Information

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

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The scientific and scientific-organizational activities of Division of Chemistry and Materials Science of the Russian Academy of Sciences in 2024 are highlighted. The most significant results obtained by scientists of the Division Institutes in 2024 are given.

Key words: Russian Academy of Sciences, Division of Chemistry and Materials Science, fundamental research, applied research, synthesis, selective methods, nanomaterials, innovative materials, physicochemical investigation methods, scientific-organizational activity, science popularization, publishing activity.

The General Meeting of the Division of Chemistry and Materials Science of the Russian Academy of Sciences (DCMS RAS) and its Sections was held on May 26—27, 2025. The Sessions of the Chemical Science and Materials Science Sections, which were held at the N. D. Zelinsky Institute of Organic Chemistry, Russian Academy of Sciences (ZIOC RAS) and at the A. N. Frumkin Institute of Physical Chemistry and Electrochemistry, Russian Academy of Sciences, respectively, nominated candidates for election as Full Members of RAS and Corresponding Members of RAS.

The General Meeting of DCMS RAS, which was held at ZIOC RAS, approved the reports on the scientific and scientific-organizational activities of DCMS RAS in 2024 and the candidates for election as Full Members of RAS and Corresponding Members of RAS nominated at the Section Sessions* and also held election of candidates for foreign members of the Russian Academy of Sciences.

The report on the scientific activity of DCMS RAS in 2024 was presented by Academician Secretary of the Division, Academician of RAS *M. P. Egorov*;

* Detailed information on the members of the Russian Academy of Sciences related to the Division of Chemistry and Materials Sciences elected at the General Meeting of RAS on May 28—30, 2025, is given further (pp. 2234—2256).

Published in Russian in *Izvestiya Akademii Nauk. Seriya Khimicheskaya,* Vol. 74, No. 7, pp. 2214—2223, July, 2025.
1066-5285/25/7407-2214

the report on the scientific-organizational activity of DCMS RAS in 2024 was delivered by Head of Department, Deputy Academician Secretary of DCMS RAS, Doctor of Chemical Sciences *V. I. Maleev*. Also, candidates for awarding the title of Honored Scientist of the Russian Federation were nominated.

Academician Secretary of the Division, Academician of RAS *M. P. Egorov* outlined the best scientific achievements of DCMS RAS in 2024.

At the N. S. Kurnakov Institute of General and Inorganic Chemistry of the Russian Academy of Sciences (IGIC RAS), a research team headed by Academicians of RAS *N. T. Kuznetsov*, *Yu. G. Gorbunova*, and *A. Yu. Tsivadze* and Corresponding Member of RAS *K. Yu. Zhizhin* synthesized for the first time conjugates of the *closo*-decaborate anion and gadolinium(III) phthalocyanines, which represent a new type of potential theranostic agents for the simultaneous tracing (magnetic resonance imaging) and killing (boron neutron capture therapy) of tumor cells. The synthesized *closo*-decaborate-linked gadolinium(III) phthalocyanines contained four boron clusters as peripheral substituents in macroheterocyclic systems. The authors of the study achieved not only a relatively high boron content in the complex (up to 21.5 wt.%, 40 boron atoms per molecule), but also an increase in the water solubility of the phthalocyanine complex. The established relaxation time in the water phantom (r_1) amounts to 6.1±0.7 $mmol^{-1}$ s^{-1} (3.0 T, 20 °C, H_2O), which is comparable with r_1 values for the contrast agents commonly used in medical practice.[1]

A research group of IGIC RAS headed by Corresponding Member of RAS *V. K. Ivanov* performed the first synthesis and characterization of a new crystalline double cerium orthophosphate $Na_{1.97}Ce_{1.03}(PO_4)_2 \cdot xH_2O$ containing cerium simultaneously in two oxidation states. The presence of trivalent cerium (10% of the total cerium content) in the structure of $Na_{1.97}Ce_{1.03}(PO_4)_2 \cdot xH_2O$ was reliably confirmed by high-energy resolution fluorescence detection X-ray absorption near-edge structure (HERFD-XANES) and ESR spectroscopy. The obtained sodium cerium phosphate hydrate $Na_{1.97}Ce_{1.03}(PO_4)_2 \cdot xH_2O$ has a tunnel structure, in which the Ce^{3+} cations are likely to partially occupy the sites of Na^+ ions. These structural features suggest that the synthesized product has a high sodium ion conductivity. It was found that the crystal structure of the new compound (space group $P21/c$, $a = 6.9441(2)$ Å, $b = 11.6805(3)$ Å, $c = 9.3434(3)$ Å, $\beta = 111.6827(18)°$) has no direct analogs among the crystal structures of double phosphates of tetravalent metals.[2]

