

Course syllabus

Polymerkemi Polymer Chemistry

KASN25, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED B/K

Date of Decision: 2023-04-18

General Information

Elective for: K4-m, N4-m

Language of instruction: The course will be given in English

Aim

The course shall give the necessary special knowledge required to read scientific literature in the area of polymer chemistry, and to participate in chemical research and development within industries that produce or use polymers.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- Be able to give detailed descriptions and analyses of general polymerisation reactions by chain and stepwise mechanism.
- Be able to give detailed descriptions of the principles behind the most important methods to determine molecular weights and molecular weight distributions, and assess their usefulness.
- Be able to describe and explain in a general way the solubility and solution properties of polymers using thermodynamic terms.
- Be able to explain general chemical degradation of polymers and describe different strategies to stabilise polymers.

Competences and skills

For a passing grade the student must

- Be able to evaluate simple methods for polymerisation and characterisation of polymers using the literature, apply these in a practical manner, and described

the results in written reports in English.

- Be able to solve complex problems in polymer chemistry through calculations based on theory.
- Be able to understand and use concepts in polymer chemistry in spoken and written English.

Judgement and approach

For a passing grade the student must

Have insights into the chemical aspects of the activities of polymer producing and polymer using industry.

Contents

The course includes the following main topics:

- Polymerisation: stepwise polymerisation, radical polymerisation, ionic polymerisation, polymerisation by organometallic catalysis, polymer stereochemistry, copolymerisation.
- Polymers in solution: polymer solubility, polymer solution thermodynamics, physical properties of polymers in solution.
- Characterisation of polymers: viscometry, size-exclusion chromatography, spectroscopy, osmometry, molecular weight distributions.
- Degradation of polymers: degradation mechanisms, measuring methods, stabilisation of polymers.

The theoretical contents of the course are discussed during the lectures. The ability of the student to solve problems in polymer chemistry is practised during the exercises. Through home assignments, the student will practise his or her ability to independently solve problems. Selected main topics are treated during practical laboratory exercises. During visits to local industry the student will be introduced to modern production and development in the area.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Written exam. Approved laboratory and home assignments, and participation in compulsory visits to polymer industries. The final mark of the course is given by the final score on the written exam.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Assumed prior knowledge: KASF05 Material and Polymer Technology, or KASF10 Functional Materials.

The number of participants is limited to: 20

Selection: Completed university credits within the programme. Priority is given to students enrolled on programmes that include the course in their curriculum.

The course overlaps following course/s: KTE080

Reading list

- J.M.G. Cowie, V. Arrighi: *Polymers: Chemistry & Physics of Modern Materials*, 3rd edition. CRC Press, 2008, ISBN: 978-0-8493-9813-1.

- Lab compendium, exercises and other material provided by the Division.

Contact and other information

Course coordinator: Baozhong Zhang, baozhong.zhang@chem.lu.se

Course homepage: <http://canvas.education.lu.se>