

# Chemical Engineering 260 Term Paper

## W 2001

### *General Notes:*

Your paper should constitute a critical review of the current literature (predominantly over the past five years), but earlier, classic papers can be included. It should be approximately 15 pages long (12 pt. Times, double-spaced) exclusive of references and figures. The paper should be sufficiently focused such that you can go into the topic in some depth. The paper should contain an abstract and be subdivided into logical sections. It will be graded on the basis of its technical content as well as on the quality of the writing (organization, clarity, logic, persuasiveness, grammar, spelling). You may pick a topic from the following list or propose one of your own.

### *Possible Topics:*

#### **Synthesis**

Cationic metallocene complexes as polymerization catalysts  
Living free radical polymerization  
Group transfer polymerization  
Pulsed plasma polymerization  
Solid-state polymerization  
Dispersion polymerization in organic media

#### **Molecular Structure and Bulk Morphology**

Mechanism of small molecule diffusion in glassy polymers  
Physical aging in glassy polymers  
Morphology and conformational structure of polysilanes (or other polymers)  
Molecular structure-property relationships in side-chain liquid crystal polymers  
Application of fluorescence spectroscopy to studies of polymer morphology  
Application of solid-state NMR to studies of polymer dynamics

#### **Structure and Dynamics of Polymer Interfaces**

Surface-initiated polymerization  
Adhesion of polymers to metal substrates  
Theory of polymer adsorption from solution  
Effect of constrained geometry on glass transition temperature  
Surface segregation in block copolymers  
Monte Carlo simulation of polymer interfaces

## **Rheology and Processing**

Dynamics of polymers in dilute solution  
Lyotropic solution properties and processing of polyamic acids  
Constitutive equations and director tumbling in flow of liquid crystal polymers  
Structure-property-processing of polyetherimides (or other engineering polymer)  
Rheology of polymers in pseudo-two-dimensional systems  
Molecular or Brownian dynamics simulation of polymers under flow  
Pulsed-field gel electrophoresis  
Photo-responsive gels

## **Ultimate Properties and Degradation**

Mechanism and models of craze formation and cracking  
Photochemical, thermal, and chemical degradation of aromatic polyimides (or others)  
Chemical modification of polymer surfaces  
Stabilization of polyolefins by hindered amine light stabilizers

## **Applications of Polymers**

Synthesis and properties of polyphenylene/poly(phenylene sulfide) conducting polymers  
Synthesis and properties of polythiophene derivatives for electronic applications  
Preparation and properties of asymmetric polymer membranes  
Preparation and properties of organic/inorganic nanocomposites  
Mechanism of perfluoropolyether hard-disk lubrication  
Mechanism of chemically amplified polymer photoresists  
Low dielectric constant materials for microelectronics packaging  
Photorefractive polymers