Information

General Meeting of the Division of Chemistry and Materials Science of the Russian Academy of Sciences

The General Meeting of the Division of Chemistry and Materials Science of the Russian Academy of Sciences was held on May 16, 2011, at the N. D. Zelinsky Institute of Organic Chemistry, Russian Academy of Sciences.

The report on the Division´s activity in 2010 was presented by Vice-President of the RAS, acting Secretary Academician of the Division *S. M. Aldoshin*. He noted the most important achievements in the chemical and materials sciences.

Academician V. N. Parmon spoke about the research work carried out at chemistry-related institutes of the Siberian Branch of the RAS in 2006—2010.

The scientific report "A New Process for the Manufacture of Perfluorinated Polymeric Membranes for Hydrogen Power Engineering" was delivered by Corresponding Member of the RAS *S. S. Ivanchev*.

Then Directors of some institutes of the Division were elected for the next term. Corresponding Member of the RAS *U. M. Dzhemilev* was elected Director of the Institute of Petrochemistry and Catalysis of the RAS, Academician *O. G. Sinyashin* was elected Director of the A. E. Arbuzov Institute of Organic and Physical Chemistry of the RAS, Corresponding Member of the RAS *S. O. Bachurin* was elected Director of the Institute of Physiologically Active Compounds of the RAS, Academician *A. Yu. Tsivadze* was elected Director of the A. N. Frumkin Institute of Physical Chemistry and Electrochemistry of the RAS, Doctor of Chemical Science, Professor *A. G. Zakharov* was elected Director of the Institute of Solution Chemistry of the RAS, Academician *A. A. Berlin* was elected Director of the N. N. Semenov Institute of Chemical Physics of the RAS.

General Meeting of the Russian Academy of Sciences

The General Meeting of the Russian Academy of Sciences (RAS) was held on May 17, 2011, in Moscow, in the Great Hall of the Russian Academy of Sciences.

The welcome speech of President of the Russian Academy of Sciences Academician *Yu. S. Osipov* was devoted to the principal scientific results of the Russian Academy of Sciences of 2010 and to the problems of its development.

In the field of chemistry and materials sciences, the following results were mentioned. The process for manufacture of instrumental-quality hole-conductive crystalline cadmium—mercury—tellurium layers on silicon substrates was developed at the Institute of the Semiconductor Physics, Siberian Branch of the RAS. Full-scale monolithic photo-receiving matrix modules with the reading circuit on the silicon part of the plate were designed and fabricated for the first time in Russia. These modules provide a TV-standard image without using mechanical scanning systems.

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At the A. M. Prokhorov Institute of General Physics, laser single crystals of strontium fluoride doped with neodymium and praseodymium ions were grown; they were used to fabricate fluoride laser nanoceramics having no analogs all over the world; on diode laser pumping, laser generation with optical efficiency of tens of percent was obtained.

Among the most remarkable scientific results of 2010, a special place is occupied by the synthesis of the new 117th element, the last chemical element of Period 7 of the D. I. Mendeleev Table. In this unique experiment performed by the scientists of the Joint Institute for Nuclear Research in Dubna, Moscow Region, in close cooperation with Russiasn institutes and with national laboratories of the USA, eleven new most heavy isotopes of 105—117th elements were generated. Analysis of the properties of lately synthesized elements unambiguously attests to the discovery of a new physical phenomenon: enhanced nuclear stability of superheavy elements. This discovery was very important for a number of areas of science: nuclear physics (nuclear fission, mass limits, and nuclear structure), astrophysics (nucleo synthesis models, element formation scenarios), and radiochemistry and also promoted the development of the chemistry of new superheavy elements at the level of individual atoms.

At the Institute of Structural Macrokinetics and Materials Science Problems, effective inhibitors for preventing ignition and detonation of hydrogen or methane mixtures with air were designed. This underlay the works on provision of hydrogen explosion safety during storage and transportation of used nuclear fuel that are carried out at the Beloyarskaya Nuclear Power Plant in cooperation with the Russian Federal Nuclear Center, All-Russian Research Institute of Technical Physics.

