

Graduation Department: Department of Molecular Physics

Form of study: full-time Study period of 4 years

Program Curator: Associate Professor Ivan Tronin, e-mail: IVTronin@mephi.ru

Program objective:

The purpose of the program is the preparation by a postgraduate student of a dissertation for the degree of PhD in Physics and Mathematics or in Engineering sciences in the field of physics of kinetic phenomena. Students are involved in theoretical and experimental studies of non-equilibrium processes in the field of separation of isotopic and molecular mixtures, physical kinetics of cooperative atomic phenomena and processes, physics of “smart” systems and materials, extreme gas dynamics of fast hypersonic flows, gas dynamics of flows in superstrong fields, magnetic hydrodynamics of electrically conductive media, physical fundamentals of mass spectrometry and mobility spectrometry, physics of membrane separation processes. Students have the opportunity to choose a training specialization focused on the theoretical or experimental study of physical phenomena and processes, the development of experimental equipment and experimental installations, as well as the development of computer models using modern high-performance computing systems.

Research and professional activity:

1. Fundamental, theoretical and experimental studies of the molecular and macroproperties of substances in the solid, liquid and gaseous state for a deeper understanding of the phenomena occurring during thermal processes and aggregate changes in physical systems, the study of collective effects in nanosystems and low-dimensional systems.
2. Research and development of recommendations for improving the quality and improving the thermophysical properties of substances in liquid, solid (crystalline and amorphous) states for subsequent commercial use. Study of properties and development of “smart” materials and systems.
3. Inhomogeneous aerodisperse systems, physics of membrane separation processes, mass spectrometry and mobility spectrometry.
4. Theoretical and technical thermodynamics, the theory of phase transitions, extreme hydrodynamics and gas dynamics, magnetohydrodynamics of electrically conductive media.
5. Numerical and natural modeling of thermophysical processes, hydrodynamic flows in superstrong fields, magnetohydrodynamic flows, flows of rarefied and dense gases, processes of separation of binary and multicomponent isotopic and molecular mixtures.’

Practical training and professional opportunities:

- National Research Center “Kurchatov Institute”
- The Federal State Unitary Enterprise Dukhov Automatics Research Institute (VNIIA)
- A.V.Topchiev Institute of Petrochemical Synthesis, Russian Academy of Science

Students defend PhD thesis in the Dissertation Council of National Research Nuclear University MEPhI