

## STATE POLICY OF THE RUSSIAN FEDERATION IN THE FIELD OF NANOTECHNOLOGIES DEVELOPMENT

**A. V. Martynenko**

*State Apparatus of the Russian Federation, Russia*

**Keywords:** Strategy of nanoindustry development, federal purpose-oriented programs, RUSNANO, National Nanotechnology Network.

### Contents

1. Introduction
  2. President's initiative "Strategy of the nanoindustry development"
  3. Purpose-oriented programs
  4. RUSNANO (formerly Russian Corporation of Nanotechnologies)
  5. Infrastructure of the National Nanotechnology Network
  6. National nanotechnologies research centre
  7. Scientific educational centers
  8. National system of standards and certification in the sphere of nanotechnology and nanomaterials
  9. Governmental commission
  10. Conclusion
- Glossary  
Bibliography  
Biographical Sketch

### Summary

In the Russian Federation, "the industry of nanosystems and materials" concerns priority directions of science, technologies and engineering development. In the present article, the governmental program for nanoindustry development and bases of the Russian Federation state policy in the field of nanotechnologies development are described.

Federal, regional, branch and departmental purpose-oriented programs providing financing of workings out in sphere of nanotechnologies and finishing of their results to a stage of industrial production are the major tools of the state support of researches and workings out in area of nanotechnologies.

The infrastructural base of the nanoindustry sector in the Russian Federation is formed as a national nanotechnological network including a set of organizations of various organizational and legal forms, performing fundamental and the applied researches, carrying out the processes of technologies commercialization, and also carrying out corresponding personnel training.

A special place in the network belongs to the head scientific organization on coordination of works in area of nanotechnologies and nanomaterials that is the National Research Centre "Kurchatov Institute".

The Russian Federation is interested in global integration into the world of nanotechnologic environment, in cooperation in the given sphere on mutually advantageous conditions.

## **1. Introduction**

The "industry of nanosystems and materials" belongs to priority directions of science, technologies and engineering development in the Russian Federation, which are defined by the President of the Russian Federation.

Bases of the Russian Federation state policy in the field of nanotechnologies development are defined by the President's initiative "Strategy of the nanoindustry development" (2007). The document states that Russia's participation in nanotechnologies creation and formation of the market of corresponding production will define its real place in the modern world and, accordingly, its economic and political possibilities.

The presidential initiative was preceded by the governmental concept of development of works in the sphere of nanotechnologies in the Russian Federation (2004), in which main principles of the state policy in the field of nanotechnologies development were formulated.

The main principles of such policy are defined in the concept as follows:

- Consolidation of the federal budget means for decision of priority problems in the sphere of the nanoindustry development;
- The system approach to the decision of problems of the nanoindustry development, including interbranch coordination of federal government bodies in realization of corresponding programs and projects;
- Development of basic researches in perspective directions of science which define progress in the sphere of nanotechnologies, and the state support of the applied researches aimed on commercialization of workings out;
- Mutually advantageous international cooperation in the field of researches and practical nanotechnologies use.

In the concept, among the basic directions of the state policy realization in the field of nanotechnologies development, there are:

- Definition of priority directions in the area of nanotechnologies, the fulfilment of which will allow reaching the most significant practical results for various industries and for the social sphere;
- Material support of works fulfilled in area of nanotechnologies and nanomaterials;
- Attraction of off-budget means to realization of researches and workings out in area of nanotechnologies and nanomaterials at all the stages - from working out till the nanotechnologies launching;
- Creation of effective research infrastructure by modernization of experimental, diagnostic and technological base;
- Development of the innovative infrastructure supplying commercialization of workings out.

According to the concept authors' plan, the use of possibilities of nanotechnologies will allow to create technological conditions for qualitatively new development of economy branches.

In mechanical engineering, there is a possibility of increase of a resource of cutting and processing tools by means of special covers; adaptive management of the cutting tool on the basis of optical measurements of both processed detail surfaces and the tool during engineering procedure with application of the nanotechnological methods of measurements and positioning; not less than quadruple increase in a resource of work of motor transport, and also three-fold decrease of working costs, improvement of set of technical indicators at the expense of the nanomaterials application and increases of surfaces processing accuracy.

In power industry (including nuclear-power engineering), there is a possibility of use of carbon structures for absorption and storage of hydrogen; application of electrodes with the developed surface on the basis of track membranes for hydrogen energetics of heat-generating and neutron absorbing elements in nuclear reactors, management of nuclear systems assembly quality and operation on basis of nanosystems engineering; maintenance of the environment preservation while storing and processing of the spent nuclear fuel and monitoring of all technological repartitions with the help of nanosensors; separation of media by filtering with the use of nanomaterials in the production and processing of nuclear fuel; essential increase in efficiency of solar batteries with the use of semiconductor nanoheterostructures, and also inorganic and organic nanomaterials with layerwise and cluster and fractal structure.

In energy-saving and resource-saving, it is the creation of highly economical solid-state lighting devices on a basis of nanostructures; development of resource-saving technologies with the use of unique properties of nanomaterials; there is in sight the application of wasteless "top-down" nanotechnology (assemblage of items from separate atoms and molecules), along with a traditional "bottom-up" processing.

