MSE-431

Physical chemistry of polymeric materials

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Cursus	Sem.	Type
Chimiste	MA2, MA4	Opt.
Ing.-chim.	MA2, MA4	Opt.
Materials Science and Engineering	MA2, MA4	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	During the semester
Workload	90h
Weeks	14
Hours	**3 weekly**
Lecture	2 weekly
Exercises	1 weekly
Number of positions	

Summary

The student has a basic understanding of the physical and physicochemical principles which result from the chainlike structure of synthetic macromolecules. The student can predict major characteristics of a polymer from its chemical structure and molecular architecture.

Content

- Introduction
- Dilute solutions
- Polymer structure in solution
- Molecular weight determination
- Concentrated solutions and phase behavior
- The amorphous state
- The crystalline state
- The glass-rubber transition
- Rubber elasticity
- Viscoelastic properties

During the course concepts, methods and models are discussed in the field of the above mentioned subjects.

Keywords

dilute and concentrated solutions
glass transition
rubber elasticity
viscoelastic behaviour

Learning Prerequisites

Recommended courses

General chemistry, Inorganic chemistry, organic and polymer chemistry

Important concepts to start the course

basic knowledge of thermodynamics

elementary laws of chemistry and physics

Learning Outcomes

By the end of the course, the student must be able to:

- Predict polymer characteristics based on chemical structure and molecular architecture
- Discuss dilute and concetrated solution and bulk behaviour of synthetic polymers
- Use insights from physicochemical experiments to discuss the composition and architecture of polymers
- Discuss dilute and concentrated solutions and bulk behaviour of synthetic polymers

Transversal skills

- Use a work methodology appropriate to the task.
- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Continue to work through difficulties or initial failure to find optimal solutions.

Teaching methods

Lectures and exercises

Assessment methods

written, in the form of a literature study
the written report has to be submitted at least, Friday of the first week after the end of the teaching.

Supervision

Office hours	No
Assistants	Yes
Forum	Yes
Others	via Moodle

Resources

Bibliography

1. T.P. Lodge, P.C. Hiemenz, Polymer Chemistry, 3rd edition, CRC Press 2020
e-book:
http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=2512676
hardcopies are available at the liberary
2. L.H. Sperling, Introduction of Physical Polymer Science
4th edition, Wiley Interscience 2005

Ressources en bibliothèque

- Polymer Chemistry / Hiemenz
- Introduction to Physical Polymer Science / Sperling

Notes/Handbook

Slides and notes are avaiable on Moodle

Moodle Link

- https://go.epfl.ch/MSE-431