



KF1010 Polymer Technology with Cellulose Technology 7.5 credits

Polymerteknologi med cellulosateknologi

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

Establishment

Course syllabus for KF1010 valid from Autumn 2011

Grading scale

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

Education cycle

First cycle

Main field of study

Chemistry and Chemical Engineering, Technology

Specific prerequisites

Completed upper secondary education including documented proficiency in English corresponding to English A. For students who received/will receive their final school grades after 31 December 2009, there is an additional entry requirement for mathematics as follows: documented proficiency in mathematics corresponding to Mathematics A.

And the specific requirements of mathematics, physics and chemistry corresponding to Mathematics E, Physics B and Chemistry A.

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:

- Identify and describe the different building stones of a polymeric material, and explain in which different ways these can be joined.
- Describe the connections between chemical structure and material properties.
- Define and describe the phenomena rubber elasticity, glass transition, polydispersity and molecular weight distribution.
- Describe different crystalline and amorphous morphologies of polymers and how they are formed.
- Describe the characteristic mechanical properties of polymers and how these are tested.
- Describe the polymerisation process and the results achieved by different techniques.
- Describe summarily the recycling processes for polymers.
- From a given result choose a suitable processing method and describe how it works.
- From a required information choose a suitable characterization method and describe how it works.
- From a given simple application choose a suitable polymeric material with regard to function, formability and environmental interaction.
- Describe the morphology of wood/wood fibers.
- Describe the structure and properties of the wood polymers.
- Describe the pulping processes used to recover fibers from wood.
- Describe the fiber applications in paper and pulping production as well as in other products.
- Explain how fibers can be utilized as a resource for the production of chemicals, e.g. cellulose derivatives, and new ways of utilizing lignin.
- Describe paper production technologies.
- Describe coating and printing processes.
- Describe wood based composites.
- Compile a literature report and present orally/in writing as a group assignment.

Course contents

Introduction to polymer chemistry with definition of basic conceptions and history. The polymer structure and the relation structure-properties. Rheology and solubility. Molecular

weight and molecular weight determination. Characterization of chemical, physical-chemical and mechanical properties of polymers. Natural polymers. Stepwise polymerization. Ion- and coordination polymerization. Radical polymerization. Copolymerization. Modification of polymers and additives and chemical reactions. Processing of polymer materials. Plastic waste handling. Environmental aspects on plastic waste.

Summary of production, properties and use of paper- and other cellulose based materials. The course also includes a study trip to a polymer industry and a paper mill.

Course literature

Book:

"Polymerteknologi – makromolekylär design" by Ann-Christine Albertsson & Ulrica Edlund

Examination

- ÖVNA - Project, 1.5 credits, grading scale: P, F
- TENA - Examination, 6.0 credits, grading scale: A, B, C, D, E, FX, 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.

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

Participation at the study trip is compulsory.

Other requirements for final grade

Examination (TENA; 6,0 credits)

Project (ÖVNA; 1,5 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.