Course Specifications
Valid as from the academic year 2019-2020

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

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

Credits 6.0                      Study time 152 h          Contact hrs 47.0 h

Course offerings and teaching methods in academic year 2020-2021

A (semester 1)  English  Gent  lecture  35.0 h  demonstration 12.5 h

Lecturers in academic year 2020-2021

Adriaens, Mieke  WE06  lecturer-in-charge

Offered in the following programmes in 2020-2021

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<th>Programme</th>
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<td>Master of Science in Teaching in Science and Technology (main subject Chemistry)</td>
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<td>A</td>
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<tr>
<td>Master of Science in Chemistry</td>
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Teaching languages

English

Keywords

Chemical surface analysis, electron interaction, photon interaction, ion interaction, local probe methods

Position of the course

- Acquiring an overview in the current state-of-the-art surface analysis techniques
- Understanding the principles of these techniques together with their capacities in various types of applications

Contents

1 General introduction on surfaces
   • Why study surfaces?
   • How do we define a surface?
   • Which information do we obtain?
2 Methods based on electron interaction
   • Interaction of electrons with matter
   • Overview of techniques based on electron interaction
   • Transmission electron microscopy (TEM) and electron energy loss spectroscopy (EELS)
   • Scanning electron microscopy (SEM, SEM-EDS, EPMA …)
   • Auger electron spectroscopy (AES, SAM)
3 Methods based on photon interaction
   • Interaction of photons with matter
   • Overview of techniques based on electron interaction
   • X-ray photoelectron spectroscopy (XPS)
4 Methods based on ion interaction
   • Interactions van ions with matter
   • Overview of techniques based on ion interaction
   • Secondary ion mass spectrometry (SIMS)
   • Rutherford backscattering (RBS)
   • Particle Induced X-ray Emission (PIXE)
5 Local probe methods
   • Principle
   • Scanning probe microscopy (SMP)
   • Scanning force microscopy (SFM)
   • Scanning tunnelling microscopy (STM)
   • Atomic force microscopy (AFM)
6 Case studies in which a combination of the above-mentioned techniques are use
For each of the methods listed above we will discuss principle, instrumentation, type of
demonstrations, lecture, chemistry obtained and a set of applications.

Initial competences
Completion of the course Physics and Analytical chemistry or having mastered the
corresponding competences in another way.

Final competences
1. The student has an overview of methods for chemical surface analysis, their
   application area, capabilities and limitations.
2. The student is aware of and can explain the basic operating principles of analytical
   instrumentation for chemical surface analysis.
3. The student is capable of suggesting and appropriate analytical technique for a given
   chemical problem in this context.

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
Demonstration, lecture

Learning materials and price
Estimated cost: 15 EUR
English lecture notes
Documents available through Ufora

References
D.J. O’Connor, B.A. Sexton, R. St. C. Smart (Eds.), “Surface Analysis Methods in
Materials Science”, Springer Series in Surface Sciences 23, Springer-Verlag, Berlin,
1992
J. Vickerman (Ed.), “Surface Analysis: the Principal Techniques”, Wiley, Chichester,
1997

Course content-related study coaching
Through individual feedback by lecturer
Interactive guidance through Ufora

Evaluation methods
end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period
Written examination with open questions

Examination methods in case of periodic evaluation during the second examination period
Written examination with open questions

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation
not applicable

Extra information on the examination methods
Evaluate understanding of basic concepts and being apply to them in concrete problem
cases.

Calculation of the examination mark
written exam: 100%