Adam Mickiewicz University in Poznań

Doctoral School of Exact Sciences AMU

Scattering techniques – DLS and SAXS

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Scientific lecture

Field of science	Physical sciences
Teaching method	Lecture, problem-based learning, laboratory method
Language	English
Numbers of hours	5 h lecture, 15 h laboratory
Aims of the course	The course aims to give students a deep understanding of the fundamental principles, techniques, and applications of various scattering methods in material science, chemistry, physics, and biology. Students will learn how scattering techniques, such as X-ray, neutron, and light scattering, are used to probe materials' structural, dynamic, and chemical properties. The course emphasizes both theoretical understanding and practical skills, enabling students to interpret experimental data, analyze material properties, and apply these methods in real-world research and industrial settings.
Course contents	1. Introduction to scattering, definition of scattering, types of scattering (elastic, inelastic), importance of scattering in material science 2. Selected types of scattering techniques (X-ray scattering -XRD and SAXS; neutron scattering, light scattering – DLS, SLS, ELS 3. Key concepts in scattering include scattering vector (q), Bragg's law, form factor and structure factor, available tools for analyzing results 4. Applications of scattering techniques, advantages and limitations of scattering techniques
Prerequisites and co-requisites	-

Learning outcomes	
On completion of the course PhD candidates will be able to:	**Assessment mode**
understand the principles of scattering; explain the physical phenomena underlying scattering processes; differentiate between elastic and inelastic scattering; describe the relevance of scattering techniques in material analysis, apply Bragg's Law and other scattering equations to interpret diffraction data (E_W01, E_W02)	Written test, report
describe key scattering techniques (X-ray, neutron, light,) and their applications; understand the principles, instrumentation, and applications of X-ray, neutron scattering, or light scattering; compare the strengths and limitations of each scattering technique concerning specific material analysis problems (E_W01, E_W02, E_U01, E_U02, E_U06)	Written test, report
conduct basic scattering experiments and apply safety procedures; apply scattering methods to various fields like nanotechnology, biology, and materials science, collaborate in teams to design and perform	Written test, report

experiments, and communicate results (E_W01, E_W02, E_U01, E_U02, E_U06, E_K01, E_K05)	
Literature	1. Berne, B.J.; Pecora, R. Dynamic Light Scattering: With Applications to Chemistry, Biology and Physics; A Wiley-Interscience publication; Wiley: New York NY, 1976; ISBN 978-0-471-07100-6. 2. Warren, B.E. X-Ray Diffraction; Dover books on physics and chemistry; Facsim. ed.; Dover: New York, 1990; ISBN 978-0-486-66317-3. 3. Furrer, A.; Mesot, J.; Strässle, T. Neutron Scattering in Condensed Matter Physics; Series on neutron techniques and applications; World Scientific: New Jersey, NJ, 2009; ISBN 978-981-02-4830-7. 4. Igor N. Serdyuk,Nathan R. Zaccai, Joseph Zaccai, Methods in molecular biophysics, , Cambridge University Press 2006
Additional information	