A method for the synthesis of a new electrically neutral metal-organic framework (MOF) based on palladium(II) complex with meso-tetrakis(4-phosphonatophenyl)porphyrin IPCE-1Pd was developed by a research group from the A. N. Frumkin Institute of Physical Chemistry and Electrochemistry of RAS. In order to improve the proton conductivity of the IPCE-1Pd framework, it was subjected to post-synthetic modification: imidazole molecules as an additional source of protons were introduced into the IPCE-1Pd pores by the vapor diffusion method. Unexpectedly, this procedure resulted in a complete structural rearrangement of MOF to give a new hydrogen-bonded organic framework (HOF), IPCE-1Pd_Im, containing imidazole molecules and imidazolate ions as building blocks. This is the first example of transformation of porphyrin-based MOF into HOF. The proton conductivity of the synthesized material at 85 °C and relative humidity of 95% amounts to $6.54 \cdot 10^{-3}$ S cm^{-1}, which is one of the highest values among all known HOFs based on porphyrins.[3] This Project was headed by Academicians of RAS *Yu. G. Gorbunova* and *A. Yu. Tsivadze*.

Researchers of the Peter the Great St. Petersburg Polytechnic University established that mechanical metamaterials can be designed using several types of structures, that is, cells, chiral structures, and origami type structures. Materials based on single cells occur in Nature as columns and surfaces. The studies resulted in the manufacturing of auxetic meta-biomaterials based on pure titanium with different network topologies. The meta-biomaterials have negative Poisson′s ratios ranging from −0.09 to −0.003. The elastic moduli of the meta-biomaterials are in the range corresponding to the elastic modulus of human trabecular bone, which confirms the applicability of these structures as implants without adverse consequences for humans.[4–7] The Project was headed by Academician of RAS *A. I. Rudskoi*.

Hydrogel films based on metal-organic frameworks with tunable luminescence and afterglow for visual detection of ofloxacin and protection against counterfeiting were proposed at the A. V. Nikolaev Institute of Inorganic Chemistry, Siberian Branch of RAS (SB RAS) and Novosibirsk State University under the supervision of Academician of RAS *V. P.*

Fedin. The incorporation of MOFs based on terbium(III) or europium(III) into the carrageenan hydrogel resulted in a flexible, stable, and biocompatible thin-film material with bright luminescence and selective response to the antibiotic ofloxacin. The resulting films made it possible to visually detect antibiotics in poultry, with the limit of detection being approximately 10 ppm, which is ten times lower than the maximum permissible content of this antibiotic established by the Technical Regulations of the Customs Union. In addition, the obtained films exhibit an unusual luminescence and afterglow effect, which makes them promising as probes to protect products from counterfeiting.[8]

A new wearless friction effect under conditions of boundary sliding friction of aluminum alloy on steel modified with bismuth by short-pulse laser melting was discovered at the M. N. Mikheev Institute of Metal Physics of the Ural Branch of RAS (UrB RAS) in cooperation with researchers from the Udmurt State University, Udmurt State Agrarian University, E. S. Gorkunov Institute of Engineering Science of UrB RAS, and Udmurt Federal Research Center of UrB RAS. The nature of the new effect is based on suppression of adhesion between the mating pieces as a result of bismuth modification, formation of bismuth subcarbonate tribological layers with easy basal slip of the tetragonal lattice, decrease in the mechanical friction component using diamond surface smoothing, self-organization of friction surfaces due to favorable material redistribution in the contact zone, and high cyclic strength of aluminum alloys. The bismuth-modified surfaces have ultralow dry sliding friction coefficients (up to 0.03) as pairs with bronze, aluminum alloy, and cast iron counterfaces. This phenomenon opens a new page in the understanding of the wearless friction effect and ultralow friction coefficients; these results have a high scientific and practical potential.[9—13]

