

CHEM 773**Polymer Properties and Polymerization**

Course offered in Winter. UW Credit 0.5. ECTS Credit 6.0

Prerequisite: CHEM 370, or equivalent. Antirequisite: CH E 542.

Contents

Copolymerization reactions are discussed including copolymerization equations, monomer reactivity ratios, types of behavior (random, alternating, blocky copolymers), integrated copolymerization equations, copolymer microstructure, multicomponent polymerization, structural effects, Q-e scheme, kinetics, and ionomers as a special topic. Different types of polymerization are presented such as anionic polymerization including initiation, propagation, termination, "living" polymerization, including solvent and temperature effects, reactivity modifiers, stereochemistry, cationic polymerization, including initiation, propagation, chain transfer, temperature effects, and coordination polymerization, including Ziegler-Natta catalysts, supported catalysts, and polymers with a well-defined structure as a special topic. Polymer mechanical properties are described based on crystallization and microstructure, crystallite morphology, modulus and glass transition temperature, structure-property correlations, viscoelasticity, stress relaxation, dynamic mechanical properties, and mechanical models. Polymer mixtures are studied using solution thermodynamics, solubility parameter and variations, and the Flory-Huggins theory. The solution thermodynamics are applied to plasticization, fractionation, and polymer mixtures (blends).

Textbooks

Principles of Polymerization (3rd Edition) by G. Odian (Wiley: NY, 1991; QD281.P603 1991), Polymers: Chemistry and Physics of Modern Materials (2nd Edition) by J. M. G. Cowie (Blackie Academic: Glasgow, 1991; QD381.C68x 1991), Elements of Polymer Science and Engineering by A. Rudin (Academic Press: San Diego, 1999; QD381.R8 1999).

Professor

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Evaluation

Mid-term exam (30%), a report on a research topic related to the course material (20%), and a 2^{1/2}-hour final exam (50%).