MSE-619

Nanofabrication with focused electron and ion beams

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Cursus	Sem.	Type
Advanced Manufacturing		Opt.
Materials Science and Engineering		Opt.

Language of teaching	English
Credits	2
Session	
Exam	Oral presentation
Workload	60h
Hours	**28**
Lecture	12
Exercises	8
Practical work	8
Number of positions	**20**

Frequency

Every 2 years

Summary

Nanofabrication with focused charged particle beams (SEM, FIB) and their applications such as lithography, gas assisted deposition / etching, and milling are discussed and the limitations of these processes are developed based on the acquired understanding of the interactions.

Content

- Introduction to Scanning Electron / Ion Microscopes: SEM, Ga-FIB, He-FIB, AuSi-FIB
- Electron / Ion interaction with solids: concepts and simulations
- Analysis with focused electron and ion beams: EDX, EBIC, EBSD, tomography
- Nanofabrication with FIB and FEB: milling, deposition, etching, lithography
- Novel Add-Ons for Nanomanipulation and Nanoanalysis inside electron microscopes: 4-point electrical measurements, positioning systems for nanostructures, magnetic bead detection, mechanical measurements: tensile, bending, and compressive loading of nanostructures, 3D topography with in-situ atomic force microscopy, chemical depth profiling by combined FIB-mass spectroscopy. Live demonstrations: Add-ons, SEM, Dual Beam.

Keywords

FIB, FEB, nanofabrication, integrated setups for in-situ measurements (chemical, mechanical, structural, electronical) of nanostructures and their in-situ synthesis (gas injection)

Learning Prerequisites

Recommended courses

Physics and Chemistry at university level, general concepts of NanoSciences and Fabrication

Assessment methods

Exposé