A research group from the Tananaev Institute of Chemistry and Technology of Rare Elements and Mineral Raw Materials, Kola Science Center of RAS (KSC RAS) accomplished the synthesis of zircon and zircon-based solid solutions using mechanical activation. A method for the synthesis of zircon and zircon-based solid solutions using zirconium-containing products of mineral raw material processing and silica fume, resulting from processing of nonferrous metallurgical slags, involving mechanical activation at reduced temperatures was developed. Cerium was chosen as a model isomorphic admixture modeling plutonium. The mechanical activation of a zirconia, silica, and ceria mixture increased the solubility of cerium in a solid solution of zircon up to 6.3 at.%, decreased the synthesis temperature by 200 °C, and reduced the synthesis time 20-fold in comparison with the traditional solid-phase method. The obtained materials have unique characteristics and can be used, in particular, as matrices for radioactive waste immobilization.[14,15]

Effective up-conversion luminophores $(Y_{0.9}Er_{0.1-x}Yb_x)_2O_3$ with high luminescence intensity were developed at the Institute of Solid-State Chemistry, UrB RAS, under the supervision of Doctor of Chemical Sciences *V. N. Krasil'nikov*. The conversion efficiency of excitation radiation is markedly improved with increasing concentration of Yb^{3+} ions (the optimal dopant concentration x is 0.8). High luminescence intensity in the 650—700 nm range is achieved due to effective energy transfer and cross-relaxation processes, which lead to population of the $^4F_{9/2}$ level in Er^{3+}.[16,17]

A research group from the A. A. Baikov Institute of Metallurgy and Materials Science of RAS headed by Academician of RAS *K. Yu. Solntsev* developed a method for the synthesis of transparent ceramic materials based on yttrium oxide (Y_2O_3) and yttrium aluminum garnet ($Y_3Al_5O_{12}$). Gel casting of the developed materials into 3D-printed polymer molds can produce samples of various shapes and sizes, including those containing inner channels. The proposed ceramic materials have high optical (linear light transmission in the visible region of up to 78%), strength, and thermomechanical properties and are designed for operation over a wide range of temperatures (up to 2300 °C) and in harsh media. The transparent ceramic materials produced by gel casting were analyzed in comparison with the material manufactured by conventional uniaxial pressing. It was shown that the developed method can be used to produce samples of transparent ceramics with relative density higher than 99.9% and grain size of 3—5 μm without sintering additives.[18—20]

A joint project of scientists from the Federal Research Center (FRC) of Problems of Chemical Physics and Medicinal Chemistry of RAS and the Ural Federal University named after the First President of Russia B. N. Yeltsin was devoted to partial replace-

ment of lead ions in the halides as a strategy for the control of the stability and the radiation resistance of perovskite solar cells. The practical implementation of the perovskite solar cells, which have light conversion efficiency (26.6%) approaching that of devices based on crystalline silicon, is restricted by their low operational stability. The authors proposed an original strategy for the targeted design of perovskite semiconductor materials by partial replacement of a small fraction of lead ions by cations of other metals. It was shown that rational modification can suppress the photolysis of PbI_2 and greatly improve the film photostability. The partial lead replacement in $CsPbI_2Br$ suppresses the light-induced segregation of halide phases. The introduction of doping cations markedly increases the radiation resistance of complex lead halides to γ-rays and high-energy electrons.[21,22]

A joint study of researchers from the A. E. Arbuzov Institute of Organic and Physical Chemistry, Kazan E. K. Zavoisky Physical Technical Institute, Kazan (Volga Region) Federal University, A. N. Nesmeyanov Institute of Organoelement Compounds (INEOS) of RAS, and G. A. Razuvaev Institute of Organometallic Chemistry of RAS resulted in new highly efficient electrocatalysts for amine oxidation based on nickel group metal complexes (Ni, Pd, Pt) with non-innocent pincer ligands, in particular diarylamidobis(phosphine) and NHC-bis(phenolate) ligands (NHC is *N*-heterocyclic carbene). The electrochemical oxidation of the obtained catalysts affords stable catalytically active ligand-centered aminyl and phenoxyl radical complexes. The resulting catalysts can be used for the degradation of persistent organic pollutants.[23–26] This Project was headed by Academician of RAS *O. G. Sinyashin*.

