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Main Provisions of M. Faraday's Work and Development of Innovative Technologies

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Editorial

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The work of M. Faraday began to play a decisive role in the development of ideas about the nature of chemical bonds and the practical application of electrochemical processes. In the XX century, a huge experimental material has been accumulated, which confirms the correctness of M. Faraday's views on the effect of electric current on chemical reactions. Key Abstracts of M. Faraday:

- The identity of energy manifestations in the interaction of material objects.
- The discrete nature of electric current.

The concept of the discrete nature of the electric current allows the combination of parameters and geometry of the electric current signal to organize unusual chemical reactions. The provision on the identity of energy manifestations in the interaction of material objects shows the need to revise the scientific provisions on the mechanism of heat exchange (and, in general, energy exchange) between material objects.

The modern science has accumulated a great deal of experimental material, including on the unusual behavior of condensed systems under the influence of various energetic influences, which gives grounds for revising the basic fundamentals of physical chemistry and theoretical inorganic chemistry. That, in turn, will allow creating innovative technological processes for various industries on a new fundamental basis. The Science was forced to return to the consideration of chemistry as a «Center of Science». Meanwhile in 2003 the United States Congress passed the Nanotechnology Act: «21st Century Nanotechnology Research and Development Act». The Act was aimed at consolidating American leadership in engineering and economics by providing sustainable long-term support for theoretical and applied scientific research. According to this document, five state organizations received funding from the government on conducting research and development work in the field of nanotechnology in the amount of $ 3.7 billion for a period of four years. Among these organizations are such strategically important departments as National Science Foundation, Department of Energy, National Institute of Standards and Technology, National Aeronautics and Space Administration (NASA), Environmental Protection Agency. This amount does not include investments by the US Department of Defense, Department of Homeland Security and Department of Health. The adoption of this Act was the culmination of the euphoria that captured the minds of scientists in connection with the prospects of this scientific direction, which was designed to solve long-standing problems in creating innovative technologies for creating new materials, "green energy", "green chemistry", the integrated use of mineral raw materials, recycling of industrial waste and household appliances, reducing the negative impact of human activity on nature, etc. The whole complex of these problems was united by the term "Sustainable Development", in relation to which the activities of international organizations, governments of many countries, public organizations and scientific communities have intensified since 1989. Since the end of the XX century, special hopes were placed on nanotechnology. The hopes for nanotechnology was founded on a seeming opportunity to solve problems with the production of new materials with predetermined properties, using the controlled construction of the microstructure of new materials and forecasting the course of technological processes. In this fashionable scientific direction, numerous monographs, articles were published and numerous technical solutions for the creation of innovative materials and innovative technologies were developed. More than 10 years have passed and the World Scientific Community has become convinced that “nanotechnologies”, as were advertised, cannot ensure the mass production of the necessary products and materials, and the basis of obtaining innovative materials are the usual physico-chemical or chemical processes associated with phase transitions. As a result in 2016 in the US Congress (Chemical & Engineering News, 2016, American Chemical Society, ISSN 0009-2347) the Act on chemistry is being lobbied and there was a group created, whose task was to explain to senators the importance of chemistry for industrial production and the economy as a whole. In fact, this meant that the hopes associated with nanotechnology were not realized. Therefore, in a number of countries great efforts are being made to solve pressing problems in topical areas. For, example, in 2014 China spent 2% on funding for research and technical development of its Gross Domestic Product - $ 345 billion. For comparison, 28 EU member states for the same time spent - $ 334 billion. China has seen a steady increase in the financing of science: 0.9% of GDP in 2000 and more than 2% in 2014. At the same time, the PRC government pays much more attention to basic science and has created financial institutions to support scientists working in this field of research. In the media of scientific communities, it is noted that the Government of India strongly supports various scientific undertakings in basic and applied research, in particular, it is planned to make India a leader in the field of solar energy.

It should be noted that sustainable development activities are not limited to increasing research funding. Countries with a developed scientific infrastructure are purposefully organizing the involvement in research of capable scientists from around the world – the globalization of scientific research. These organizational forms of research in relevant research areas indicate attempts to solve issues by «assault». Of course, this leads to unreasonably high human labor costs and inflated financial costs. So, how do we explain this situation? The reason lies in the presence of a crisis in natural science. Strange as it may seem, the increase in the number of experimental data, which from the point of view of existing ideas is considered anomalous, causes increasing attention to the experimental solution of actual problems. The consideration of “anomalous” experimental data and extreme natural phenomena dictates the need to revise the existing theoretical views on chemical, physico-chemical and other energy processes in various technologies.

Scientific research activity will become more than successful if it is based on the fundamental principles developed by a Brilliant Scientist, a Great Philosopher with an objective look at the processes in nature and technology – M. Faraday:

- The identity of energy manifestations in the interaction of material objects.
- The discrete nature of electric current.

Based on these provisions, it is possible to formulate the concept of “energy”, to determine the mechanism of heat exchange between material objects, to clarify the transport properties of physical and chemical systems and to determine the energy exchange between material objects when they move relatively to each other.