

Khabib Minachevich Minachev Memorial Address

On March 25, 2002, Khabib Minachevich Minachev, a prominent scientist in the field of catalysis and petrochemistry, Member of the Russian Academy of Sciences, Member of Advisory Board of the Zelinskii Institute of Organic Chemistry, and a science manager passed away.

Academician Minachev was born to the family of a peasant in December 24, 1908, in Novye Bikshi village of Chuvash Republic. He received his first education in the village seven-year school. In 1927, he came to Moscow where he started to work as a building construction employee. In 1929–1933, he studied at the Sverdlov workers' faculty (*rabfak*) and then was admitted to the Department of Chemistry of Moscow State University. Being a student, he worked as a senior laboratory assistant under the supervision of a famous chemist Yu.K. Yur'ev and joined in his research work. In 1939, Minachev started to work at the Institute of Organic Chemistry of the Russian Academy of Sciences (IOC RAS) in the laboratory of organic catalysis headed by N.I. Shuikin. All Minachev's research work is associated with IOC RAS. There, his scientific interests were crystallized and there he grew from a Junior Research Scientist to the vice director, laboratory head, and academician.

Starting from his first works, he showed excellent scientific intuition and an enormous capacity for work, which enabled him to design low-percentage supported metal Pt/C catalysts and study the catalysis of hydrocarbon conversions. World War II interrupted these studies. From September 1942, he was at the front. At the beginning of the war, he was in the ski brigade. He participated in the Battle of Stalingrad. From mid-1943, he was in the tank army, participated in the Korsun-Shevchenko operation, the liberation of Minsk, and the battles for Kenigsberg, Warsaw, and Mlawa. The end of war found him in Schtettin.

In 1945, Minachev returned to Moscow and continued his research. In 1949, he defended his Cand. Sci. dissertation entitled *Finding New Active Forms of Catalysts for the Dehydrogenation of Six-Membered Cyclanes*. These studies were continued: Minachev was the first in our country to develop active and stable catalysts with low concentrations of group VIII metals; he studied the mechanisms of dehydrogenation and isomerization of alkanes and cyclanes and the nature of catalyst poisoning by sulfur-containing compounds. These results were summarized in his doctoral dissertation in 1954 and contributed greatly to the scientific bases of catalytic reforming.



In the late 1950s and early 1960s, Minachev started to explore the catalytic chemistry of rare-earth elements rhenium and zeolites. Studies along these lines were extended after organizing the Laboratory of Catalysis by Rare and Scattered Elements headed by Minachev until 1989. Studies in this laboratory acquired a higher level based on the complex use of physicochemical and kinetic methods for various catalytic systems, the analysis of reaction mechanisms, and on the basis of combining basic research with solving practical problems. An important result of these studies on the catalytic properties of rare-earth elements was the development of catalysts for alkane dehydrogenation together with Yu.S. Khodakov, B.A. Kazanskii, and O.D. Sterligov. Experimental findings along these lines were generalized in the monograph *Rare Earths in Catalysis* (1972, in co-authorship with Yu.S. Khodakov, G.V. Antoshin, and M.A. Markov). A series of studies were devoted to the use of rhenium in catalysis. Together with M.A. Ryashentseva, Minachev discovered the properties of oxides, sulfides, halides, and

other rhenium compounds as catalysts of various organic reactions. In 1983, they published the monograph *Rhenium and Its Compounds in Heterogeneous Catalysis*.

Studies by Minachev and co-workers in the design and application of synthetic zeolite-based catalysts were recognized worldwide. Owing to the specific features of their chemical compositions, crystalline structures, and adsorption ability, zeolites opened new avenues in solving the fundamental problems of theoretical heterogeneous catalysis and the practical problems of petrochemistry and basic and fine organic synthesis. Minachev was one of the first to recognize the value of zeolite systems and he initiated the study of them. He showed that zeolites can serve as catalysts for numerous reactions and discovered 20 such reactions. Minachev and coworkers determined the efficiency of applying different structural types of zeolites for accelerating reactions in an aqueous medium, that is, under conditions of syntheses of pharmaceuticals, plant growth regulators, bioactive compounds, and other materials. The high catalytic activity and selectivity of zeolites was established in the processes of oxidative dehydrogenation of alkylaromatic, naphthene, and olefin hydrocarbons. These studies were summarized in the book *Redox Catalysis on Zeolites* (in coauthorship with V.V. Kharlamov).

Minachev was brought up in the tradition of the Russian school of catalysis. In due course, he understood the importance of information on the structure and composition of the surface and near-surface layers of a substance for the development of ideas on the mechanism of catalytic action. He supervised XPS studies, studies of heteromolecular isotopic exchange, and studied catalyst exposure to ionizing irradiation. The development of the XPS method for solving the problems of adsorption and catalysis was summarized in the monographs *Photoelectron Spectroscopy and Its Application in Catalysis* and *Catalyst Surface: Physical Methods of Studying* (in coauthorship with E.S. Shapiro and G.V. Antoshin). For a series of studies into the main regularities of the formation of highly dispersed metal catalysts carried out using modern physicochemical methods, Minachev received the Balandin Award (1992) from the Presidium of the Russian Academy of Sciences. Minachev was elected as a corresponding member (1972) and a full member (1979) of the USSR Academy of Sciences (now the Russian Academy of Sciences) at the Division of General and Technical Chemistry. For his fundamental studies, Minachev received the Zelinskii Award (1972 and 1987), the

USSR State Award (1977), and the USSR Council of Ministers Award (1976).

Minachev is the author of 7 monographs, more than 100 inventor's certificates and foreign patents, and more than 900 research papers. Many of his papers were published abroad and reported at various meetings and received recognition. Minachev actively participated in international collaborations. For a long time, he coordinated multilateral collaboration in the field of catalysis on zeolites, collaborating with researchers from the United States, Germany, Great Britain, India, Bulgaria, and Vietnam. Scientists from many countries worked in his laboratory.

Minachev was advisor to 50 doctors and candidates of science, who now successfully work in various regions of Russia. In 1973–1988, Minachev was a member and the vice-chair of the Expert Council on Organic Chemistry of the Higher Attestation Commission of the Soviet Union, chair and a member of several specialized councils for defending doctoral and candidate of science dissertations.

Minachev's activity on the organization of science was many sided and fruitful. In 1976–1990, he was a member of the bureau and a deputy academician-secretary (1985–1990) of the Division of General and Technical Chemistry of the USSR Academy of Sciences, chair of and deputy chair of the Scientific Council on Catalysis of the USSR Academy of Sciences, member of academic scientific councils on adsorption and the chemistry of fossil solid fuel, as well as scientific councils of the State Committee on Science and Technology *Catalysis and Its Industrial Use, Complex Processing of Fossil Solid Fuel for Obtaining Synthetic Fuel*, and others, and a member of the Presidium of the Central Administration Board of the Mendeleev All-Union Chemical Society. For many years, Minachev was editor in chief of the journals *Khimiya Tverdogo Topliva* (Chemistry of Solid Fuel) and *Neftekhimiya* (Petrochemistry), deputy editor in chief of *Izvestiya Akademii Nauk SSSR, Seriya Khimicheskaya* (USSR Chemistry Bulletin), member of the editorial boards of *Catalysis Letters*, *Kinetika i Kataliz* (Kinetics and Catalysis), and several other academic journals.

Russian and worldwide science has suffered a loss. We miss a great scientist whose sense of life was in serving science and a wonderful person with very high moral standards. Khabib Minachevich Minachev's studies determined the profile of modern studies in catalysis and petrochemistry. His rich scientific heritage will be a stimulus and a source of inspiration for younger scientists.