Researchers of ZIOC RAS headed by Academician of RAS *V. P. Ananikov* developed a new approach to automated determination of the molecular structure using deep machine learning on the basis of compound images (scanning electron microscopy and optical microscopy images). The proposed method provides the possibility of identifying molecules with minor structural differences, such as the addition or removal of a single atom or methylene unit. The main emphasis is on the use of convolutional neural networks, which effectively relate the crystal nanostructure features to molecular properties. This approach opens up prospects for considerable decrease in the expenditures for structural analysis of materials and acceleration of the development of new compounds. Experimental studies demonstrated high accuracy in the classification and prediction of physical properties of quaternary phosphonium salts, including melting points and NMR chemical shifts. This study represents a significant step forward in the development of artificial intelligence tools for chemical analysis and provides a new level of insight in the structural studies of organic materials.[27]

A joint project of researchers from the I. Ya. Postovsky Institute of Organic Synthesis, UrB RAS, and FRC of Problems of Chemical Physics and Medicinal Chemistry of RAS, headed by the Academician of RAS *V. N. Charushin* and Corresponding Member of RAS *V. I. Saloutin*, was devoted to the synthesis and biological studies of conjugates of amiridine and salicylic acid derivatives as promising multifunctional agents for the treatment of Alzheimer′s disease. During the study, new amiridine conjugates with salicylic acid derivatives and alkylene spacers of various lengths were obtained and conditions for introduction of the aminopolymethylene spacer into the amiridine molecule were found for the first time. The synthesized conjugates showed a higher degree of acetylcholinesterase (AChE) and butyrylcholinesterase inhibition than amiridine; they are able to displace propidium ion from the AChE peripheral anionic site at the donepezil level and inhibit amyloid Aβ42 self-aggregation in the thioflavin assay; and have high radical scavenging and chelating capacity.[28]

Biodegradable polycarbonates with tunable mechanical characteristics that can be chemically recycled were developed at the A. V. Topchiev Institute of Petrochemical Synthesis of RAS under the supervision of Academician of RAS *I. P. Beletskaya*. It was shown for the first time that cobalt salen complexes can conduct living (without chain termination) copolymerization of propylene oxide with CO_2 at room temperature and elevated pressure up to high degrees of epoxide conversion, which results in highly selective formation of polycarbonate with a molecular weight of more than 10^5 and a narrow molecular-weight distribution (the polymer contains virtually no ether units). In the presence of the catalyst (a few ppm), the polycarbonate completely decomposes within 1 h at 180 °C to give cyclic carbonate; accelerated composting leads to the formation of propylene

glycol. It was found that polycarbonate can behave as a plastic or elastomer depending on the processing temperature. This is due to the release of a minor amount of cyclic carbonate (less than 5%) during heat treatment; the cyclic carbonate is a plasticizer well compatible with the polymer. The developed method for polypropylene carbonate synthesis and modification makes it possible to propose this product as a packaging material and a material for the production of biodegradable plastic ware for cold foodstuff. In addition, owing to high adhesion properties, it can be used as a binder, which is readily removed during heat treatment.[29–31]

Employees of the International Tomography Center, SB RAS, headed by Professor of RAS *M. V. Fedin* investigated heterostructured photocatalysts using advanced ESR techniques. Detailed understanding of charge transfer processes in heterostructured photocatalysts is of key importance for the development of solar energy conversion technologies. The heterojunctions in the tris(4-aminophenyl)-amine—terephthaldialdehyde/$ZnIn_2S_4$ (TP/ZIS) systems promising for the protogeneration of hydrogen from water were studied using the continuous-wave, pulsed, and time-resolved ESR spectroscopy. Using continuous-wave and pulsed ESR, it is possible to study surface paramagnetic centers accessible for water, whereas the results of time-resolved ESR attest to the photoinduced electron transfer from TP to ZIS, which induces the formation of spin-correlated radical pairs upon photoexcitation and effective charge separation in the S-scheme heterojunctions. The authors showed for the first time the high utility of ESR spectroscopy for studying S-scheme heterojunctions and for developing new photocatalytic systems.[32]

Researchers of the N. S. Enikolopov Institute of Synthetic Polymer Materials of RAS, in cooperation with scientists from the Lomonosov Moscow State University, demonstrated a promising application of macromolecular nanoobjects in relation to hydrogels, a type of molecular nanogels. Thus, polymethylsilsesquioxane hydrogels proved to be effective carriers for oral dosage forms of iron compounds to treat iron deficiency anemia. Nanocomposites based on polyorganosilsesquioxane hydrogels and silver nanoparticles showed good prospects for killing drug-resistant infectious gastrointestinal bacteria and removal of toxins from the gastrointestinal tract.[33,34] The Project was headed by Academician of RAS *A. M. Muzafarov* .