In electronics and optoelectronics, it is the expansion of possibilities of radar systems with the use of phased antenna arrays with low-noise microwave transistors on the basis of nanostructures and fiber-optical communication lines with increased throughput with the use of photodetectors and injection lasers on structures with quantum dots; perfection of thermal sighting systems on the basis of photodetector arrays produced with the use of nanotechnologies and characterized by high thermal resolution, etc.

In computer science, it is repeated increase of productivity of the systems of information transfer, processing and storage, and also creation of new architectures of high-efficiency systems, with approaching possibilities of computing systems to the properties of wildlife objects; adaptive distribution of management by the multicomponent computing systems, the specialised components of which are capable to self-training and coordinate actions for purpose achievement; creation of new methods of data recording and terabit storage devices on their basis (nanophotonics).

In public health services, it is working out of new medicines, creation of highly effective systems of delivery of medical products to the affected site, maintenance of early diagnostics and treatment of cancer, hepatites, cardiovascular and other diseases.

In the field of medical technology, it is creation of diagnostic aids, noninvasive surgery, building of artificial organs.

In agriculture, it is an essential increase in productivity practically of all food and commercial crops, increase of their tolerance for unfavorable weather conditions using steroids in combination with bacteriorhodopsin made on the basis of nanotechnologies.

In animal industries, it is a sharp increase of resistance of various animal species to stresses and infections, and efficiency rise in all respects with usage of veterinary nanopreparations.

In ecology, it is an increase of degree of water and air purification, desalinization of marine water using nanomaterial-based filters and membranes; fast biochemical indication of chemical and biological effects to the environment with the help of nanosensors; usage of new ecologically pure materials, biocompatible and biodegraded polymers; creation of ecologically pure technologies; application of new methods of waste utilization and recycling.

Russian line towards development of nanoindustry has a steady platform of domestic investigations in this field of knowledge, which were started nearly simultaneously with similar investigations in industrially advanced countries of the world.

## **2. President's Initiative "Strategy of the Nanoindustry Development"**

In the President's initiative "Strategy of the nanoindustry development", three primary goals of nanoindustry development in Russia are formulated.

The first stage goal is the cardinal increase in production volumes of nanotechnological produce in demand, saturation of the corresponding markets in the next years. During this period, creation of significant number of new hi-tech workplaces in scales of a national economy is forecasted, along with the increase of public health services quality with wide introduction of essentially new diagnostic means, and improving of ecological situation.

The second stage goal is working out and production startup of new kinds of nanotechnology-based produce that are expected on the market in three-five years. As a result, duration and quality of life will be increased by introduction of essentially new kinds of health services; level of personal safety will be increased, as well as safety of transport, objects with public, household and industrial function through wide use of essentially new systems of the remote control and management.

The third stage goal is the priority development of essentially new directions in the area of nanotechnologies, involved in the creation of superbranch scientific and educational and industrial environment for the next 10-20 years.

-  
-  
-

TO ACCESS ALL THE 15 PAGES OF THIS CHAPTER,  
Visit: <http://www.eolss.net/Eolss-sampleAllChapter.aspx>

### **Bibliography**

Federal law of the Russian Federation of July 19, 2007, No. 139-FZ "On the Russian Corporation of Nanotechnologies". [In Russian]. [The federal law establishes legal status, principles of organization, objectives of creation and activity, procedures of activity management, procedures of reorganization and liquidation of the Russian Corporation of Nanotechnologies].]

Federal law of the Russian Federation of July 27, 2010, No. 211-FZ "On Reorganization of the Russian Corporation of Nanotechnologies". [In Russian]. [The federal law establishes the procedure of reorganization of the Russian Corporation of Nanotechnologies.]

Federal Purpose-Oriented Program "Research and Development in Priority Directions of Development of Russia's Science and Technology Complex for a Period of 2007 - 2012" (a regulation of the Government of the Russian Federation of October 17, 2006, No. 613). [In Russian]. [The program is oriented to conducting and financing of pilot studies yielding in actual developments and products, assigns resources to applied researches in priority technological directions, and establishes financing of innovation infrastructure.]

Federal Purpose-Oriented Program "Nanoindustry Infrastructure Development in Russian Federation for a Period of 2008-2010" (a regulation of the Government of the Russian Federation of August 2, 2007, No. 498). [In Russian]. [The program is aimed at the creation of modern infrastructure for national nanotechnological network.]

Innovation development – the basis of modernization of Russia's economy: National report. (2008). Moscow: IMEMO RAN, GU-VShE, 168 p. [In Russian]. [Special attention is given to the assessment of nanoindustry development prospects, possibilities and directions of government granting.]

Vahtra Peeter (2010). The Rusnano Corporation and internationalisation of Russia's nanotech industry. Electronic Publications of Pan-European Institute, 11/2010. <http://www.tse.fi/pei>. [Operating and funding

principles of Rusnano are described, including funding of ventures involving foreign companies. International operations and investments of the Rusnano Corporation and international scope of Russia's recent activities in the nanotechnology field are discussed.]

### **Biographical Sketch**

**Martynenko Aleksandr Vladimirovich** has graduated from the Lvov State Medical Institute (1977); Doctor of Medicine (1997), Professor (1997). Works in the Apparatus of the Government of the Russian Federation; Real State Councillor of the Russian Federation of 3 class.

He specializes in the sphere of state scientific and technical and innovation policy, investigates the problems of public health and social medicine. Prof. Martynenko is an organizer and the head of the Department of Social Medicine of Moscow Humanitarian University (1992).