

===== HISTORY OF CHEMISTRY AND CHEMICAL TECHNOLOGY =====

Professor Adam Vladislavovich Rakovskii (To 125th Anniversary of His Birthday)

A.V. Rakovskii, a corresponding member of the Academy of Sciences of the USSR and a professor of Moscow State University, performed a wide variety of experimental studies and made a major contribution to the formation of physical chemistry as an independent educational discipline and to the development of chemical education in Russia.

Adam Vladislavovich Rakovskii was born on December 23, 1879, at Mezhirech'e village of Sedlets-kaya Province (now in the Republic of Poland) into the family of a teacher. In 1896, he finished a classical gymnasium at the town of Bela in the same province and entered the natural department of the physico-mathematical faculty at Moscow University. Rakovskii expressed the strongest interest in chemistry beginning from the first years of his education. At that time, chemical sciences were for the most part taught at the University by professor N.D. Zelinskii (1861–1952, academician of the Academy of Sciences of the USSR since 1929); V.F. Luginin (1834–1911), founder of a thermochemical laboratory at the University; and A.P. Sabaneev (1842–1923). I.A. Kablukov (1857–1942, honorary member of the Academy of Sciences of the USSR since 1932), a known physical chemist, was elected extraordinary professor of Moscow University only in May 1903.

In 1903, Rakovskii graduated from the University with a first-degree diploma and, on Zelinskii's recommendation, was taken on the staff of the Central chemical laboratory of the Ministry of Finance as a junior laboratory assistant. The main task of the laboratory was to monitor the quality of alcoholic drinks, in connection with the state monopoly on this kind of products, and also to control the work of provincial laboratories and to improve methods for rectification of ethanol. Most of the staff members of the laboratory were graduates from Moscow University, the operation of the laboratory was supervised by Zelinskii.

Already by the end of Rakovskii's education at the University his scientific interests were mainly focused on physical chemistry, even though no separate discipline of this kind existed at Moscow University in those years. When being an undergraduate, Rakovskii worked at the thermochemical laboratory;



he is the author of an unpublished manuscript "Heats of Combustion and Formation of Organic Substances in the Context of the Structural Theory" (Moscow, 1902) [1]. During his work at the laboratory of the Ministry of Finance, Rakovskii could, in addition to discharging his duties, prepare for publication his first study "Kinetics of Consecutive First-Order Reactions" (1907) [2]. In 1907–1910, the scientist published the results of seven more physicochemical studies. These included "Specific Heats of Solutions in Water and Ethanol" (1909) and "Purification and Rectification of Ethanol" (1909). In 1911–1914, a set of 11 publications concerned with the adsorption of water and aqueous solutions by starch appeared in *Zhurnal Russkogo Fiziko-khimicheskoro Obshchestva* (Journal of the Russian Physicochemical Society). The results of these studies were summarized in Rakovskii's master's dissertation "To the Theory of Adsorption" (1913), defended at Kiev University in 1914. Based on the results of his experiments, Rakovskii, in particular, concluded that the adsorption of water vapor by solid colloids occurs continuously and irreversibly. The irreversibility of the adsorption process is manifested in that there exists a hysteresis of the water content in the colloid. This set of publications devoted to adsorption was analyzed in detail by

Ya.I. Gerasimov and A.V. Kiselev in the collection of works [2]. The authors highly appreciated Rakovskii's studies in the field of adsorption and thermodynamics of irreversible processes.

After the degree of master of science was conferred on Rakovskii, he became a privatdocent at the chair of chemistry of Moscow University and started to deliver lectures on chemical thermodynamics and application of mathematics to chemistry. Because of the beginning of World War I, Rakovskii took active part, as a staff member of the Ministry of Finance, in the equipment of plants for manufacture of the necessary medicines. In 1917, he was appointed head of the Central chemical laboratory of the Ministry of Finance and supervisor of chemical plants affiliated with this Ministry (beginning in 1918, People's Commissariat of Finance).

In 1919–1932, Rakovskii headed the laboratory of inorganic chemistry at the Institute of Pure Chemical Reagents, in whose organization he was directly involved. Beginning in 1920, the scientist started to pay increasing attention to Moscow University, without terminating his work at industrial research institutes. In 1920–1928, Rakovskii was a professor at the chair of inorganic chemistry of Moscow University; in 1928–1930, he headed this chair; and from 1930 till the end of his life, he headed the chair of physical chemistry of Moscow State University. From 1933 to 1937, he simultaneously occupied the positions of dean of the chemical faculty and director of the Institute of Chemistry at Moscow State University. Rakovskii was a talented and many-sided teacher.