A high-performance catalyst for dehydrogenation of aminoboranes based on manganese(I) bis-carbene complexes was developed by researchers from INEOS RAS under the supervision of Doctor of Chemical Sciences *E. S. Shubina* in cooperation with scientists from the Laboratory of Coordination Chemistry, National Research Center in Toulouse (*Le laboratoire de chimie de coordination, Le Centre national de la recherche scientifique* (*CNRS Toulouse*)). The use of the proposed catalyst in the dehydrogenation of aminoborane makes it possible to achieve hydrogen evolution at a constant rate. The efficiency of dimethylaminoborane dehydrogenation in the presence of this catalyst is 50 times higher than that in the presence of known catalysts based on 3d-block metals and eight times higher than that for catalysts based on platinum group metal complexes.[35]

New-generation multifunctional photosensitizing agents for photodynamic therapy of cancer were developed at the N. I. Lobachevsky National Research State University of Nizhny Novgorod under the guidance of Corresponding Member of RAS *A. Yu. Fedorov*. The prepared therapeutic agents contain a photosensitizing block based on natural or synthetic porphyrinoids. In order to increase the selectivity and efficiency of the chosen porphyrinoids, they were conjugated with tumor-specific moieties based on targeted cytostatics or classical antimitotic agents. The photosensitizing and cytotoxic blocks are connected by linkers that are cleaved directly in tumor tissues releasing drug moieties. Thus, the strategy of dual tumor targeting was implemented, according to which the drug was first selectively accumulated in tumor cells and activated by the tumor microenvironment and irradiation with light. The anticancer activity of the dual agents was investigated on cancer cell cultures and on animals with human tumor xenografts. The results indicate that the new agents for photodynamic therapy are selectively accumulated in cancer cells, in particular in tumor grafts in animals. In addition, the synthesized dual agents possess synergistic photodynamic and chemotherapeutic action *in vivo* and *in vitro*. The conducted experiments adequately simulated the tumor development in the human body and, therefore, they reliably confirm the efficacy of the new therapeutic agents.[36,37]

The report on the scientific organizational activity of DCMS RAS in 2024 was presented by Head of Department, Deputy Academician Secretary of DCMS RAS, Doctor of Chemical Sciences *V. I. Maleev*. In his report, *V. I. Maleev* pointed out that in 2024, Russian and international scientific communities celebrated significant events: the 300th anniversary of the Russian Academy of Sciences, and DCMS RAS celebrated its 85-year birthday.

In the reporting year, according to the order of Ministry of Science and Higher Education of the Russian Federation No. 405, dated June 24, 2024, the A. E. Favorsky Irkutsk Institute of Chemistry of SB RAS was reorganized into the FRC A. E. Favorsky Irkutsk Institute of Chemistry, after being merged with the Irkutsk Scientific Center of SB RAS.

In accordance with the order of the Government of the Russian Federation No. 3921-r dated December 20, 2024, the Federal State Budgetary Institution of Science FRC G. K. Boreskov Institute of Catalysis of SB RAS was granted the status of the State Research Center of the Russian Federation.

During the reporting period, two general meetings of DCMS RAS were held. At the first meeting, which took place on May 27, 2024, Academician Secretary of DCMS RAS, Academician of RAS *M. P. Egorov* presented a report on the scientific activity of DCMS RAS in 2023 and Head of Department, Deputy Academician Secretary of DCMS RAS, Doctor of Chemical Sciences *V. I. Maleev* made a report on the scientific-organizational activity of the Bureau of DCMS RAS in 2023. Also, members of the Division were presented with jubilee medals for the 300th anniversary of RAS.

