CH-632

Principles and Applications of X-ray Diffraction

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Cursus	Sem.	Type
Chemistry and Chemical Engineering		Opt.

Language of teaching	English
Credits	2
Session	
Exam	Written
Workload	60h
Hours	**32**
Lecture	20
Exercises	12
Number of positions	**15**

Frequency

Every year

Remark

Next time: Fall 2023. Pre-registration form
https://docs.google.com/forms/d/e/1FAIpQLSd5lyrEGUar8FBwxPqnIW1JBoPBr4YQjiA1yRGt3E7kOL-nXQ/viewform

Summary

Basic theoretical aspects of Crystallography and the interaction between X-ray radiation and matter. Experimental aspects of materials-oriented powder and single crystal diffraction. Familiarization with modern X-ray diffractometers.

Content

The course will consist of various modules. Students will be introduced to the fundamentals of Crystallography (symmetry, groups, lattice theory) and the basic theoretical aspects of X-ray diffraction (Generation of X-rays, interaction with matter, principles of interference functions and diffraction, scattering of periodic arrays, fourier transform and structure factors).
The basic theoretical aspects of structure solution will be taught (phase problem, reciprocal and direct space methods, absolute structure, twinning) as well as of structure refinement, with a focus on the theory of Rietveld refinement on powders.
Basic experimental aspects will be taught for single crystal, powder and thin film X-ray diffraction (Anomalous dispersion, Debye-Scherrer and Bragg-Brentano measurements, grazing incidence diffraction, in-plane diffraction) aiming at providing a solid knowledge on a large spectrum of methods relevant to diffraction studies on materials.
Students will be familiarized with different modern X-ray diffractometers, instrumental optics and experiment strategies.
This course is open both to PhD students and PostDocs, passing the oral exam will give PhD students 2 ECTS credits.

Keywords

XRD, Powder diffraction Materials

Learning Prerequisites

Required courses

No particular prequisites, notions of very basic concepts of scattering and the solid state (inorganic materials) would be advantageous.

Learning Outcomes

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

- basics of Crystallography

- basic theoretical and experimental aspects of the discussed x-ray diffraction methods
- basic data analysis on materials

Assessment methods

exercises (computer-based)

Resources

Websites

- https://docs.google.com/forms/d/e/1FAIpQLSd5lyrEGUar8FBwxPqnIW1JBoPBr4YQjiA1yRGt3E7kOL-nXQ/viewform