
CHRONICLE

Professor Krylov Is 80

September 13, 2004, was the 80th birthday of Oleg Valentinovich Krylov, a prominent scientist in the field of heterogeneous catalysis, Doctor of Sciences, and Professor.

Krylov was born in Ivanovo. In 1947, he graduated from the Ivanovo Institute of Chemical Engineering as a specialist in production of inorganic substances and took a postgraduate course at the Institute of Physical Chemistry of the USSR Academy of Sciences. Under the supervision of Simon Zalmanovich Roginskii, Corresponding Member of the USSR Academy of Sciences, he received a candidate of sciences degree in 1951. His dissertation was devoted to the catalytic properties of platinum in oxidation and hydrogenation reactions. He was the first to study the activation of platinum by the reaction it catalyzes.

In 1951, Krylov became Junior Researcher at the Laboratory of Catalysis of the Institute of Physical Chemistry; later, he was promoted to the post of Senior Researcher. In 1961, the Laboratory of Catalysis was moved to the Institute of Chemical Physics of the USSR Academy of Sciences (now Semenov Institute of Chemical Physics, Russian Academy of Sciences). There, he began as Senior Researcher and then proceeded on to Head of Laboratory, Head of Department, and, finally, Deputy Director of Institute. At present, he is Chief Researcher. In 1972, he received the degree of Professor.

In 1964, Krylov received a doctoral degree. His dissertation was devoted to selecting nonmetal catalysts. This was the subject of his first book, which was entitled *Catalysis by Nonmetals* (Leningrad: Khimiya). Later, this book was published by Academic Press. In these works, Krylov considered the general features of catalysis by nonmetals (oxides, sulfides, selenides, etc.) and established a correlation between the activity and band gap of semiconductor catalysts.

Krylov's subsequent studies were concerned with coordination mechanisms in heterogeneous catalysis. He demonstrated that the catalytic activity of transition-metal oxides in oxidation reactions depends on the number of d electrons in the metal atom, the d^3 and d^8 systems being the most active.

Krylov's laboratory adapted a variety of physical methods (IR, UV, and Mössbauer spectroscopy; EPR; X-ray powder diffraction) for studying catalysis *in situ* and proved the formation of intermediate surface complexes in oxidation reactions. In those studies, reaction kinetics were traced simultaneously with concentration of surface complexes and changes in catalyst structure.

These experiments allowed the mechanisms of a number of oxidation reactions to be elucidated.

In the mid-1970s, Krylov took an interest in excited molecules and nonequilibrium processes in catalysis. He demonstrated that the energy of exothermic stages of catalysis may excite molecules participating in catalysis and cause restructuring of the catalyst or its surface layer. For example, translationally nonequilibrium states were observed on the platinum surface involved in carbon oxidation.

Krylov has guided not only theoretical but also applied studies. He put forward the idea that multiphase catalysts are necessary for complicated multistage processes such as oxidation of organic compounds. This idea was embodied in active and selective multicomponent catalysts for olefin oxidation into unsaturated aldehydes and unsaturated acids. Laboratory findings in this area were confirmed by carrying out isobutylene oxidation into metacrolein and metacrylic acid at a pilot plant constructed in Chernogolovka on the initiative of Academician Aleksandrov. Under Krylov's guidance, the problem of the catalytic activation of methane was addressed and active and selective catalysts were developed for the oxidative condensation of methane into ethylene. A mechanism was suggested for this reaction, and it was demonstrated that the reaction is controlled by generation of free methyl radicals by the catalyst.

Krylov's study of the deep catalytic oxidation of hydrocarbons served as a basis for the development of so-called catalytic heaters. These heaters were manufactured on a commercial scale and were used in warming car engines in Siberia and the Arctic Region. For these studies, Krylov was awarded a USSR Council of Ministers Prize.

Krylov is the author of approximately 450 articles on heterogeneous catalysis in domestic and foreign journals. He is in possession of approximately 30 inventor's certificates and patents in production of industrially important catalysts and in design of catalytic processes. He has written 12 monographs on catalysis, which deal with the theory of selection of non-metal catalysts, adsorption on semiconductor surfaces, electronic phenomena in adsorption and catalysis, adsorption and catalysis on transition metals, and nonequilibrium processes in catalysis. These monographs have been published both in the Soviet Union (Russia) and abroad. Krylov has recently published a comprehensive textbook entitled *Heterogeneous Catalysis*, which is based on the lectures given by the author (together with Academician Kazanskii) to students of

the Academic College at the Mendelev University of Chemical Technology.

Krylov has been an active participant and organizer of Russian and international conferences and congresses on catalysis. He long represented the Soviet Union and Russia in the International Council of Congresses on Catalysis (together with Academician Boreskov) and headed the Committee for Multilateral Cooperation of the Academies of Sciences of Socialist Countries in Catalysis. He is among the initiators of the Congress on Oxidative Catalysis and represents Russia in the organizing committee. He is on the editorial boards of a number of scientific journals devoted to

catalysis, a member of the American Chemical Society, and a member of academic councils at the Semenov Institute of Chemical Physics and the Zelinskii Institute of Organic Chemistry. He has been the supervisor of 11 Doctoral and 41 candidate of sciences dissertations. He was awarded the Order of Red Banner of Labor, the Order of Honor, and various medals. Over 35 years, Krylov has guided the Moscow Interinstitution Workshop on Catalysis, which is still popular and takes place according to schedule. The editorial board of *Kinetics and Catalysis* congratulates Prof. Krylov on his jubilee and wishes him good health and further success in science.