The first General Meeting of DCMS RAS approved Editors-in-Chief for the journals published by DCMS RAS (*Kinetika i Kataliz* (*Kinetics and Catalysis*), *Rasplavy* (*Melts*), *Fizika i Khimiya Stekla* (*Glass Physics and Chemistry*), *Khimiya Tverdogo Topliva* (*Solid Fuel Chemistry*), and *Khimicheskaya Fizika* (*Chemical Physics*)) and members of the Editorial Boards for several journals (*Vysokomolekulyarnye soedineniya* (*Polymer Science*), *Radiokhimiya* (*Radiochemistry*), *Fizika i Khimiya Stekla* (*Glass Physics and Chemistry*), *Teoreticheskie Osnovy Khimicheskoi Tekhnologii* (*Theoretical Foundation of Chemical Engineering*)); made corrections in the lists of journal co-founders (*Mendeleev Communications*) and the journal publication policy (*Zhurnal Prikladnoi Khimii* (*Russian Journal of Applied Chemistry*), *Membrany i Membrannye Tekhnologii* (*Membranes and Membrane Technologies*)); and established the journal *Meditsinskaya Khimiya i Sozdanie Lekarstvennykh Sredstv* (*Medicinal Chemistry and Drug Development*).

The second General Meeting of DCMS RAS held on December 19, 2024, hosted the scientific session "Communication of DCMS RAS with Government Authorities and Organizations of the Real Sector of Economy to Solve Problems of the Scientific and Technological Development of the Russian Federation." The Meeting on December 19, 2024, started with the welcome addresses of the Deputy Minister of Science and Higher Education of the Russian Federation *D. S. Sekirinski*, Deputy Director of the Chemical Industry Department of the Ministry of Industry and Trade of the Russian Federation *Sh. R. Yulgushev*, and President of the Russian Union of Chemists *V. P. Ivanov*.

The program of the scientific session included nine reports covering key trends in the chemistry and materials science. The meeting emphasized the importance of cooperation of scientific organizations with government authorities and business companies to address the priority problems of the country. The reports demonstrated the potential of scientific results for implementation in various industries ranging from rocket science and medicine to agriculture and energy production. The abstracts of the reports were submitted to the Presidium of the Russian Academy of Sciences for delivery to the interested Federal Ministries.

General Meeting of DCMS RAS congratulated scientists of the Division institutes with state and personal awards and international and non-government prizes.

Academician of RAS *E. N. Kablov* was awarded the order For Merit to the Fatherland II class; Academician of RAS *A. Yu. Tsivadze* was awarded the order For Merit to the Fatherland IV class; Academicians of RAS *V. N. Parmon, V. N. Charushin*, and *R. Z. Sagdeev* were awarded the order of Alexander Nevsky; and Academicians of RAS *A. A. Berlin* and *I. L. Eremenko* were awarded the Order of Honor. The Order of Friendship was awarded to Academicians of RAS *I. P. Beletskaya, V. M. Buznik, V. I. Bukhtiyarov, N. Z. Lyakhov, S. N. Kalmykov, V. Yu. Kukushkin, Yu. M. Mikhailov, O. G. Sinyashin, P. A. Storozhenko, M. F. Churbanov*, and *V. F. Shabanov* and Corres-

ponding Members of RAS *U. M. Dzhemilev* and *A. S. Oryshchenko*.

The Medals of the Order For Merit to the Fatherland I class were presented to Corresponding Members of RAS *V. A. Likholobov, V. V. Sagaradze, V. N. Strelnikov*, and *S. V. Sysolyatin*. The Medals of the Order For Merit to the Fatherland II class were presented to Academicians of RAS *S. O. Bachurin, L. B. Boinovich, Yu. G. Gorbunova, V. L. Kozhevnikov, N. Z. Lyakhov, V. P. Meshalkin, A. A. Rempel, V. L. Stolyarova, I. L. Fedyushkin, M. S. Yunusov,* and *A. B. Yaroslavtsev* and Corresponding Members of RAS *E. V. Antipov, S. D. Varfolomeev, A. A. Voshkin, K. Yu. Zhizhin, V. K. Ivanov, V. P. Kolotov, A. V. Makarov, N. E. Nifantiev, A. N. Ozerin, S. A. Ponomarenko, V. F. Razumov, I. G. Tananev, R. Kh. Khamizov*, and *A. K. Chibisov*.

Commendation of President of the Russian Federation was awarded to Academicians of RAS *V. V. Boldyrev, N. Z. Lyakhov*, and *N. T. Kuznetsov*, Corresponding Members of RAS *S. P. Gromov* and *B. V. Gusev*, and research groups of ZIOC RAS, A. E. Favorsky Irkutsk Institute of Chemistry of SB RAS, and Institute of High Temperature Electrochemistry of UrB RAS.

