

# MSE-451 Polymer morphological characterization techniques

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Cursus	Sem.	Type
Materials Science and Engineering	MA2, MA4	Opt.

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

### **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 tehoniques 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/