

Level: PhD				
Course title: Synthesis and processing of new materials				
Status: elective				
ECTS: 15				
Requirements:				
Learning objectives Acquisition of modern knowledge about innovative methods of obtaining new materials.				
Learning outcomes Upon completion of the course, students should have developed: - Knowledge of processes and technologies for obtaining materials; - Ability to follow professional literature and prepare presentations of the scientific research results; - Capacity to creatively and independently conduct experiments in order to obtain materials with specific properties; - Ability to realize certain technical solutions.				
Syllabus <i>Theoretical instruction</i> The connection between the processing, structure and properties of materials. The formation of solid particles. Nucleation and crystal growth. Methods of obtaining nanosized powders. Methods of synthesis of nanosized powders from liquid phase (homogeneous precipitation, sol-gel method, hydrothermal synthesis, spray pyrolysis, combustion method). Methods of synthesis from the vapor phase, evaporation/condensation, synthesis in plasma. Methods for functionalization of nanoparticles. Nanocomposites. Methods for preparation of thin solid films: deposition from the liquid phase (dip-and spin-off process, electrophoresis), cathode dispersion; deposition from vapour phase; electric glow discharge; chemical vapour deposition, electrolytic (galvanic) deposition at high current densities, thermal or laser evaporation and condensation in vacuum. Phase diagrams and methods of obtaining amorphous materials. Obtaining glass. Oxide and non-oxide glasses. Obtaining glass by sol-gel method. Obtaining the glass-ceramics. Obtaining amorphous metals. Ceramic fiber pull-out methods. Mechanochemical methods of obtaining materials, mechanical milling and mechanical alloying. Methods of obtaining polycrystalline materials bulk. Processes of forming, drying and sintering. <i>Practical instruction</i> Research work and preparation and presentation of the seminar papers.				
Weekly teaching load				Other:
Lectures: 4	Exercises:	Other forms of teaching:	Student research: 6	