Division: *Institute of Natural Sciences and Mathematics, Department of Ecology and Chemical Engineering*

Academic programme: *18.04.02 Energy- and Resource-saving Processes in Chemical Engineering, Petrochemistry and Biotechnology, Reagent-free (Photocatalytic) Water Treatment*

Mode of study: *full-time*

Programme length: *2 years*

Programme level: *Master's degree*

Programme description: *The educational programme is carried out in the form of project-based learning.*

The goal of the project is to develop and implement a new reagent-free, waste-free approach to the photocatalytic destruction of difficult-to-oxidize organic pollutants.
Project objectives:

- *adjusting the properties of catalysts for the destruction of phenol and cyanides, while the presence of other industrial impurities should not interfere with the main process of destruction;*
- *study of the kinetics of photodegradation, the kinetics of deposition of catalyst granules, the development of a mathematical model for the processes of water purification and the extraction of catalyst grains, the theoretical and experimental determination of the optimal performance characteristics of the granules;*
- *calculation, design development and manufacturing of a pilot water treatment plant according to the requirements of Magnitogorsk Iron & Steel Works;*
- *development of a method for modifying the surface of photocatalysts to give them the required properties;*
- *development of a line of catalysts for specific production;*
- *involvement of other industrial partners;*
- *creation of a high-tech enterprise for the production of catalysts.*

Each Master's degree student performs work in the direction associated with subsequent professional activities.

Objects of professional activity of the students:

- *biological and chemical objects and their impact on the environment;*
- *methods and devices for monitoring pollution of gas, solid and liquid components of production and the environment;*

- *waste disposal and recycling systems;*
- *methods and means of protecting the environment from anthropogenic impact.*

Our graduates have great career opportunities both in enterprises and in science. The graduates have competencies in:

- *the creation, implementation and operation of energy and resource-saving, environmentally friendly technologies in the production of basic inorganic substances, products of basic and fine organic synthesis, polymeric materials, oil refining products, etc.;*
- *the development of methods for managing industrial and household waste and raw materials.*

Main programme-specific classes:

- *Membrane Technologies and Equipment for Wastewater Treatment*
- *Current Trends in the Development of Membrane Technologies*
- *Simulation of Biospheric Processes for the Purposes of Energy and Resource Saving*
- *Simulation of Natural Processes*
- *Simulation of Technological Processes*
- *Renewable Energy Sources*
- *Environmental Problems of Traditional Energy*
- *Aquatic Ecotoxicology*
- *Soil Toxicology*
- *Ultra- and Nanodisperse Systems and Technologies*
- *Geoecology of Water Bodies*

Programme manager: *Viacheslav V. Avdin, Doctor of Sciences (Chemistry), Associate Professor, Head of the Department of Ecology and Chemical Engineering*