GHENT UNIVERSITY

Course Specifications

From the academic year 2014-2015 up to and including the

Advanced X-ray Spectroscopic Techniques for Chemical Analysis (C002961)

Course size (nominal values; actual values may depend on programme)

Credits	3.0	Study time	75 h	Contact hrs	15.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	English	lecture	15.0 h

Lecturers in academic year 2018-2019

Vincze, Laszlo	WE06	lecturer-in-charge

Offered in the following programmes in 2018-2019	crdts	offering
Master of Science in Chemistry	3	A
Master of Science in Chemical Engineering	3	A
Master of Science in Chemical Engineering	3	A
Exchange Programme in Chemistry (master's level)	3	A

Teaching languages

English

Keywords

X-ray spectroscopy, Monte Carlo simulation, synchrotron radiation, XRF, XAFS, XANES, EXAFS

Position of the course

This course provides a detailed knowledge of the principles of the most important analytical methods based on advanced X-ray induced (micro)spectroscopic techniques which make use of either laboratory or synchrotron radiation sources. The course discusses in detail the principles of chemical/structural analysis on the microscopic level by X-ray absorption/emission techniques. Special attention is given to the use of synchrotron radiation for trace-element microanalysis, absorption microspectroscopy and novel X-ray imaging methods such as transmission, phase-contrast and fluorescence microtomography. Throughout the course, examples of applications of the discussed techniques will be given in the field of materials science, geochemistry, archaeology and environmental science.

Contents

- Quantitative X-ray fluorescence (XRF) spectroscopy
- Monte Carlo simulation for XRF
- Complementary information on X-ray interactions with matter (polarisation effects in X-ray scattering, Doppler effect in Compton scattering, X-ray resonant Raman scattering, effects of secondary photoelectrons via impact ionisation and photoelectron bremsstrahlung)
- X-ray absorption spectroscopy (XAS) using synchrotron radiation

Initial competences

Having followed successfully the course "Spectroscopische analysemethoden / Spectroscopic Methods of Analysis" or having achieved these competences in an alternative way.

Final competences

The student has a thorough knowledge of the concepts of advanced X-ray (micro) spectroscopic methods for chemical analysis. He/she knows how to apply them in specific applications.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture

Learning materials and price

English syllabus Cost: 8 EUR

References

R. E. Van Grieken, A. Markowicz (eds.), "Handbook of X-ray Spectrometry", second edition, Practical spectroscopy series, Marcel Dekker, New York, 2002.
K. Tsuji, J. Injuk, R. E. Van Grieken (eds.), "X-Ray Spectrometry: Recent Technological Advances", John Wiley & Sons Ltd., Chichester, 2004.

Course content-related study coaching

Interactive support through Minerva, personal: upon electronic appointment.

Evaluation methods

end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period

Written examination

Examination methods in case of periodic evaluation during the second examination period

Written examination

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

not applicable

Calculation of the examination mark

Written exam counts for 100 %.