

Viktor Arturovich Pleskov (On Occasion of His Centenary Jubilee)

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On August 31, 2007, Professor Viktor Arturovich Pleskov, Doctor of Chemistry, famous for his works on the electrochemistry of nonaqueous solutions, would be 100.

V.A. Pleskov was born on August 31, 1907, in Geneva where his father, prominent figure of the Russian Social-Democratic Workers Party (later on, like his numerous comrades, victimized (1937)), had to emigrate after the failure of the December (1905) Armed Revolt. When the amnesty has been announced (1907), the family returned to Moscow.

V.A. Pleskov went to the school related to the Sokol'niki Biological research Station; there he took a great interest in chemical experiments. His classmate was Alexander Kron, later on a famous writer who left his memoirs about those times. "The life and soul of the physics laboratory was Ivik¹ Pleskov, alias "Professor".

¹ From *Ives*, since he was born in the French part of Switzerland.

The "Professor" was a sharp-nosed, slim, yet sturdy little fellow, wearing eyeglasses; he smiled very rarely. His erudition was the subject of many legends. Ivik really was uncommonly educated, he knew how to get electricity, perform chemical experiments, develop photographic plates, and print using a collotype press. "Ivik's laboratory, I watched simple chemical experiments for the first time in my life; I learned releasing oxygen from the Berthollet salt and chlorine from the cooking salt; eventually, I really took a great interest in chemistry..." (A. Kron, *The Eternal Problem*, Moscow: Sovetskii Pisatel, 1976).

V.A. Pleskov entered the Department of Chemistry of the Moscow University (1923); he graduated from the University in 1929. In the Chemical Department, he made the acquaintance of A.I. Shatenshtein, later on a noted researcher in physical chemistry; their teamwork and friendship lasted to the Pleskov's dying day.

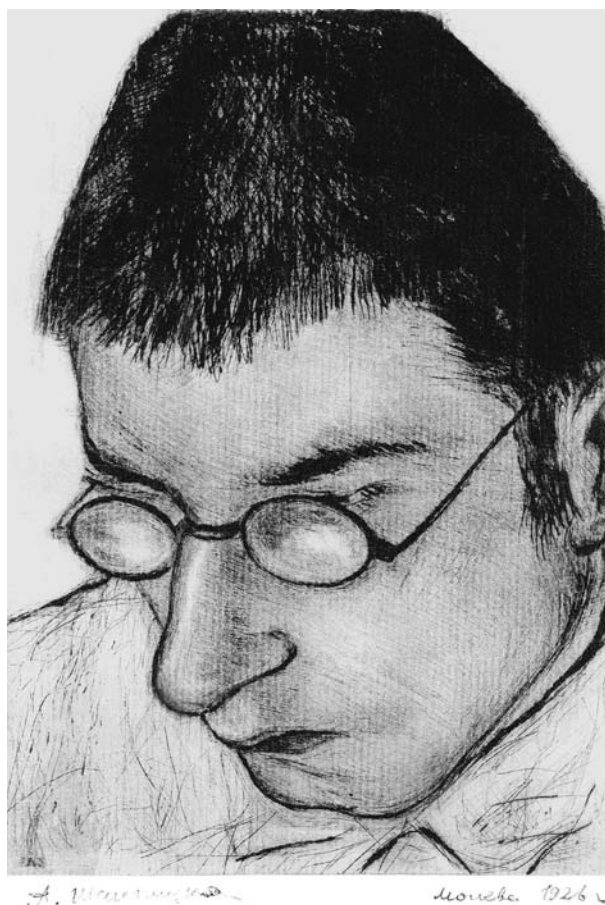
A.I. Shatenshtein, a skilled amateur-painter, portrayed V.A. Pleskov at the age of 19.

On graduating from the Chemical Department, both joined the Karpov Physicochemical Institute; in the laboratory of A.M. Monosohn, they devoted themselves to the physical chemistry and electrochemistry of non-aqueous solutions, and their studies soon brought fame to them.

