

Level of education: **Master**

Field of study: **16.04.01 Technical Physics**

Advanced Quantum and Nanophotonic Systems

SPECIAL SECTIONS OF INORGANIC CHEMISTRY

Credits: 3 ECTS

Semester		Assessment
2 nd semester	3 ECTS	Exam

Course developers: **Andrey Krasilin**

The course focuses on the analysis methods of synthetic or mineral nanomaterials. Choice of an appropriate analytical method has crucial importance in revealing the correlations between structure, composition, and properties of the materials. General trend on in-situ and combined analytical techniques will be also discussed. Students will gain knowledge on essential methods of analysis in inorganic and solid-state chemistry, on their working principles, types of analytical information, and on certain restriction of each method.

Requirements

Course of physics, principles of diffraction.

Course structure

1. Introduction:
Concept of 'composition-structure-property' relation in materials science. Overview of the course.
2. Thermal analysis:
Overview of different techniques for studying sample changes during heating (mass loss, chemical changes, heat effects).
3. Scanning electron microscopy:
Overview of the method and related techniques. Determination of element composition, phase composition, and morphology.
4. Transmission electron microscopy:
Overview of the method and related techniques. Determination of element composition, phase composition, and morphology. High resolution, electron properties.

5. Powder X-ray diffraction:
Overview of the methods. Analytical information that can be extracted from the diffraction pattern.
6. Porous structure:
Methods for porous structure characterization. Porosity. Types of density. Specific surface area.
7. Hydrosilicate nanoscrolls:
Application of the course methods for complex characterization of nanoparticles.

Assessment

- To obtain an assessment of "good" or "excellent", it is necessary to provide proofs of statements and theoretical substantiation of methods, give examples of the application of concepts and theorems to solving practical problems. In addition, the student is invited to answer two additional questions briefly on the topics of the semester.
- Correctly completed homework problems can give student extra points during the exam.

Faculty: **Faculty of Physics**

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Tags: **Inorganic chemistry, 'composition-structure-property' relation in materials science, thermal analysis, scanning electron microscopy, transmission electron microscopy, powder X-ray diffraction, porous structure, hydrosilicate nanoscrolls**