At the A. A. Baikov Institute of Metallurgy and Materials Science, bulk single-crystalline niobium carbonitrides and double niobium—zirconium carbonitrides were synthesized for the first time; they can serve for the design of new-generation functional materials for operation under extremal conditions.

A process for production of energy sources from renewable feedstocks (biofuels) was developed at the N. M. Emanuel´ Institute of Biochemical Physics. Heterogeneous catalysts for the production of bioethanol and biobutanol from cellulose hydrolyzates were designed.

A holographic apparatus with a multitude of optical traps formed by continuous and femtosecond lasers was developed at the N. N. Semenov Institute of Chemical Physics. Each of these can move simultaneously with the other along various individual trajectories. New approaches to the use of femtosecond pulses for complex microsurgery were proposed.

An integrated flow chart for the recovery of gold from technogenic raw materials of Magadan Region, Primorski Territory, and Khabarovsk Territory was developed at the Institute of Chemistry of the Far Eastern Branch together with some other Institutes of the Division; the flow chart includes the use of gravity dressing at the initial stage and hydrometallurgical and fluoride methods of gold extraction at the final stage.

A strategy of the design of anticancer agents aimed at versatile use against any type of tumor was proposed at the Institute of Molecular Genetics. Twenty nine potential gene therapy anticancer drugs were prepared and studied; four of these that contained the killer gene were selected. A process for the production and purification of the agents was developed and their preclinical trials were performed.

A process for manufacture of shaped high-strength single crystalline sapphire and the production process and prototypes of the sapphire endoprosthetic elbow hinge joints with high wear resistance and reliability markedly exceeding the characteristics of the existing polyethylene joints were developed at the A. F. Ioffe Physical Technical Institute within the framework of the program "Fundamental Science for Medicine." For treating the cerebral aneurysm, a new carotid wallstent based on a thin titanium nickelide wire with the superelasticity effect was elaborated.

When speaking about the problems faced by the Academy of Sciences, *Yu. S. Osipov* noted the insufficient budget of 2010, which, in particular, precluded implementation of the re-equipment plan of the material, technical, and instrumental facilities of the Academy of Sciences, which was adopted in 2009 at the General Meeting of the RAS and supported by Prime Minister V. V. Putin. As a result of enormous effort the budget of the RAS of 2011 was increased. In particular, the Academy was able to open 1000 additional vacancies for young scientists and purchase residential space for them.

Yu. S. Osipov also considered the participation of the RAS in the innovative activity and renovation of the economy of Russia. The proposals for constructing a national innovation system were composed by the Academy back in 2001. In 2010, more than 160 proposals on economy renovation were submitted to the Russian government. An important aspect of the innovative activity of the RAS is cooperation with the Foundation for the Skolkovo Center for the Innovative Technology Development and Commercialization. An agreement between the Academy and the Foundation was signed and more than 40 Institutes of the RAS signed direct agreements with the Skolkovo Foundation dealing with particular applied projects.

A number of new agreements with state corporations, foundations, and other development institutions were concluded, in particular, with the Foundation for the support of small business enterprises in the field of science and technology, the Russian Foundation for Basic Research, State Corporation Rosnano, State Corporation Rostekhnologii, OJSC Russian Railways, Rosneft, and so on.

Yu. S. Osipov spoke about the necessity of preparing a new version of the "Foundations of RF Policy in the

Development of Science and Technology up to 2020". For this purpose, a working group headed by Academician N. P. Laverov was established.

An important task is to elaborate and adopt the Concept for the Development of the Russian Academy of Sciences for the period up to 2025. This implies comprehensive analysis of the state-of-the-art in the key areas of the activity of the Academy and analysis of strong and weak points. The principal goal of the concept is the strategy of development of the Russian Academy of Sciences. *Yu. S. Osipov* emphasized that the success in the development of this fundamental document largely depends on the constructive participation of the members and the staff of the Academy in the discussion.

