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**PLASMA PHYSICS AND CONTROLLED THERMONUCLEAR  
SYNTHESIS: HISTORICAL ASPECTS OF DEVELOPMENT (1950–2017)**

**Summary**

On the basis of historical and problem-chronological analysis, the most complicated scientific and technical problem of plasma physics and controlled thermonuclear fusion (TCF) is investigated – the creation of cost-effective thermonuclear reactors, which in the future can become the basis of a new generation of energy. Research in plasma physics was founded in the 50s, in the last century, in particular, for the first time in Ukraine, at the Kharkov Institute of Physics and Technology (KIPT). Kharkov physicists are the undisputed leaders in research and development in the field of plasma physics and controlled thermonuclear fusion and remain to this day. At the Institute a series of large-scale installations – «Hurricane» type stellarators for magnetic confinement of high-temperature plasma — was developed and built. The success of KIPT has stimulated the development of research on stellarators in Germany and Japan. Intensive work on the study of plasma physics and the problems of TCF yielded results in related directions. So, widespread adoption in industry, including abroad, she received the ion-plasma coating technology

developed at KIPT at Bulat plants, which significantly increases the wear resistance of tools and machine parts. The problem of TCF is constantly in the field of view of the National Academy of Sciences and the Government of Ukraine. The materials of the consideration of the TCF problem as the basis of the energy of the future, and its technological applications, are presented. Based on the hybrid synthesis-fission scheme, a new approach can be proposed to ensure the fuel balance of large-scale nuclear energy and the disposal of spent nuclear fuel. Attention is paid to measures from scientific institutions of the NAS of Ukraine to participate in the EURATOM European Thermonuclear Research Program. The EU is the main donor for the construction of the first experimental nuclear fusion reactor, ITER, which is currently under construction in the city of Cadarache (France) as part of one of the most ambitious international projects, in which the USA, Russia, Japan, China, South Korea and India also take part. The difficulties of creating a commercial thermonuclear reactor prompted the search for alternative ways to use the energy of fusion of light nuclei, the so-called «cold nuclear fusion», or LENR (low energy nuclear reactions).

***Key words:*** *plasma physics, controlled thermonuclear fusion, thermonuclear reactors, Euratom, ITER, tokamak, stellarator, «Bulat», «cold nuclear fusion».*