



Condensed Matter and Interphases

Kondensirovannye Sredy i Mezhfaznye Granitsy
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90th anniversary of the Department of Physical Chemistry of Voronezh State University

The Department of Physical Chemistry as an independent structural subdivision of Voronezh State University (VSU) was founded in 1932. The first head of the Department was Professor N. V. Kultashev, a well-known scientist of the scientific school of the outstanding physical chemist Gustav Tamman at Yuriev University. Since 1924, academic work and extensive scientific research has been carried out at VSU in the field of physical chemistry. These were started under the leadership of N. V. Kultashev. The study of the processes of vacuum evaporation of zinc from alloys with silver and copper for the production of metal membranes concluded with the defence of a Ph.D. thesis by associate professor F. A. Santalov, who was head of the Department from 1938 to 1939. In the period from 1942 to 1954, associate professor S. A. Kretinin was the head of the joint Department of Physical and Colloidal Chemistry.

Since 1939, research into electrochemical corrosion has performed at the Department of Physical Chemistry of Voronezh State University. Assistant A. Ya. Shatalov, under the supervision of Prof. N. V. Kultashev, for the first time performed measurements of the electrode potentials of antimony and other metals. The studies interrupted during the Great Patriotic War were resumed by Associate Professor A. Ya. Shatalov in 1950. The corrosion behaviour of metals in solutions with various acidity was investigated. The defence of his doctoral thesis at the Institute of Physical Chemistry of the Academy of Sciences of the USSR (Moscow) by A. Ya. Shatalov was a notable event that confirmed the productive application of the theory of electrochemical kinetics for the description of corrosion processes on metals in electrolyte solutions. Since 1956, under the guidance of Professor A. Ya. Shatalov, intensive research has been carried out at the

Department of Physical Chemistry relating to the electrochemical corrosion of metals.

In 1979 Professor I. K. Marshakov, became the head of the department and guided systematic studies on anodic dissolution and the selective corrosion of alloys, which he started back in 1958. Professor I. K. Marshakov is one of the founders of a new area in corrosion science, "Electrochemistry and the corrosion of alloys".

A significant contribution to the general theory of alloy dissolution with an analytical description of kinetic regularities was made in the doctoral thesis of A. V. Vvedensky, who was head of the Department from 2000 to 2019. For the first time, a fairly complete and consistent physicochemical model of the anodic dissolution of a homogeneous alloy was presented in the thesis. Professor A. V. Vvedensky continues to actively work at the department and he is the chairman of the dissertation board on physical chemistry, inorganic chemistry, and electrochemistry.

The current head of the Department of Physical Chemistry of VSU is Doctor of Chemical Sciences, Associate Professor O. A. Kozaderov. In his thesis (2016) he established the physicochemical regularities of the formation and development of a nonequilibrium surface layer at the alloy/solution interface under conditions of simultaneous unsteady diffusion processes, phase transformations, and changes in surface morphology.

The main scientific area of the Department of Physical Chemistry of VSU is "Thermodynamics and kinetics of heterogeneous processes in metal and metal-polymer systems with electrochemical, chemical, adsorption and transport stages as a scientific foundation for the creation of new principles of electrocatalytic reaction



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control, production of highly active electrode materials and the creation of new principles of electrocatalytic reaction control". Fundamental research is carried out within the framework of the state task for universities in the area of scientific research of the Ministry of Science and Higher Education, grant projects of the Russian Science Foundation and the Russian Foundation for Basic Research, the federal scientific and technical programme of development of synchrotron and neutron techniques and research infrastructure and other science support programmes.

The Department has educational and scientific laboratories for electrochemistry and the corrosion of metals and alloys, photoelectrochemistry, the physical chemistry of metal/polymer systems, electrocatalysis, and the electrodeposition of metals and alloys. The workplaces of researchers, teachers, and students are equipped with modern electrochemical stations (IPC-Compact, IPC-Pro L, IPC-Pro MF, P-20X, P-40X, etc.) and computers with specialised software (Comsol Multiphysics, Mathematica, Matlab), which allow them to conduct scientific research at a high level.

Academic cooperation between the Department of Physical Chemistry of Voronezh State University and scientific Russian and foreign organisations is successfully developing. A joint laboratory of Voronezh State University and the A. N. Frumkin Institute of Physical Chemistry and Electrochemistry of the Russian Academy of Sciences "Adjoint processes in Electrochemistry and Metal Corrosion" was created. International projects with the National Chemical Engineering Institute in Paris (France) and the National Institute of Technology in Kurukshetra (India) are supported by national governments. Interactions with real economy enterprises were established and based on requests from these organisations, commercial R&D projects

are carried out. The results of fundamental and applied research are used in solving urgent problems in the field of electrochemical and hydrogen energy, in the synthesis of functional coatings for micro- and nanoelectronics, in the development of effective methods of anti-corrosion protection.

The training of staff for specialised sectors of the economy is carried out at the department within the framework of training courses and practical sessions in physical chemistry and electrochemistry, chemical current sources and electrochemical technologies, quantum chemistry and computer modelling of electrochemical systems, physical chemistry of adsorption processes and thermodynamics of irreversible processes, methods of protection against corrosion. The graduates of the department work at the enterprises of the electronic, energy, and food industries (OAO "Concern SOZVEZDIE", OAO NIIPM, AO NIET, AO VZPP-Mikron, Novovoronezh nuclear power station, GC "EFKO", etc.), in medical organisations, pharmaceutical companies and environmental laboratories (Rospotrebnadzor, AO Binergia, Binnopharm group, OOO DNA-Technologies, etc.), teach at schools and universities, conduct research in scientific organisations (A. N. Frumkin Institute of Physical Chemistry and Electrochemistry and other institutes of the Russian Academy of Sciences).

Today the Department of Physical Chemistry is the core of the dynamically developing and somewhat original Voronezh School of Electrochemists and Corrosionists. Congratulations to the staff of the Department of Physical Chemistry of Voronezh State University on its 90th anniversary and wishes for future successes in education and new scientific achievements!

*The Editorial board
of the journal Condensed Matter and Interphases
Translated by Valentina Mittova*