Honorary Certificates from RF President were awarded to Academicians of RAS *I. P. Beletskaya, V. M. Ievlev*, and *B. A. Trofimov* and Corresponding Members of RAS *V. G. Bamburov, G. P. Vyatkin, V. V. Gusarov, A. N. Kuznetsov, A. L. Lapidus, A. V. Lukashin, V. G. Kulichikhin, I. V. Melikhov, V. B. Mintsev, E. F. Panarin, V. L. Rusinov, I. G. Tananaev, A. G. Tolstikov, A. K. Chibisov,* and *Yu. A. Shpigun* and Doctor of Chemical Sciences *E. V. Polyakov* (Institute of Chemistry and Chemical Technology, UrB RAS). Letters of Gratitude from RF President were presented to Academicians of RAS *S. M. Aldoshin, M. V. Alfimov, A. L. Buchachenko, V. I. Minkin, L. A. Smirnov*, and *O. N. Chupakhin*, Corresponding Members of RAS *V. V. Azatyan, Yu. S. Antipin, G. N. Vorozhtsov, E. A. Gudilin, A. G. Kolmakov, A. I. Nikolaev,* and *V. P. Shibaev* and Doctor of Chemical Sciences *A. A. Tulupov* (International Tomography Center, SB RAS).

The Prize of the Government of the Russian Federation in Science and Technology for the development of innovative engineering solutions for the design of polyfunctional textile materials and products was awarded to Corresponding Member of RAS *V. M. Buznik*, Doctor of Technical Sciences *N. P. Prorokova* (Institute of Solution Chemistry of RAS), and other.

To commemorate the 300th anniversary of the Russian Academy of Sciences, President of the Russian Federation established the jubilee medal "300 Years of the Russian Academy of Sciences." This medal was awarded to all members of RAS and Professors of RAS (pertaining to DCMS), a foreign member of RAS, Academician of the National Academy of Sciences of Armenia *A. S. Sagyan*, and to 371 employees of institutes under scientific and methodological guidance of DCMS RAS.

I. V. Kurchatov Gold Medal for outstanding contribution to the development of NRC Kurchatov Institute was awarded to Academician of RAS *S. M. Aldoshin*; V. P. Makeev medal was awarded to Academician of RAS *O. N. Chupakhin*. D. K. Chernov Gold Medal was awarded to Academician of RAS *A. I. Rudskoi* (Peter the Great St. Petersburg Polytechnic University) for the series of studies "New thermoplastic treatment techniques for a wide class of materials, providing high physicochemical and operational properties of metals, composites, and special materials for a broad range of applications."

The V. V. Markovnikov International Prize was awarded to Academician of RAS *V. P. Ananikov*. Corresponding Member of RAS *E. V. Antipov* became a winner of the Sber Scientific Prize; the Prize in the category "Life Sciences" was awarded to Doctor of Physical and Mathematical Sciences *M. V. Ivanov* (N. N. Semenov Institute of Chemical Physics of RAS). The "Challenge" National Prize, in the field of future technologies was awarded to Corresponding Member of RAS *E. V. Antipov* ("Breakthrough" category) and to Doctor of Chemical Sciences *L. L. Fershtat* (ZIOC RAS) ("Outlook" category).

I. V. Grebenshchikov Prize for the series of fundamental studies "Scientific grounds of physicochemical engineering and intelligent statistical analysis of the texture and properties of sheet glass and special glass materials" was awarded to Academician of RAS *V. P. Meshalkin*, Professor *O. B. Butusov* (D. I. Mendeleev University of Chemical Technology of Russia) and Academician of the Russian Academy of Architecture and Construction Sciences *V. T. Erofeev* (National Research Moscow State University of Civil Engineering). V. N. Ipatiev Prize was awarded to Corresponding Member of RAS *A. L. Maksimov*

and Doctor of Chemical Sciences *Kh. M. Kadiev* (A. V. Topchiev Institute of Petrochemical Synthesis of RAS) for series of works "Development of scientific and technological bases of hydrorefining processes of carbon raw materials over original nanosized dispersed catalysts." A. N. Nesmeyanov Prize was awarded to Academician of RAS *V. Yu. Kukushkin* (Institute of Chemistry, Saint-Petersburg State University) for the series of fundamental studies "Organoelement chemistry of stable carbenes." L. A. Chugaev Prize was awarded to Doctor of Chemical Sciences *M. A. Kiskin*, Doctor of Chemical Sciences *A. A. Sidorov* (both from IGIC RAS) and Corresponding Member of RAS *V. K. Ivanov* for the series of studies "Coordination chemistry as a base for the development of new functional materials."