Among the problems, *Yu. S. Osipov* mentioned the detraction of the role of the Russian Academy of Sciences. In particular, this refers to publications in foreign and Russian journals. Some of the articles are published without mentioning that the authors work at institutes of the Russian Academy of Sciences, and this distorts the evaluation figures of the activity of the RAS. For five physical institutes alone, the loss was 10% of the total citation count or 38% of the total number of references to the RAS in physical sciences. Bibliometric analysis, for example, demonstrated a high level of cooperation of the RAS with state universities. In 2009, more than 32% of publications of the Moscow State University were performed together with scientists of the RAS, and for Federal universities this value is even higher: for the Siberian Federal University, it is 60%, and for the Southern Federal University, it is 50%. These publications, too, are often ignored among the works of RAS employees included in the ESI database. The shares of the RAS and State universities in the Russian publications with high citation indices in 2000—2010 are as follows: RAS, 57.6%; MSU, 11.6%; St.-Petersburg State University, 1.4%; St.-Petersburg Technical University, 1.2%; Moscow Engineering Physics Institute, 3.4%. All these facts require regulation.

In conclusion, *Yu. S. Osipov* noted that in 2010, the Academy worked hard and effectively. However, the activity of the Academy should be and can be more effective, responsible, and large-scale, which depends to a large extent both on the governmental support of science and on the members of the Academy, the management, organization, leadership, and responsibility of every employee, consolidation of scientists, and the ability to strengthen and defend the academic community.

The report about the activity of the RAS was presented by Chief Academic Secretary of the Presidium of the RAS Academician *V. V. Kostyuk*.

He considered the most important aspects of the activity of the RAS related to implementation of the main functions of the Academy such as gaining new fundamental knowledge, predictive analytical research, expert examination of important state projects, participation in renovation of the country economy.

In 2010, Sessions of the Presidium of the RAS considered issues highly important for the country and the Academy, in particular, "Lack of Demand of Science as a Threat for the National Security of Russia", "Accident at the Sayano-Shushenskaya Power Plant and Scientific and Engineering Assistance for Post-Accident Management", "Current World Financial and Economic Crisis: the End of the Growth Economy or Change of the Development Paradigm?", "The Integrated System of Measures for Improving the Age Distribution of Scientists, Attraction and Retaining of Gifted Young Scientists in Scientific Organizations of the RAS, Provision of the Scientific and Administrative Career of Young Scientists", and so on.

The scientists of the Academy prepared more than 900 opinions and proposals on draft federal orders and regulations of the RF Government, more than 800 proposals and recommendations on the decrees and executive orders of RF President and the RF Government. The scientists of Institutes of the RAS actively participated in the development and expert examination of important state documents, in particular, "The Strategy of the Innovative Development of the RF up to 2020", "Global Safety Problems of the 21st Century: The Contribution of Russia to Their Solution", "Key Directions of the State Policy for Preservation and Development of Cultural and Moral Values, Strengthening of the Solidarity of Russian People".

Important works were performed for preventing the threats to the national safety caused by the global climate change, for development of the oil and gas resources of the continental shelf of Russia. On the basis of the Academy proposals and with its active participation, the Military-Industrial Commission at the RF Government completed and submitted for approval a state program for the fundamental and exploratory scientific research in the field of country defense and safety for 2011—2015. The Russian Academy of Sciences Participates in the preparation of draft federal laws and supplements to the laws. About 3000 opinions on draft documents of federal executive bodies were prepared.

