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