Preface

Nowadays one of the organizational mechanisms for development of science and technology, which is already proven in technologically advanced countries, is an increasing support for the research conducted at the leading centers of research and education. In many ways, namely the universities are the core of the integrated scientific and educational complex, which ensures fulfillment of a significant share of fundamental and applied research.

Large-scale modernization of the laboratory and technological base and foundation at the MSTU "STANKIN" in 2013 of a unique world-level technological ground (the ground area amounts to about ten thousand square meters) allowed formation of an unique platform for international scientific cooperation in the field of engineering technology, metalworking and materials science. Currently, technological ground of the MSTU "STANKIN" includes not only various individual types of modern equipment, but also the whole technological and laboratory facilities, many of which already meet the sixth technological order: laboratory of additive technology, micro-processing laboratory, laboratory of coating and heat treatment, material characterization laboratory.

In the last three years on the basis of the MSTU "STANKIN" a number of scientific and educational institutions were created together with leading European partners - the Russian-French laboratory of innovative additive technologies, the Russian-Italian training center in the field of mechanical engineering and metalworking technology, the Russian-Swiss center of competence in the field of microprocessing technologies and the Russian-Spanish laboratory of spark plasma sintering.

In the framework of the Russian-French laboratory the MSTU "STANKIN" among the first in Russia started development of technological bases and equipment for the production of complex-shaped products using selective laser melting of powder materials and their implementation in the domestic industry. The laboratory team has developed for the first time in Russia and patented a set of innovative technologies of additive manufacturing, including those using the domestic powder materials, as well as created new technology and domestic equipment for the entire chain of additive production of multifunctional and complex-shaped engineering parts.

Using the spark plasma sintering in the framework of the Russian-Spanish laboratory are created nanocrystalline matrix composites - a new class of engineering materials, composed exclusively of nanometric layers with thickness of less than 100 nm. Created materials are remarkable for improved mechanical, magnetic, thermal, optical and catalytic properties; they can be used in the construction of a wide range of engineering equipment, tools and products. The success of these materials commercial use depends on the possibility of their use in large-sized machine parts (without impairing their nanostructure).

In the framework of the Russian-Swiss laboratory are under development and creation a number of technologies and automated equipments for nanoengineering of the product working surface intended to provide a unique set of performance properties. These studies can solve urgent problems facing the domestic machine-building enterprises and are directed towards the development and creation of a number of import-substituting technologies and automated equipment for implementation of various working surface nanoengineering methods, which significantly enhance the performance characteristics and quality of high-tech engineering products.

The collection «Innovative Methods in Machining and Advanced Materials» includes the results of innovative fundamental and applied research work carried out by the scientists of the Moscow State University of Technology "STANKIN" (Russian Federation) in collaboration with the scientists of prestigious European scientific and educational institutions.

Dr., Prof. Grigoriev S.N.

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Sponsor

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