The report by *V. V. Kostyuk* concerned financing of the RAS. He noted that during the crisis, developed countries sharply increased the size of financing of fundamental science. However, the total budget financing of the Russian Academy of Sciences in 2010 decreased as compared with 2009. The expenses per research worker are ten times lower in Russia, in particular in the RAS, than in Germany, Sweden, or the USA. In the world cost of research and development, the share of Russia is 2.2%, while the share of the USA is 33%, that of the EC is 26%, that of Japan is 13%, and that of China is 10%. The size of financing is well correlated with the publication activity. The share of Russia in scientific publications is 2% and that of the USA is 29%. Moreover, the fraction of financing of fundamen-

tal research and the RAS in the total expenses for science continues to decrease. *V. V. Kostyuk* noted that investment to the university science would apparently increase the efficiency of the university branch of science but this should not be done at the expense of the Academy. A serious problem that remains at the institutes of the RAS is the state of the equipment and instrument estates. Despite the fact that since 2001, the fraction of the equipment more than 11 years old was reduced from 50 to 30%, the fraction of modern equipment increased insignificantly, from 12 to 15%. This means that the institutes of the Academy are not adequately equipped with advanced instruments and facilities, which is largely a consequence of inadequate financing of the RAS. *V. V. Kostyuk* emphasized that unless Russia starts to adequately finance effective scientific organizations, the gap between Russia and developed countries may become insurmountable.

In 2010, the Russian Academy of Sciences focused attention on the innovative activity. Among the most interesting innovative projects of the RAS, *V. V. Kostyuk* distinguished the following. The I. Ya. Postovsky Institute of Organic Synthesis in cooperation with the Research Institute of Influenza and the Center for Virology of Moscow Region completed the development and performed clinical trials of the antiviral drug triazaverin, which has a novel mechanism of action against flu, tick-borne encephalitis, and other diseases. The industrial production of this drug is being developed at the plant Medsintez (the town of Novoural´sk, Sverdlovsk Region). Within the bounds of the cooperation program with Gazprom, effective 100 Wt electrochemical fuel cells were developed, manufactured, and successfully tested at the Institute of High-Temperature Electrochemistry of the Ural Branch of the RAS. A prototype model has been successfully operating since October 2010 at the Gazpromtransgaz Ekaterinburg site. Mechanisms for remote detection of nitrogen-containing or trojan explosives were developed (the head executive organization is the Institute for Problems of Chemical and Energetic Technologies of the Siberian Branch of the RAS). The fabricated service models are at the world level or even higher.

During the year under report, perfection of the structure of the RAS was systematically carried out. In particular, the Division for Physiology and Fundamental Medicine was established on the basis of the Physiology Section of the Division of Biological Sciences.

V. V. Kostyuk noted that a sore point of Russian science is that researchers become older, although some success in the recruiting of young scientists to institutes of the Academy were achieved in 2010. More than 800 young university graduates of 2010 came to work to scientific organizations of the RAS; half of them got permanent positions and the other entered post-graduate courses. However, this does not solve the problem. The shares of Directors and heads of research groups that are above 70 years old are 32 and 23%, respectively; this poses a complicated challenge of re-election of up to 60% of the heads of research organizations and branches of the RAS. The Academy has to train a personnel reserve, and furthermore this should involve scientists below 35 years old. This problem could be partially solved by the thousand additional vacancies allocated to the RAS by Russian President. In addition, the RAS received additional budget funds for the residential space for young scientists.

In 2010, the integration of science and education continued. This work included expert evaluation of textbooks and development of the fundamental core of the educational standards; establishing of educational scientific centers; participation in the foundation of university departments and chairs; implementation of integrated cooperation programs. In 2010, 215 educational scientific centers existed in the RAS. They include pre-university training (lyceums, colleges), research university with post-graduate courses and doctoral training, some other higher education structures and integrate the university education with the research facilities of institutes of the Academy.

V. V. Kostyuk spoke about exhibitions. In 2010, institutes of the RAS participated in 92 exhibitions, 73 in Russia and 19 abroad. More than 300 institutes participated in the exhibitions. More than 2000 innovative projects were exhibited. During the period under report, institutes of the RAS concluded more than 1400 preliminary agreements for cooperation and got more than 100 requests for the development of new technologies.

