KF2140 Polymer Physics 7.5 credits

Polymerfysik

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for KF2140 valid from Autumn 2007

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Chemical Science and Engineering,Chemistry and Chemical Engineering

Specific prerequisites

KF1010 Polymer technology with cellulose technology and knowledge corresponding to 3 years' education in chemical engineering.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After finished course the student should be able to:

- Describe the structure of the polymer chain starting from its conformation, configuration and distance between terminal points.
- Describe how molecular weight averages are defined, calculated and measured.
- Describe preparation, structure and behaviour of crosslinked polymers and quantify this by means of the rubber elasticity equation.
- Describe structure and behaviour of polymeric multicomponent systems and quantify this by means of Flory-Huggin's theory.
- Describe the different phase transitions of polymers and their causes and effects.
- Describe the different morphologies of polymers and relate these to the structure and properties of the polymers.
- Use given mathematical relations to quantify the properties of polymers in their different states and during phase transitions.
- Describe rheological basic concepts, common rheological behaviours and rheological measurement methods for polymers.
- Describe summarily degradation processes and –results for polymers.
- Describe common mechanical behaviours and mechanical measurement properties for polymers.
- Perform, interpret and critically assess laboratory work, containing characterization of polymers.

Course contents

Conformation and configuration of the polymer chain, random-walk and macroconformation. Weight and size of the molecules and determination of these. Behaviour of polymers in solutions and mixtures, multicomponent materials and phase separation. Crosslinked polymers and rubber elasticity. The amorphous phase, its chemical-physical aspects, and the phenomenon glass transition. The WLF-equation. The crystalline state, its chemical-physical aspects, and characterization. Viscoelasticity and rheology of polymers. Mechanical properties, electrical properties, optical properties, chemical properties of polymers – degradation, stress cracking. Polymeric materials – systematics.

Course literature

Sperling: Introduction to Physical Polymer Science

Strobl: The Physics of Polymers

Examination

- LAB1 - Laboratory Course, 3.7 credits, grading scale: P, F
- TEN1 - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- ÖVN1 - Practical Course, 0.8 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Other requirements for final grade

Written examination (TEN1; 3,0 credits)
Exercise course (ÖVN1; 0,8 credits)
Laboratory work including written report (LAB1; 3,7 credits)

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.