MSE-465

Thin film fabrication technologies

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Cursus	Sem.	Type
Materials Science and Engineering	MA2, MA4	Opt.

Language of teaching	English
Credits	2
Session	Summer
Semester	Spring
Exam	Oral
Workload	60h
Weeks	14
Hours	**2 weekly**
Courses	2 weekly
Number of positions	

Summary

The students will learn about the essential chemical, thermodynamic and physical mechanisms governing thin film growth, about the most important process techniques and their typical features, including process-microstructure-relationships.

Content

- Introduction (applications, importance, history, overview, vacuum science and technology)
- Major deposition methods with examples and typical applications: evaporation; plasmas, ion beam processing, sputtering; chemical vapor deposition; atomic layer deposition
- Nucleation and growth models, epitaxy
- Film morphology and microstructure
- Interdiffusion, reactions and transformations
- Characterisation techniques of thin films and surfaces
- Mechanical properties of thin films

Examples throughout the chapters mostly from Swiss companies on hard coatings, microelectronics, architectural glass, decorative coatings

Keywords

Plasma and thermal activation
Thin film growth models
Non-equilibrium and equilibrium processes
Ion bombardment & sputtering
Film morphology and micrstructure
Thin film characterisation methods
Mechanical properties
Industrial application of thin films

Learning Prerequisites

Important concepts to start the course

Basic courses on thermodynamics, physics, and chemistry

Learning Outcomes

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

- Describe thin film growth methods
- Explain main mechanisms
- Propose methods according to requirements
- Theorize on the effect of process parameters
- Describe thin film characterisation methods
- Propose thin film characterisation methods according to damage cases or quality control requirement

Transversal skills

- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Access and evaluate appropriate sources of information.

Teaching methods

ex cathedra
exercices
demonstrations

Assessment methods

Written exam

Supervision

Assistants	Yes

Resources

Bibliography

Copies of slides will be distributed via moodle
Recommended books

Moodle Link

- http://moodle.epfl.ch