Material science and Engineering

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Faculty	Faculty of Materials Science and Technology
Type of study	Doctoral
Language of instruction	English
Code of the programme	P0788D270004
Regular period of the study	4 years
Coordinating department	Department of Materials Engineering and Recycling
Coordinator	prof. Ing. Bohumír Strnadel, DrSc.
Keywords	structure of materials, properties of materials, material engineering, degradation processes, testing method

About study programme

The doctoral program „Material Science and Engineering“ is a modern interdisciplinary program. It is built on a deep knowledge of the structure of conventional and specially materials, their utility properties and mechanisms of their degradation. It includes the field of the evaluation of mechanical and physical properties, the diagnostics of the chemical constitution and material structure, including the diagnostics of defects in materials as well as their recycling.
The aim of the doctoral program „Material Science and Engineering“ is to train the students for the independent creative scientific-research activities in the broad field of material engineering based on needed theoretical knowledge and experimental abilities using current modern experimental techniques.

Graduate's employment

Graduates of the doctoral program „Material Science and Engineering“ have wide employment opportunities on the labour market due to their flexibility. This study program will prepare highly skilled professionals with employment possibilities in scientific-research and development services, as well as in the management and production sphere of the given branch and related branches.
Graduates have the potential to be employed as a research staff, material specialists and technologists in a wide range of companies and enterprises engaged in the production, processing, recycling of advanced technical materials and nanomaterials, as well as companies engaged in the evaluation of their properties, prediction of their lifetime and, last but not least, in sales. Graduates can also be employed as scientific, research or pedagogical staff at universities and research institutions, as technologists in companies dealing with the treatment and recycling of secondary raw materials.

Study aims

The doctoral program „Material Science and Engineering“ is a modern interdisciplinary program based on a broad natural-science background. It is built on a deep knowledge of the structure of conventional and specialty materials, including nanomaterials, their utility properties and mechanisms of their degradation, both in normal conditions and under extreme exposure. As for specialty materials, the program is perspective focused mainly on titanium alloys, nickel and/or cobalt based superalloys, and cobalt, and shape memory alloys. Specialty materials represent also combinations of different types of materials to form composite materials with unique properties. These are both clay-based friction composites used in automobile braking systems as well as ceramic and antibacterial nanocomposites applied in biomedicine and finally sandwich composite materials based on polymers for the transport infrastructure. This also relates to the issues of surface treatment of the reinforcement elements of these systems to ensure high compatibility between the matrix and the reinforcing components. The character of the program is also directed to the field of modern technologies for their preparation and includes the area of the evaluation of mechanical and physical properties, the control of chemical constitution and material structure, including the diagnostics of defects in materials and finally the selection of materials for different applications. Due to the growing importance of the ecological production and introducing clean technologies, it also

focuses on issues of material recycling.
The aim of the doctoral program „Material Science and Engineering“ is to train highly educated, adaptable professionals with a comprehensive knowledge and skills, capable of independent creative activities in the field of material engineering in basic research and development area as well as in the management and production sphere of the given branch and related areas.

Graduate's knowledge

The graduate of this study program will be equipped with a broad theoretical knowledge, supplemented by specific practical skills and experience from industrial enterprises possessing the material technologies and from internships at foreign universities, with an excellent knowledge of languages and experience in science and research cooperation in international scientific teams.
Graduates of the doctoral program „Material Science and Engineering“ will gain broad theoretical knowledge of progressive technical materials and practical expertise in advanced experimental procedures for the evaluation of their properties, including mastering the experimental techniques needed to achieve the objectives of the dissertation. They will acquire the theoretical foundations within properly selected subjects, whose offer covers both subjects of physical and mathematical characters, and the special material subjects ranging from the internal structure of materials, through the phase transformations, influencing of the utility properties by the structural change or surface treatment, the selection of materials for specific conditions of use to the degradation processes and recycling of materials. They will also gain knowledge in the field of preparation, characterization and applications of nanomaterials in a wide range of human activities, including industrial applications.

Graduate's skills

Graduates are able to design and apply advanced research methods, use them in their research to achieve original results, and thereby contribute to the expansion of knowledge in a given field of science. The emphasis in the professional skills of students of the doctoral program „Material Science and Engineering“ is placed on the development of independent creative thinking, especially in the interpretation of obtained results, on the study of the current state of knowledge in the given field and on the ability to present the obtained results to the professional community. Students are encouraged to participate actively in national and international conferences.

Graduate's general competence

Graduates of the doctoral study program will be able to formulate a scientific problem independently, to analyse it and to implement its solution in a creative way. They will apply modern experimental techniques and critically confront the obtained results with literature citations. Based on professional internships, they intensified the connection of theory with practice and their ability to communicate with the professional community both in the Czech Republic and abroad. They will acquire teamwork skills.

Study curriculum

- form Full-time (en)
- form Part-time (en)