During the period from 1919 to 1933, Rakovskii and co-workers carried out, mainly at the Institute of Pure Chemical Reagents, quite a number studies. He published in *Trudy Instituta* (Coll. of Works of the Institute), *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), *Zhurnal Obshchei Khimii* (Journal of General Chemistry), and other editions results of 33 studies. These include important investigations concerned with equilibria in water–salt systems, development of standards and standard procedures for testing of chemical reagents (including acids and alcohols), and a set of studies devoted to heteropolyacids and heteropolycompounds. All investigations performed by Rakovskii and his pupils are distinguished by extraordinary thoroughness in experimental work and assessment of the results obtained. Rakovskii made a major contribution to the organization of manufacture of various high-purity preparations. During several years, he was a consultant at Gintsvetmet and Giredment institutes. A collection of thermody-

namic works carried out by staff members of the Gintsvetmet institute was published under Rakovskii's editorship (1935).

Rakovskii's services in organization of the higher chemical education in our country were great, he was actively involved in composition of curricula and programs of chemical higher-school institutions and paid primary attention to teaching of physics and mathematics to students of chemical specialities. Rakovskii was permanently concerned with problems of publication of educational literature in the field of inorganic and physical chemistry and chemical thermodynamics. Originally, his lectures from various courses were published as lithographic editions (1926–1935). In 1933, Rakovskii published (together with E.F. Krauze and A.V. Bogomolov) *Kurs obshchei i neorganicheskoi khimii* (Course of General and Inorganic Chemistry) (420 pp.). In 1938, he published a fundamental work *Vvedenie v fizicheskuyu khimiyu* (Introduction to Physical Chemistry) (679 pp.). The book comprised an extended and supplemented course of lectures delivered by the author at Moscow State University; it was widely used by postgraduate students and research workers. In 1939 was published a more concise *Kurs fizicheskoi khimii* (Course of Physical Chemistry) (544 pp.), recommended as a textbook for students of chemical specialities.

Rakovskii paid a considerable attention to translation of foreign publications into Russian; quite a number of textbooks and monographs were published under his editorship and with his supplements, which were rather significant in some cases. The book by A. Smith *Introduction to Inorganic Chemistry* was published in three editions in Russian translation under editorship and with supplements by Rakovskii (1928–1931). Rakovskii published a special supplement *Khimicheskaya kinetika i kataliz* (Chemical Kinetics and Catalysis) (1931, 84 pp.) to the Russian translation of A.P. van Eyken's *Foundations of Physical Chemistry* (*Osnovnye nachala fizicheskoi khimii*, 1929, 343 pp.). J.R. Partington's course of chemical thermodynamics was seriously reshaped [3]. This was the first experience of publication of a course of chemical thermodynamics in Russia; the translation was done by Rakovskii's closest associate Ya.I. Gerasimov (1903–1983, corresponding member of the Academy of Sciences of the USSR since 1953). The book simultaneously served as reference and strongly affected the development and level of the thermodynamic research in our country. Of considerable interest is Rakovskii's foreword to the Russian translation of the book by I.D. Van der Waals and F. Konstamm *Course of Thermostatistics* (*Kurs termostatiki*;

1936, part I, 452 pp.; part II, 439 pp.) in which, in particular, editor's standpoint concerning important problems of the theory of solutions was presented.

Rakovskii's scientific activities were honored by his election a corresponding member of the Academy of Sciences of the USSR in 1933.

Adam Vlasdislavovich Rakovskii died of long and severe illness on June 7, 1941. He gave more than quarter of a century of his life to Moscow University, being one of the leading professors of the chemical faculty. Warmest recollections of Rakovskii, a brilliant pedagogue and talented scientist, were published by his closest pupils and co-workers Ya.I. Gerasimov, A.V. Kiselev, A.V. Frost, M.M. Popov, D.N. Tarasnikov, and others [2, 4, 5]. Rakovskii's accomplishments in organization of the chair of physical chemistry and, simultaneously, of the laboratory of chemical thermodynamics of Moscow State University (1930) are described in G.F. Voronin's essay devoted to the life and activities of Ya.I. Gerasimov who headed the laboratory of chemical thermodynamics for more than 35 years (since 1943) and the chair of physical chemistry of Moscow University for more than 30 years (since 1952) [6]. The collection of works [2] contains a full list of Rakovskii's scientific publications.

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A.G. Morachevskii