MSE-202

Cristallography and diffraction methods

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Cursus	Sem.	Type
Materials Science and Engineering	BA4	Obl.

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

Summary

Diffraction methods are widely used to investigate the crystallography and microstructural properties of materials. This course intends to give an introduction to crystallography, the basics of diffraction and diffraction methods.

Content

- Symmetry and periodicity of crystals, Bravais lattices, Point and Space groups

- Introduction to diffraction (reciprocal lattice, Bragg, Laue, Ewald sphere, structure factor, diffraction pattern analysis, peak profile)

- X-ray diffraction for selected applications in crystallography and materials science: various methods/geometries, their capacities and limits, powder diffraction, Laue diffraction, crystalline phase identification, analysis of crystallite size and residual strain- epitaxial and polycrystalline films: texture analysis, pole figures.

- Other diffraction techniques used in materials science (neutrons, electrons), examples of applications
- Introduction to large facilities: synchrotron sources and neutron sources, when to use them

Keywords

crystallography, diffraction, Xrays, neutrons, crystalline materials

Learning Outcomes

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

- Students are supposed to: be familiar with symmetry operations,
- be able to recognise/identify symmetry,
- be familiar with the formalism of direct and reciprocal space,
- understand and perform stereographic projection,
- be able to analyse simple Laue and powder diffraction patterns,
- know different diffraction methods used for single crystals and polycrystalline systems,
- interpret diffraction data from scientific publications,
- be familiar with use and possibilities of large X-ray and neutron facilities for material science

Expected student activities

lectures and excercises during the lectures

Assessment methods

oral exam with time for preparation

Resources

Bibliography

- The Basics of Crystallography and Diffraction, C. Hammond, Oxford University Press 2009, ISBN:978-0-19-954645-9
- Elements of Xray Diffraction, B.D. Cullity, S.R. Stock, ISBN 0-201-61091-4

Ressources en bibliothèque

- Elements of Xray Diffraction / Cullity
- The Basics of Crystallography and Diffraction / Hammond

Notes/Handbook

pdf of notes will be available