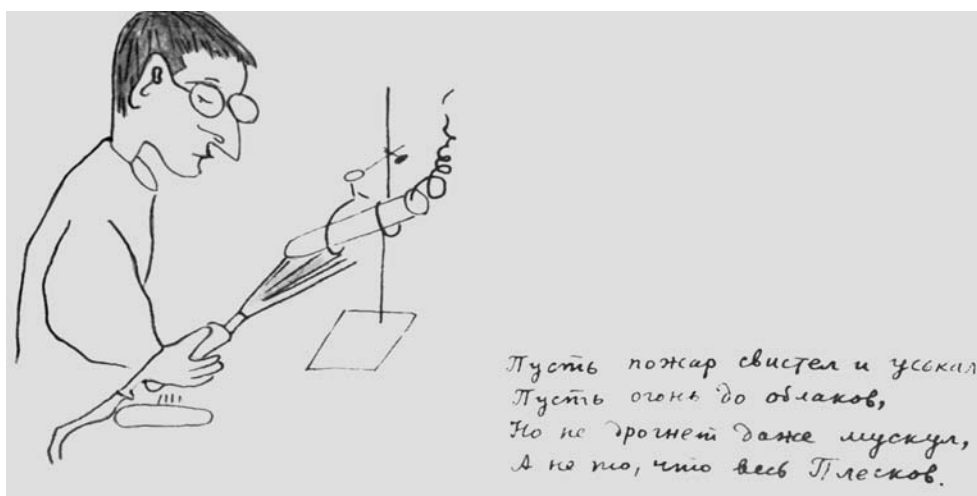
At first, the main object of these studies was liquid ammonia; the approach they developed to its investigation was later extended to other solvents (formic acid, hydrazine, etc.). Before the bursting out of World War II, V.A. Pleskov has measured the electrode potentials of Zn, Cd, Pb, Cu, Ag, Li, Na, K, Rb, Cs, Ca, haloids, nitrogen; physicochemical properties of solutions of metal salts (conductivity, activity, etc.) and the hydrogen overpotential in these solvents were determined. These technically complicated measurements demanded from Viktor Arturovich the developing of new experimental methods. One of his windfalls is the Ag/Ag⁺-reference electrode; reversible and easily reproducible, it is well-known as *the Pleskov electrode*.

Thus obtained experimental results allowed V.A. Pleskov giving an accurate account of the effects of the ion–solvent interaction on the forming of electrode potentials. It is this field where he made his principal, imperishable discovery: the method of comparing the electrode potential series in different solvents. As is well known, this problem does not have strict thermodynamic solution because the change in the solvation energy of individual ion transferred from one solution to another, which is required for such a comparison, cannot be measured. Viktor Arturovich suggested an approach that is model in its nature: to choose, as a potential-determining, such an ion whose solvation energy is small *per se*; hence, its change can be neglected all the more. Because the solvation energy decreases with the increasing of ion's diameter and decreasing of its charge, he suggested the rubidium electrode as a reference electrode, which he used in his measurements of the electrode potentials in different solvents. V.A. Pleskov called this approach *the method of normal element*; in the English-speaking literature, the term *pilot ion* took root. These studies underlie the doctoral dissertation of V.A. Pleskov *Electrode Potentials in Nonaqueous Solvents* (1949).

In a few years after V.A. Pleskov died, ferrocene and other metallocenes were synthesized, which allowed H. Strehlow to suggest, as an advancement of the Pleskov's idea, another standard reference electrode based on the ferrocene/ferricenium couple, now widely used. Here the same principle is used; however, the ferricenium cation is sized larger as compared with the rubidium ion, which favors to the reliability in the comparing of different solvents. What is more, the ferrocene/ferricenium system is more convenient experimentally.



