

MSE-451

**Polymer morphological characterization techniques**

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<b>Cursus</b>	<b>Sem.</b>	<b>Type</b>
Materials Science and Engineering	MA2, MA4	Opt.

Language of teaching	English
Credits	2
Session	Summer
Semester	Spring
Exam	During the semester
Workload	60h
Weeks	14
<b>Hours</b>	<b>2 weekly</b>
Courses	2 weekly
<b>Number of positions</b>	

**Summary**

Sample preparation and direct observation techniques (optical microscopy, AFM, electron microscopy) and their practical application to the study of morphology and microdeformation in polymers.

**Content**

## INTRODUCTION

- Overview of polymer structures
- Importance of polymer morphology in practice

## METHODS

- sample preparation
- application of the different types of microscopy to polymers (OM, TEM, SEM, scanning probe microscopy ...)
- crystallographic methods, numerical simulation

## APPLICATIONS

- semicrystalline polymers and liquid crystalline polymers
- supermolecular structures
- fractography and microdeformation
- nanostructures and self-organization

**Keywords**

Polymers, microscopy, specimen preparation

**Learning Prerequisites****Recommended courses**

Polymères, structures, propriétés, MSE-230, MX, Plummer

**Important concepts to start the course**

Basics of materials science, physics

**Learning Outcomes**

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

- Compare the advantages and disadvantages of the various techniques
- Describe the main microscopy techniques and their application to polymers
- Recall the principal methods of specimen preparation for SEM/TEM
- Choose a technique for a given problem in polymer science
- Develop a rational approach to solving multiscale problems in polymer science
- Operate an optical microscope in different modes
- Apply basic optical microscopy to the study of polymers
- Assess / Evaluate the use of different microscopy techniques in the literature

### Transversal skills

- Make an oral presentation.
- Summarize an article or a technical report.

### Teaching methods

Ex cathedra, demonstrations

### Expected student activities

Attending lectures and laboratory demonstrations, completing exercises, analysis and presentation of a scientific article from the literature

### Assessment methods

Written exam after 4-5 weeks + oral presentation in group of 2 people at the end of the course.

Final grade = (2x presentation grade + 1x written exam grade) /3

### Resources

#### Bibliography

Polymer microscopy - third edition, Sawyer, Grubb & Meyers, Springer , NY 2008

#### Ressources en bibliothèque

- [Polymer microscopy / Sawyer](#)

#### Notes/Handbook

Copies of the lecture notes

#### Websites

- <http://my.epfl.ch>
- <http://www.olympusmicro.com/primer/>