

MSE-674

Multidisciplinary approach to NPs characterization

Casati Nicola, Lütz Bueno Viviane, Mueller Elisabeth, Testino Andrea

Cursus	Sem.	Type
Materials Science and Engineering		Opt.

Language of teaching	English
Credits	1
Session	
Exam	Written
Workload	30h
Hours	20
Lecture	12
Practical work	8
Number of positions	16

Frequency

Every year

Remark

7-9 January 2025 at PSI

Summary

Four experienced scientists will guide students in nanoparticles (NPs) characterization world with different approaches, from laboratory-based characterization techniques to X-ray scattering and electron microscopy.

Content

The course starts with a general introduction, colloidal stability concepts, and laboratory-based characterization techniques. Then, two sections explore wide and small angle X-ray scattering (WAXS and SAXS) and the information about structure, size, and shape that can be collected in dry NPs and colloids with the support of synchrotron light. Finally, the information accessible via electron microscopy are introduced, such as single particle electron diffraction, tomography, spectroscopy. Each topic consists of about three hours of lecture and about two hours of practical work.

Major contents:

1. Introduction and laboratory methods for NPs characterization, 5h (Dr. Andrea Testino, MER)
2. X-ray diffraction/scattering (WAXS) methods theory and practice, 5h (Dr. Nicola Casati, Group Leader, Beamline Manager)
3. X-ray scattering (SAXS) colloidal systems in liquids theory and practice, 5h (Dr. Viviane Lütz Bueno, Instrumental Scientist)
4. NPs characterization via electron microscopy (SEM, TEM, ED, EDX, tomography) 5h (Dr. Elisabeth Mueller, Group Leader, Electron Microscopy Manger)

Note

Block course done at Paul Scherrer Institut (PSI, Villigen) in three days with final exam. Book you room at PSI guest house well in advance, if needed. The course is in January of February, please check exact days every years. Free auditors accepted. Limited to 16 participants.

Keywords

Nanoparticles characterizarion, particle size. particle shape, colloidal stability, WAXS, SAXS, electron microscopy

Learning Prerequisites

Required courses

Basic scientific background

Learning Outcomes

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

- - Assess / evaluate / modify colloidal stability of a suspension.
- - General knowledge on methods for NPs characterization.
- - Identify which technique is appropriate to assess NPs properties.
- - Critically evaluate information on NPs nature with a multidisciplinary view

Transversal skills

- Demonstrate the capacity for critical thinking
- Access and evaluate appropriate sources of information.
- Plan and carry out activities in a way which makes optimal use of available time and other resources.

Assessment methods

Final written exam

Resources

Notes/Handbook

Detailed bibliography given with the course notes

Moodle Link

- <https://go.epfl.ch/MSE-674>