MSE-351

Surface analysis

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Cursus	Sem.	Type
Materials Science and Engineering	MA1, MA3	Opt.

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	Written
Workload	90h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
TP	1 weekly
Number of positions	

Summary

The course treats the main surface analysis methods for the characterization of surfaces, interfaces and thin films. It discusses how these methods can be applied to gain specific knowledge about structural, chemical and functional properties of surfaces and thin films.

Content

1. Introduction
2. Introduction to electronic states on atoms
3. Photo Electron Spectroscopy and Chemical Analysis (ESCA/XPS)
4. Auger Electron Spectroscopy (AES)
5. Secondary Ion Mass Spectrometry (SIMS)
6. Depth profiling
7. Electron diffraction from surfaces
8. Scanning Tunnelling Microscopy (STM)
9. Atomic Force Microscopy (AFM)
10. Quantitative measurements of surface properties with AFM

Keywords

electronic states on atoms, angular momentum, spin, particle wavelength, photoélectrons, energy analyzers, chemical composition, interatomic forces like van der Waal's, surface topography, image of magnetic and piezoelectric responses

Learning Outcomes

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

- Describe the main features of surface analysis
- Differentiate advantages and disadvantages
- Choose the appropriate methodes

Transversal skills

- Use a work methodology appropriate to the task.
- Access and evaluate appropriate sources of information.
- Evaluate one's own performance in the team, receive and respond appropriately to feedback.

Teaching methods

ex-cathedra and exercises

Expected student activities

learn, look up, make exercises

Assessment methods

written exam

Resources

Bibliography

Leonard C. Feldmann and James W. Mayer, Fundamentals of surface and thin film analysis , North-Holland, (Elsevier) 1986
Hans Jörg Mathieu, Erich Bergmann, and René Gras, Analyse et technologie des surfaces , Presses polytechniques et universitaires romandes, 2003.
D.J. O¿Connor, B.A. Sexton, R.St.C. Smart (eds), Surface analysis methods in materials science , Springer, 2003.

Ressources en bibliothèque

- Analyse et technologies des surfaces / Mathieu
- Surface analysis methods in materials science / Connor
- Fundamentals of surface and thin film analysis / Feldman

Notes/Handbook

copies of foils, script available as pdf file