

Physics of Extreme States of Matter (Condensed matter physics)

National Research Nuclear University MEPhI (Moscow Engineering Physics Institute)

Degree or qualification is awarded: **Researcher. Lecturer-researcher**

Language of study: **Russian, English**

Mode of study: **full-time**

Duration: **4 years**

Availability of free education: **yes**

Price: **325 000 rubles per year**

Programme curator: **Kalin B.A,**

Tel.: **Contact name: Olga N. Petukhova, Phone number. +74957885699, ext. 8045.**

E-mail: ONPetukhova@mephi.ru

Program objectives: Preparation of postgraduates able to work successfully in the field of condensed state physics, to conduct high-level research and development in this area, to develop new structural and functional materials, as well as physical models underlying their preparation. Preparation of highly qualified specialists that possess universal and subject-specialized competences contributing their social mobility and stability in the labor market.

Basic department: Department of Materials Science (Dept. No. 9)

StrAU: Institute of Nuclear Physics and Technologies

Field of the professional activity: the spheres of science, techniques, technologies and pedagogy covering a set of tasks of the direction "Physics and Astronomy", including solution of the problems that require the use of fundamental knowledge in the field of physics and astronomy, including: modeling of processes and phenomena occurring in the solid under radiation action; development of structural and functional materials with a specified complex of properties, including high-temperature, radiation- and corrosion-resistant ones, with consideration for the stabilization principles of structural-phase states; obtaining of the skills of theoretical and experimental studies of the structure, composition and properties of materials; investigation of the structural-phase state and physical-mechanical properties of structural and functional materials after various types of treatment, including radiation action; modification of structural materials using ion-beam and plasma technologies in order to improve their corrosion, erosion and tribological properties.

Objects of the professional activity: physical systems of various scale and levels of organization; innovative technologies of experimental and theoretical research in the field of physics; structural, fuel and functional materials of nuclear and fusion reactors; processes and phenomena occurring in the solid under radiation action; methods to design advanced materials using multiscale mathematical modeling and corresponding software; ion-plasma technologies of modifying the surface of various materials; methods and tools for the analysis of the structural-phase state of materials, including electron and atomic force microscopy, X-ray equipment and sources of charged particles; methods and means to determine the complex of physical characteristics of materials (mechanical, thermal, optical, electrophysical and others) that correspond the objectives of their practical use.

Features of the curriculum: The main feature of the educational process is the fundamental physico-mathematical and engineering preparation that allows mastering the main basic and special disciplines. The program promotes the development of skills of independent research work on a high professional level with self-esteem of the executed works. The emphasis in the educational process is made on the practical application of the acquired knowledge. Research and training are implemented in close connection with the works carried out at the Department of Materials Science and in the scientific organizations of the State Corporation "Rosatom" and institutes of the Russian Academy of Sciences (NRNU MEPhI, NRC "Kurchatov Institute", A.A.Baikov IMET RAS, NPO "Luch", A.A.Bochvar VNIINM and others).

Graduates of the department will get knowledge for solving a wide range of problems, primarily, such as:

- Theoretical and experimental study of the physical nature of the properties of metals and alloys, inorganic and organic compounds, dielectrics both in the solid and amorphous states depending on their chemical and isotopic composition, temperature and pressure;
- Study of the experimental state of condensed substances (high compression, shock effects, change of gravitational fields, low temperatures), phase transitions in them and their phase equilibrium diagrams;
- Modeling of processes and phenomena occurring in the solid;
- Development of experimental methods to study physical properties and create the physical fundamentals of the industrial technology of obtaining materials with specified properties;
- Development of techniques to improve the service performance of the materials of structural components of nuclear and fusion reactors.

List of enterprises for the practical training and employment of graduates: Russian scientific centers; enterprises of the SC "Rosatom"; RAS institutes.

Specializations within this programme