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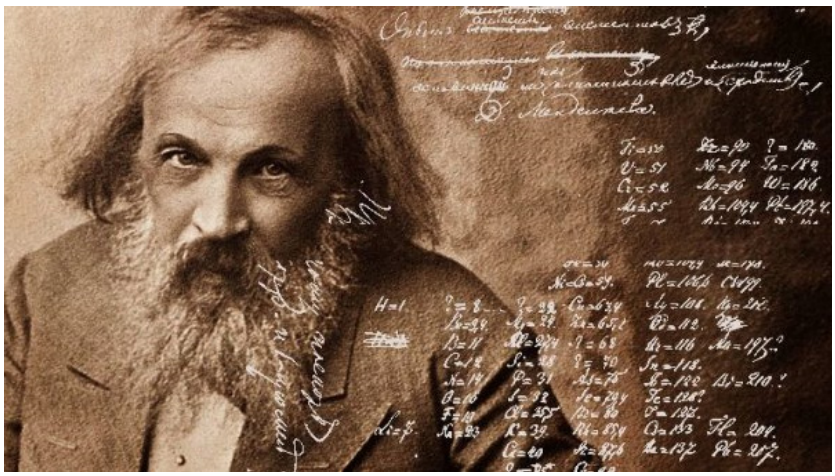
On the 150th anniversary of the D.I. Mendeleev Periodic Table

The year 2019 was a landmark for the world chemistry community, when it was declared by UNESCO the International Year of the Periodic Table of chemical elements[1]. The discovery of the periodicity of changes in the properties of elements, the design of these patterns in a table, the powerful predictive power of the Periodic Law are the brilliant achievements of Dmitry Ivanovich Mendeleev[2]. They reflect such important modern criteria for fundamental knowledge as systematic thinking, the possibility of scientific forecasting, and reprography (compression) of information. Today, mastery of these concepts characterizes the scientific culture and maturity of a researcher. They are actively used in scientific practice, including in the development of high-tech chemical technologies.



With his discovery, Dmitry Ivanovich demonstrated a magnificent example between the logical relationship of content and form. A series of scientific articles in the journal Fine Chemical Technologies, represented by its authors, the editorial board, the entire faculty and research staff of the M.V. Lomonosov Institute of Fine Chemical Technologies RTU MIREA pays tribute to the greatness of this Russian scientist.

A new impulse to modern ideas about the predictive power of the Periodic Law and the possibilities of its application was given by quantum mechanics that originated in the 1930s. Based on fundamental discoveries in the field of atomic structure, its most important section – quantum chemistry – made it possible to explain the nature of chemical bonds, the stability of chemical systems, and to predict the formation mechanisms for organic and inorganic compounds. The generally recognized leader in this field in Russia was Yakov Kivovich Syrkin, whose 125th birthday is being celebrated these days. Academician Ya.K. Syrkin made an outstanding contribution to the development of the fundamental branches of physical chemistry – chemical thermodynamics, kinetics, structural theory, and the nature of the bonding of chemical compounds. His foundational work allowed for the rational application of various research methods – spectral, magnetic, resonance, and x-ray – to establish new types of chemical bonds and fine effects in organic and metalloorganic chemistry.

The true triumph of the Periodic Law is the Soviet atomic project, covering the entire Periodic Table of chemical elements: from the first element in the table (hydrogen) to the last at the time of the project's completion (plutonium). In an article by Professor R.E. Kuzin, based on rare open publications, the main stages and chemical-technological problems of creating the nuclear shield, in other words atomic and thermonuclear weapons, are taken into consideration. New fundamental results are given on the chemistry and technology of isotopes of hydrogen, lithium, beryllium, polonium, uranium and plutonium, which have significantly expanded the Periodic Table. A noteworthy publication is that (Professor T.M. Buslaeva, et al.) dedicated to ruthenium – one of the most interesting elements in the D.I. Mendeleev

[1] https://iypt2019.org
[2] Photo: www.globallookpress.com

Periodic Table, discovered 175 years ago by the outstanding Russian chemist Karl Karlovich Klaus. The "youngest" stable element of the Periodic System, dvi-manganese, also known as rhenium, predicted by D.I. Mendeleev, the history of its discovery, the many uses of rhenium and its compounds in Russia are described in an article by Professor D.V. Drobot and a co-author.

In general, the history of the discovery and use of chemical elements is closely connected with the history of mankind and is fraught with many mysteries. One of them is associated with element No. 13 in the D.I. Mendeleev Periodic system, aluminum. Professor P.P. Fedorov, et al. presented a possible scenario of the ancient Roman technology for producing aluminum. Based on modern ideas about chemical transformations and known technological parameters, the authors conclude that the main components in the process of producing metal aluminum from an unknown Italian master could be available. However, the likelihood of this creative process, in the opinion of the authors, is quite low.

This year's 29th Mendeleev Competition of chemistry students was also marked by the 150th anniversary of the Periodic System of Elements, which gave solemnity, significance and a sense of youth involvement in great discoveries. The lecture that was delivered by Doctor of Sciences Sergey Nikolaevich Dmitriev, Director of the Laboratory of Nuclear Reactions of the Joint Institute for Nuclear Research in Dubna, showed the results of the contemporary work of Russian nuclear physicists, physicists and chemists, and technological equipping of research. As a result of close scientific cooperation between Russian and foreign scientists, four superheavy elements in the Periodic Table were discovered with the atomic numbers 113 (nihonium), 115 (moscovium), 117 (tennessine), and 118 (oganesson). Such achievements fill the hearts and minds of young scientists with pride and are the best motivation for serving science "to the true benefit and glory of the Fatherland" as said by another great Russian scientist Mikhail Lomonosov.

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