

## SYLLABUS: POLYMER ANALYSIS

Quarter: Fall, 1999 Tuesday/Thursday 11-12:15

Instructor: Prof. Gregory Beaucage  
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Textbook:

- 1) **"Polymer Characterization, Physical Techniques" D. Campbell and J. R. White, 1989. (Chapter References Below)**
- 2) "Data Reduction and Error Analysis for the Physical Sciences", P. R. Bevington, McGraw-Hill, New York, 1969.
- 3) "Introduction to Physical Polymer Science", Sperling
- 4) "Polymer Chemistry", Young
- 5) "Polymer Characterization", B. J. Hunt and M. I. James, 1993.  
One copy on 1-day reserve in Chemistry Library
- 6) "X-ray Diffraction in Polymers", Alexander, 19  
Several sections will be copied
- 7) Handouts
- 8) Some Web Sites

Level: Graduate/Undergraduate

Synopsis of Course: Some of the major analytic tools for polymers will be covered. Emphasis is on the physical basis of analytic techniques.

1. Introduction. (Chapter 1, Chapter 1 of Hunt and James and class notes).

Levels of Characterization "Choose the right tool for the job".  
Characteristics of Polymers

2. Error Analysis. (Bevington or other statistical analysis book)

Propagation of error, simple statistical descriptions and models for data.

3. Thermal Analysis (Chapter 12).

DTA, DSC  
DMTA

4. Radiation as an Analytic Tool, an Overview (Chapter 3).

The Electro-Magnetic Spectrum  
Vibration/Absorption  
Elastic Scattering  
Inelastic Scattering

5. IR/Raman Spectroscopy in Polymers (Chapter 5).

General  
Fourier Transform Instruments  
Applications  
Orientation  
2-D IR

6. NMR for Polymers (Chapter 6).

General  
Solution NMR, proton,  $^{13}\text{C}$   
Solid State  
2-D NMR

7. XRD. (Chapter 8, Alexander).

General  
Degree of Crystallinity  
Lamellar Thickness  
Crystalline Composition  
Orientation

8. Elastic Scattering . (Chapter 2 [2.2.2], Chapter 11[11.5]).

Neutron/X-ray  
Light

### **COURSE REQUIREMENTS**

Weekly Quiz (60%) Closed Book Each Friday

Final Exam (30%) on Designated Day (Comprehensive)

Computer Program or Detailed Notebook with outside references (10%).