In connection with the 300th anniversary of RAS, in the framework of anniversary events, organizations under the scientific and methodological guidance of DCMS RAS took part in numerous scientific festivals, conferences, congresses, exhibitions, youth competitions, lectures, and meetings with high school students. In 2024, DCMS RAS participated in the arrangement of more than 100 scientific events related to anniversaries of scientific institutions, memorable dates of prominent scientists, and other science awareness events. In particular, this included conferences and readings dedicated to the memory of outstanding chemical scientists: A. E. and B. A. Arbuzovs, E. B. Burlakova, N. S. Enikolopov, N. S. Kurnakov, A. N. Nesmeyanov, V. I. Ovcharenko, Yu. M. Polukarov, and I. V. Tananaev. The practice of holding events for popularization and promotion of scientific knowledge was continued. The activities were aimed at making young people acquainted with the methods and approaches of modern science, as well as attracting the attention of youth to scientific activity in general.

The XXII Mendeleev Congress on General and Applied Chemistry in October 2024 held at the Sirius federal territory was a landmark event of 2024. The Congress was held within the framework of the Decade of Science and Technology and was attended by 4000 participants, including foreign guests from 39 countries. The event was dedicated to 190 years from the birth of D. I. Mendeleev and 300 years from the Foundation of the Russian Academy of Sciences.

An important activity of DCMS RAS is expert evaluation. In accordance with the expert evaluation function imposed on RAS, the Division prepared 3462 expert reports concerning projects, plans, and research topics of scientific and educational organizations, as well as reports and other objects.

Table 1. Training of scientific personnel in 2020—2024

Years	Number of post-graduates			
	total	admitted	graduated	
			totally	with thesis defense
2020	899	278	222	34 (15%)*
2021	986	245	162	30 (19%)*
2022	925	288	164	40 (24%)*
2023	917	238	159	43 (27%)*
2024	997	280	228	48 (21%)*

* In percent to the total number of post-graduates whose post-graduate course was completed in the current year.

The Division provided information and analytical materials, proposals, and conclusions at the request of public authorities and state bodies and participated in the preparation of materials for the report to President of the Russian Federation and the Government of the Russian Federation on the state of fundamental science, which included the most important scientific achievements of chemical scientists in 2024.

DCMS RAS pays great attention to the training of scientific personnel. Owing to the state support for students, post-graduates, and young scientists, the attraction of post-graduate courses has increased in recent years. Indeed, the number of post-graduates increased by almost 10.9% since 2020 (Table 1).

At the end of the report, *V. I. Maleev* gave information on the publishing activity of employees of DCMS RAS institutes. Analysis of the numbers of publications of Russian scientists in the period from 2019 to 2024 indicates that the number of studies published in domestic journals rapidly increases and has become virtually equal to the number of publications in foreign journals (Table 2).

Table 2. Publishing activity of employees of institutes of DCMS RAS in 2019—2024

Year of publication	Number of papers in journals		Number of books and monographs
	domestic	foreign	
2019	3807	5491	325
2020	4358	6503	148
2021	4338	7555	112
2022	3065	6541	84
2023	5268	3741	322
2024	4219	4374	482

The following candidates for the title "Honored Scientist of the Russian Federation" were nominated at the General Meeting: *Kh. S. Shikhaliev* (Voronezh State University), *V. I. Bregadze* (INEOS RAS), Corresponding Member of RAS *I. S. Antipin* (Kazan Federal University), and Corresponding Member of RAS *S. P. Gromov* (Photochemistry Center of RAS).

General Meeting of the Division decided to

1. approve the activity of DCMS RAS in 2024
2. approve the reports on scientific and scientific-organizational activities of DCMS RAS
3. approve candidates for the election as Full Members and Corresponding Members of RAS.

Funding

The work was performed as a part of ongoing research of the N. D. Zelinsky Institute of Organic Chemistry.

Animal Testing and Ethics

No human or animal subjects were used in this research.

Conflict of Interest

The authors declare no competing interests.

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Received June 5, 2025;
accepted June 5, 2025