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Chemistry shaping the future

The cross-year of Germany in Russia and Russia in Germany, which took place from June, 2012, to June, 2013, was held under the patronage of Presidents of Russian Federation and German Federal Republic and included joint events in culture, education, science, business and politics aimed at strengthening Russian–German relations and definition of new paths of joint future of the two countries. The motto of the year was 'Germany and Russia: building the future together'. An important place in the events belonged to chemical science and industry including the innovative technologies concerning sustainable development and green chemistry, new materials, disease control and provision of the mankind with pure water and health food. This was luckily connected to the events held in 2011, which was announced by the UNO as the International Year of Chemistry.

Very successful was the Russian–German scientific symposium 'Chemistry shaping the future' held by the Russian Academy of Sciences and a large German chemical group LANXESS AG with participation of the Ministry of Education and Science of the Russian Federation. The Symposium took place on November 8, 2012 at the Crentral House of Scientists in Moscow and was devoted to the problems and the role of organic chemistry and catalysis, polymer chemistry, new materials and technologies, and some related fields.

The group LANXESS AG has above 17 thousand employees at 50 plants in 31 countries and the annual production output of more than 9 billion euros. Before 2005, it was a part of BAYER, a top German chemical and pharmaceutical manufacturer. Currently, LANXESS AG is mainly engaged in the development, manufacture and sales of plastics, rubbers and intermediates of special chemistry and has 13 offices combined into three segments called Performance Polymers, Advanced Intermediates and Performance Chemicals.

The Symposium was attended by about 300 representatives of scientific and political circles of both countries, including leading scientists from Russia and Germany, who discussed the role of chemical science and industry and the significance of the international cooperation for the solution of global problems and development of breakthrough technologies of the future.

The Symposium was opened by Russian President's special envoy for international cultural cooperation Mikhail Shvydkoy and German Ambassador to Russia Ulrich Brandenburg, who noted the special significance of cooperation in science and technology for both countries.

Vice President of the Russian Academy of Sciences Academician S M Aldoshin and a member of the Board of Management of LANXESS AG Dr. Werner Breuers addressed the audience with greetings. Academician S M Aldoshin emphasized the special role of the two-party cooperation between Russia and Germany involvoing scientists of the Russian Academy of Sciences and the innovative industrial potential of LANXESS AG. In turn, Dr. W Breuers emphasized that Russia and CIS countries provide the possibility for LANXESS AG to supply goods and technologies corresponding to the megatrends of the future and to develop science and technology cooperation.

At the main, scientific session of the Symposium, top scientists of both countries presented reports where they defined chemistry as a science that holds keys to solving the today's global problems. The German party was represented by reports of Professor Hans-Jörg Bullinger (President of the Fraunhofer Society, Munich), 'The miracle of innovation — turbulent times require creative minds'; Joachim Sauer (Professor of the Humboldt University, Berlin), 'Atomistic understanding of heterogeneous catalysis — C–H bond activation'; Dr. Michael Schelhaas (Head of Product Innovation of LANXESS AG), 'Clean water for the world'; Professor Wladimir Reschetilowski (Director of the Institute of Industrial Chemistry, Dresden University of Technology), 'Alternative resources for the metanol economy'; Professor Rolf Muelhaupt (Director of the Institute of Macromolecular Chemistry, Freiburg University), 'Taylor-made graphenes for advanced nanocomposites, catalysis and 3D printing'; Dr. Martin Wanders (Manager for Global Application Development, BU High Performance Materials of LANXESS AG), 'Lightweighting with thermoplastic materials — evolution of the hybrid technology'; and Professor Martin Möller (Director of DWI at the Rhein Westfal Technical University, Aachen) 'Principles of hierarchical self-organization for new functional properties in polymer systems'.