V. V. Kostyuk noted that a significant place in the activity of the RAS is occupied by the international scientific cooperation. Currently the Academy of Sciences has 115 agreements on scientific cooperation and the exchange of scientists with the academies of sciences and scientific organizations of 57 countries; the RAS participates in five intergovernmental agreements; it is a member of 46 international organizations and actively works in other interstate commissions and committees.

The achievements of the employees of the RAS were marked by state awards and prizes. In 2010, the Russian Federation State Prize in the field of science and technology was awarded to: Academicians *V. Ya. Pancheno* and *V. N. Parmon*, Doctor of Science (Physics and Mathematics) *N. A. Vinokurov*. The Russian Federation President Prizes in the field of science and innovations were awarded to 7 young scientists: *N. N. Andreev*, *D. S. Gorbunov*, *D. V. Grashchenkov*, *N. E. Uvarova*, *E. P. Simonenko*, *M. I. Mokrousov*, and *A. B. Sanin*. The RF Government Prize in the field of education was awarded to 21 employees and the RF Government Prize in the field of science and technology was awarded to 41 employees. Honorary titles of the Russian Federation were awarded to 39 employees of the RAS. For the merits for the state, long fruitful activity, and large contribution to the development of science, 178 persons were honored

with state awards by the Decrees of Russian Federation President.

When speaking in the debate on the summary report, Chairman of the Siberian Branch of the RAS Academician *A. L. Aseev* and Chairman of the Far-Eastern Branch of the RAS Academician *V. I. Sergienko* considered the results of the development of science in their regions, cooperation with the regional administrative authorities and large Russian corporations in the development of the Siberia and Far East productive power.

Chairman of the Ural Branch of the RAS Academician *V. N. Charushin* noted that Ural is traditionally an industrial and high-technology center of Russia; therefore, the cooperation with fundamental science is highly demanded. However, poor condition of the equipment precludes in some cases advanced level of research.

Academician *V. E. Fortov* emphasized that the situation in science is not unshadowed due to decrease in the financing, in particular, a 20—30% decrease in the financing of instrumentation. The innovative development cannot be adequately implemented, although projects of scientists of the RAS are demanded abroad and by the business.

Vice-President of the RAS Academician *V. V. Kozlov* touched upon the Project "Concept of the Development of the Russian Academy of Sciences up to 2025". Currently this project is being completed; both members of the RAS and the whole academic community can participate in its discussion.

Academician *A. A. Kokoshin* noted the importance of cooperation of social and natural scientists in various fields; Academician *N. A. Kuznetsov* proposed making the election procedure to the Academy as clear as possible.

The Medals and Diplomas of 2010 were presented to the winners in the General Meeting.

The highest award of the Russian Academy of Sciences, namely, M. V. Lomonosov Big Gold Medal of 2010, was awarded to Academician *S. T. Belyaev* for the outstanding contribution to some important areas of modern physical science: the plasma physics, the theory of quantum and relativistic particle systems, the atomic nuclear theory and the theory of nuclear reactions, and the elementary particle accelerator physics. Of foreign scientists, this prestigious award was presented to foreign member of the RAS: Professor *'t Hooft Gerardus* (Utrecht, the Netherlands) for the outstanding contribution to the theory of gage fields, in particular, the construction of renormalizable gage-invariant theories with spontaneously violated symmetry and the development of methods for the analysis of gage theories beyond the perturbation theory. The M. V. Lomonosov Big Gold Medal winners presented scientific reports.

President of the RAS Academician *Yu. S. Osipov* also presented *gold medals named after famous scientists* to the winners of 2010. In particular, in the field of chemical sciences, *N. S. Kurnakov Gold Medal* was awarded to Academician *N. T. Kuznetsov* for the achievements in the development of new inorganic structural and functional materials for aerospace and laser engineering, hydrogen power engineering, and other applications.

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