

Subject Area: Chemical engineering and advanced materials

MA Program: Functional materials

1. Educational objectives

The educational objectives of the Master program "Functional materials" include:

- in-depth knowledge of the structure and properties of materials;
- theoretical knowledge in the field of structure and properties of inorganic and organic materials;
- specific cognitive and practical skills for obtaining and characterization of new materials;
- knowledge of the behavior of materials under different operating conditions.

2. Description

The Master's program is designed for candidates with Bachelor or Master degree in Chemistry, Physics or Biology, or in Biotechnology, Ecochemistry, Biology and Chemistry, Physics and Chemistry, Chemistry and Informatics at Sofia University or other universities, or who have graduated from any of the programs of the Universities of Chemical technology.

The educational objective is achieved through introduction of courses involving chemical, physical and technological aspects of preparation and processing of materials. Past experience has shown that specialization in materials science is possible if students have basic knowledge in chemistry, physics and mathematics, obtained in the undergraduate training.

First semester: students are trained in core courses, including basic sections of chemistry and physics of materials, and separate a thorough examination of metallic materials and polymeric materials. One of the main courses is dedicated to nanomaterials and nanotechnology.

Second semester: includes examination of the preparation methods and properties of ceramic materials and nanocolloids. Special attention is paid to instrumental methods for characterizing of the structure and properties of materials of different nature and to their application.

A course project during the first semester and research practice in the second semester are provided, aiming at developing the research skills of the students by working on specific problems of materials science, as well as training them to be able to apply modern methods in the study of materials. The emphasis is on methods for the characterization of nanostructured and nanosized materials.

3. Professional Qualifications

Specialists with higher education qualifications feature Master of Chemical Engineering and Advanced Materials - Functional materials should be able to carry out research, technological implementation and production activities, and in particular:

- preparation of different inorganic and organic materials, composites;
- processing of materials;
- testing of the various mechanical, physical and chemical characteristics of the materials;
- controlled thermal and mechanical treatment of materials in order to improve their properties;

- application of materials in different fields.

The Masters in Materials science should have specific skills and competences to work with modern instrumental techniques and with highly specialized software. The Master in functional materials should have a thorough understanding of the basics in: structure and its relation to the properties of materials, methods of production of basic inorganic and organic materials, methods of materials processing, protection of materials from damaging effects, methods for analysis of different types of materials. The Master in functional materials should have the specific skills to work with equipment for analysis and quality control of materials.

4. Professional Realization

The students who have acquired Master degree in Chemical Engineering and Advanced Materials - Functional materials can work in:

- the industry – in the preparation of a variety of materials, both inorganic and organic;
- in control laboratories - testing the properties of different materials;
- in different fields of chemistry and physics.