MSE-451

Polymer morphological characterization techniques

Plummer John Christopher

Cursus	Sem.	Type
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
Hours	**2 weekly**
Courses	2 weekly
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 tehcniques 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/