In the late 1940s, the possibility of calculating of the so-called absolute electrode potential was vividly discussed in the literature. V.A. Pleskov, in part with B.V. Ershler, showed the incorrectness of some approaches used by others and revealed the physical meaning of some quantities thus obtained. In particular, the free energy of the process comprising ion transfer from metal to solution and, simultaneously, electron transfer to gas phase (to a point in close proximity to the solution surface), calculated in terms of strict thermodynamic approach, appeared equal to the sum of the metal work function and the Volta potential in the metal–solution system, measured at a given electrode potential. This quantity was suggested by E.A. Kanevskii as the absolute electrode potential; it was called by V.A. Pleskov and B.V. Ershler “the Kanevskii's potential”. In his talk (unfortunately, unpublished) at the III All-Union Conference on electrochemistry (1950), Viktor Arturovich gave a brilliant example that emphasized the relational nature of the Kanevskii's “absolute potential”. When a monolayer of an insoluble surfactant is placed onto solution surface, no change in the solution bulk properties occurs; correspondingly, the metal/solution Galvani-potential and the measured cell emf remains unchanged. And yet, the surface potential at the solution/gas interface will change, which inevitably results



in the change of the Volta potential in the metal–solution system, and hence, significant shift of the Kanevskii's "absolute potential". The actuality of this argumentation of V.A. Pleskov still holds out at present, because "the absolute potential of normal hydrogen electrode" (that is, the Kanevskii's potential of this electrode; unfortunately, the Kanevskii's papers have never been cited in this connection) is often used as some universal standard. And no reservation for, e.g., effects of surfactant-ions or restrictions related to nonaqueous solutions has been done.

During the World War II, V.A. Pleskov was occupied with research connected to the defense industry. After the War, the subject-matter of nonaqueous solutions in the Karpov Institute was closed, and Viktor Arturovich had to switch over to the studying of electrode processes using radioactive tracers, a hot topic at that time. In this field he obtained one more fundamental result: he measured precisely the exchange current of amalgam electrode for the first time. Thus he clearly demonstrated that at the reversible potential there exists dynamic equilibrium between the anodic and cathodic processes at the electrode. (The next step was taken, also in the Karpov Institute, by V.V. Losev who made similar measurements at polarized electrode and proved the existence of the anodic partial current at cathodic polarization; cathodic, at anodic polarization.)

Viktor Arturovich was an outstanding experimenter; he made his cells and instrumentation with his own hands. His skillfulness in glass-blowing was praised by the leading glass-blowers in the Institute of Physical Chemistry and Karpov Institute.

During his brief career of a researcher, V.A. Pleskov published not many papers—only 28, mainly in the *Zhurnal Fizicheskoi Khimii*; of them, 12 were translated into German (or, after 1945, English) and published by A.N. Frumkin in his journal *Acta Physicochimica U.R.S.S.* It is these publications that made foreign scientists to take a closer look at the Pleskov's works.

In collaboration with B.N. Kabanov and B.V. Ershler, V.A. Pleskov edited the Russian translation of M. Dole's monograph "Principles of Experimental and Theoretical Electrochemistry" (Moscow: ONTI, 1937); all three editors added their new chapters to the original text (the book was published by the supervising of A.N. Frumkin). At that time, long before the publication of the Russian translation of S. Glasstone's "An Introduction to Electrochemistry" and "Kinetics of Electrode Processes" by A.N. Frumkin, B.N. Kabanov, Z.A. Iofa, and V.S. Bagotzky, the Dole's book was the most trustworthy textbook in the fundamental electrochemistry. V.A. Pleskov also edited the Russian translation of another book, "Preparation and Measurement of Isotopic Tracers" (Moscow: Gos Izd. Inostr. Liter, 1948).

In his nature, Viktor Arturovich was outwardly restrained; a man of few words. However, among close friends he was conversable and witty; a good company. Concerning the research, he was a man of principle; in hard times, showed a strong character. This feature of his nature has been embodied in comic verses written by his tutor in the Department of Chemistry, A.P. Terent'ev (later on, Corresponding Member of the Academy of Sciences of USSR), on the occasion of fire happened in the laboratory (fortunately, it ended safely):

Let the fire whine and roar,
Let the flame stretched to the skies,
But Pleskov didn't waver,
Not a single muscle moved.

Apart the research (which took the first place in his life), V.A. Pleskov took keen interest in reading books, attending concerts, devoting himself to photography.

V.A. Pleskov died on March 8, 1951, in his laboratory in the Karpov Institute, with which his whole life in science was bound.

B. M. Grafov, L. I. Krishtalik, Yu. V. Pleskov

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