According to Professor H-J Bullinger, the interplay of industry and science is of key importance for the development of innovative technologies and elaboration of new products. In the increasingly globalized world, this interplay develops at the international level. 'Events such as this Symposium are valuable because they offer an opportunity to learn more about the achievements of both countries and to converse with colleagues speaking the language of science and set seeds for people to trust one another. Therefore, if you wish to efficiently cooperate with another country, it is very important to hold symposia of this sort in various fields, especially in science'.

Professor J Sauer reported the results of a theoretical calculation study of heterogeneous catalytic transformations of hydrocarbons and emphasized the importance of

available hydrocarbon resources for the manufacture of chemicals of various sorts, in particilar, polymers, which are an inherent part of society. In this connection, calculations at the molecular level are useful for optimization of the industrial application of the obtained results.

The reports of LANXESS AG representatives, Dr. M Schelhaas and Dr. M Wanders were devoted to the studies carried out by the LANXESS AG group to solve two global problems — provision of the population with clean water and so-called 'green mobility', *i.e.*, economic, lightweight and safe transport. Professor R Mülhaupt (Freiburg) outlined his view on the new prospects for the design of multifunctional nanostructured carbon materials, dispersions and carbon–polymer hybrid materials *via* targeted functionalization of mono- and multilayer graphenes. The report of Professor M Möller (Aachen) was focused on polymer research, in particular, on the design of complex molecular structures and supramolecular assemblies.

On the part of the Russian Academy of Sciences the following reports were delivered: 'The semiconductor revolution in the 20th century' by Academician Zh I Alferov (Nobel Prize Laureate in Physics of 2000, Vice President of the RAS); 'Extreme states of matter on the Earth and in the cosmos: is there any chemistry beyond the megabar?' by Academician V E Fortov (newly elected President of the RAS); 'Green cemistry: development trajectory' by Academician I I Moiseev; 'Direct functionalization of the C—H bonds in arenes and hetarenes — a new trend in development of organic synthesis' by Academician V N Charushin; 'New approaches in silicon production and recycling for sustainable future' by Academician A M Muzafarov; 'Polymer nanostructures for advanced materials' by Academician A R Khokhlov; 'Green chemistry in the context of green economy' by Corresponding Member of the RAS N P Tarasova, 'Target-oriented analysis of gaseous, liquid and solid chemical systems by mass spectrometry, nuclear magnetic resonance spectroscopy and electron microscopy' by Corresponding Member of the RAS V P Ananikov and 'Cathode materials based on perovskite-like transition metal oxides for intermediate temperature solid oxide fuel sells' by Corresponding Member of the RAS E V Antipov.

Academician Zh I Alferov noted that science, first of all chemistry, plays the key role in the solution of global problems. 'The mankind has always created new materials, studied them, and their application played the crucial role. Whereas the early development of the mankind have gone through the Bronze and Iron Ages, now we have the 'Silicon Age' and in the near future heterostructures and polymeric materials would come at the forefront.'

The report of Academician V N Charushin was devoted to new, in principle, approaches to the introduction of nucleophilic moieties into an aromatic ring *via* the oxidative displacement of hydrogen in the C—H bonds. A review of various polymeric nanostructures incorporated in modern advanced materials was given in the review of Academician A R Khokhlov. The state of the art in sustainable development and safe handling of chemicals in the context of 'green economies' was presented in the report of Corresponding Member of the RAS N P Tarasova.

This issue of *Russian Chemical Reviews* includes a number of reviews prepared by the authors on the subject matter of the reports they presented at the Russian–German Symposium. The issue contains reviews by Academician Zh I Alferov, Academician V I Fortov and Corresponding Member of the RAS B V Mintsev, Academician I I Moiseev, Professor W Reschetilowski, Academician A M Muzafarov with co-workers, Corresponding Member of the RAS V P Ananikov with co-workers and Assistant Professor S Ya Istomin and Corresponding Member E V Antipov.

The editorial staff and the Editorial Board of the journal believe that the collection of these reviews reflects quite comprehensively the problems that have been discussed and the proper idea of the Symposium 'Chemistry shaping the future'.

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