FKF3420 Synchrotron Characterization Methods in Fibre and Polymer Technology - Theory 2.0 credits

Synkrotron karaktäriseringsmetoder för Fiber och Polymerteknologi - Teori

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for FKF3420 valid from Autumn 2017

Grading scale

G

Education cycle

Third cycle

Specific prerequisites

Prerequisites:

M.Sc. in chemistry, physics or comparable areas

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The aim of this PhD course is to give a theoretical introduction into synchrotron-based characterization methods, which are especially useful for fibre and polymer technology, ranging from bulk material to thin films. It provides knowledge on the different scattering, diffraction and imaging methods used in this field. The methods instructed will be applied to current topics in fibre and polymer technology.

After completing the course, you should be able to explain the principles of synchrotron radiation generation and focusing;

Explain the functioning of a beamline at a 3rd generation synchrotron source;

Deduce key features in scattering pattern

Analyze quantitatively atomistic and nanoscale information from experimental data.

Course contents

Theoretical descriptions on:

- X-ray interaction with matter
- Basics of synchrotron radiation & x-ray sources
- Refraction and reflection from interfaces
- Diffraction: X-ray diffraction, grazing incidence wide-angle X-ray scattering
- Scattering: X-ray reflectivity, small-angle X-ray scattering, grazing incidence small-angle X-ray scattering
- Coherence: Coherent diffraction imaging, X-ray Photon Correlation Spectroscopy

Applied examples of in situ and operando will deepen the understanding.

Disposition

Course organization:

10 lecture hours, 6 hours excercises and individual home assignments.

Course literature

J. Als-Nielsen, D. McMorrow: "Elements of modern X-ray Physics", John Wiley & Sons, New York 2011

J. Daillant, A. Gibaud (Eds.): “X-ray and Neutron Reflectivity”, Lecture Notes in Physics, Springer, Heidelberg, 2009

T.A. Ezquerra, M. Garcia-Gutierrez, A. Nogales, M. Gomez (Eds.): “Applications of synchrotron light to scattering and diffraction in materials and life sciences.”, Lecture Notes in Physics, Springer, Heidelberg, 2009

Examination

Based on recommendation from KTH’s coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

Course requirements:

Fulfilled home assignment.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.