polymer processing	4

Exam III

ChE 461
Polymer Science and Engineering

Goals:

By the end of the course

1. Students will know the names, structural formulas and uses of common polymers.
2. Students will be familiar with the two major mechanisms of polymerization and understand how differences between these influence molecular weight and molecular weight distribution in a batch reactor.
3. Students will learn about the common methods of measuring polymer molecular weight.
4. Students will become familiar with the mechanical and barrier properties of solid polymers, both above and below the polymer glass transition temperature.
5. Students will understand the solubility behavior of polymers.
6. Students will understand the flow behavior of polymeric liquids.
7. Students will learn to model some of the common polymer processing operations.

Other Introductory Polymer Textbooks

1. Billmeyer, F.W., Textbook of Polymer Science, 3rd ed., Wiley, New York, 1984.
2. Cowie, J.M.G., Polymers: Chemistry & Physics of Modern Materials, 2nd ed., Blackie Academic, London, 1991.
3. Fried, J.R., Polymer Science & Technology, 2nd ed., Prentice Hall, Upper Saddle River, NJ, 2003.
4. Grulke, E.A., Polymer Process Engineering, Prentice Hall, Englewood Cliffs, NJ, 1994.
5. Painter, P.C. and M.M. Coleman, Fundamentals of Polymer Science, 2nd ed., Technomic Publishing, Lancaster, PA, 1997.
6. Rodriguez, F., C. Cohen, C.K. Ober and L.A. Archer, Principles of Polymer Systems, 5th ed., Taylor and Francis, New York, 2003.
7. Rosen, S.L., Fundamental Principles of Polymeric Materials, 2nd ed., Wiley, New York, 1993.
8. Young, R.J. and P.A. Lovell, Introduction to Polymers, 2nd ed., Chapman & Hall, London, 1991.