CHEMICAL PROBLEMS OF THE DEVELOPMENT OF NEW MATERIALS AND TECHNOLOGIES
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RESEARCH INSTITUTE FOR PHYSICAL CHEMICAL PROBLEMS OF THE BELARUSIAN STATE UNIVERSITY CELEBRATES THE 25TH ANNIVERSARY

Research Institute for Physical Chemical Problems of the Belarusian State University was founded at November 22, 1977 according to the decision of Council of Ministers of the Belarusian Soviet Socialist Republic No 371 of 01.03.1997. At the beginning, Institute consisted of nine research laboratories including laboratory of chemistry of photographic processes, laboratory of physical chemistry of cellulose, laboratory of physical chemistry of solid state, laboratory of radiation chemistry, laboratory of high-temperature reactions, laboratory of semi-conductor ceramics, laboratory of modification and stabilization of polymers, laboratory of organic synthesis and laboratory of extraction and sorption processes. The Institute was staffed mainly by the research workers of chemistry department chairs and amounted at this time to 181 persons including 33 philosophy doctors.

The Institute faced the following basic challenges:

- research, development and technological works, innovation and production activities according to key problems of the chemical and interdisciplinary sciences as well as the improvement of the experimental, material and technical basis for performing of scientific investigations;
- the background of highly trained personnel including philosophy doctors and professors in the field of chemical and pedagogical sciences in collaboration with the chemical department of the Belarusian State University for the scientific and pedagogic domain of the Republic of Belarus.

A significant work on the establishment of the Institute has been done by the deputy rector of BSU academician L.V.Volod'ko, by the deputy Minister of the Higher Education of Belarusian Soviet Socialist Republic prof. F. N. Kaputsky who was the first director of the Institute in 1978–1979 as well as by prof. G. A. Branitsky who acted as a deputy director of the Institute during 1978–1989 and by academician V. V. Sviridov, the director of the Institute in the period of 1979–1993. Then, prof. S. K. Rakhmanov (1993–1997) and prof. O. A. Ivashkevich (since 1997) were in charge of the Institute.

The following basic directions of scientific activities of the Institute were specified by the resolution of the USSR State Committee of Science and Technologies:

1. Study of regularities of the chemical effect of light on solids for the purpose of development of novel materials for photochemical registration of information (scientific supervisor was V.V.Sviridov).

2. Development of methods for the improvement of physico-chemical properties of cellulose aimed at creation of new industrially important materials (scientific supervisor was F. N. Kaputsky).

Besides, investigations aimed at the development of new materials for power-generated devices have been carried out. These research works have been performed mainly in two following areas: (1) chemistry of condensed systems with controlled combustibility (scientific supervisors were A. I. Lesnikovich and V. V. Sviridov) and (2) chemistry of high-temperature inorganic materials (A.A.Vecher and I. F. Kononyuk). Along with the above considered directions, investigations have been carried out in the fields of radiation chemistry (E. P. Petryaev), chemistry of extraction and sorption processes (G. L. Starobinets), organic chemistry (I. G. Tishchenko), chemistry of high-molecular compounds (P. A. Matusevich and T. S. Pritytskaya), chemistry of low temperatures (V. A. Lishnevsky) and some others.

The main directions of the scientific investigations have not been substantially changed during the period of the Institute activity. At the same time, they were expanded and specified to the necessity of solving new problems dealing with economic interests of the State.

The Institute is one of the initiators and active proponents of an innovative approach to the development of scientific investigations both at the Belarusian State University and in the Republic of Belarus as a whole. A considerable part of scientific research pursued in Institute is developed to the level of practical realization and the finances obtained are used for the advancement of fundamental investigations.

At present, the main directions of investigations carried out at the Institute are the following:

- physical chemistry and scientific fundamentals of practical application of ultra-dispersed and nanostructured systems obtained by chemical and electrochemical methods (A. I. Lesnikovich, G. A. Branitsky, S. K. Rakhmanov, A. I. Kulak, T. N. Vorobyova, D. V. Sviridov, G. P. Shevchenko, S. A. Vorobyova, M. V. Artemiev);
- investigation of processes of chemical modification of native and synthetic polymers including cellulose and development on their basis new materials of technical and medicinal application (F. N. Kaputsky, L. P. Krul, P. N. Gaponik, T. L. Yurkshtovich, D. D. Grinshpan. V. P. Prokopovich, V. V. Bogdanova, V. P. Mardykin);
- theoretical and experimental investigations of thermodynamic properties of organic substances and thermodynamic substantiation of energy- and resources-saving technologies for organic synthesis (G. Y. Kabo);
- investigation of physico-chemical fundamentals of processes for preparation of thin films and coatings based on metals, their alloys, oxides and composites with controlled composition, structure and properties (G. A. Branitsky, T. N. Vorobyova, T. V. Gaevskaya, L. I. Stepanova);
- development of efficient methods for the synthesis and investigation of physico-chemical properties and structures of tetrazole derivatives including metal complexes, tetrazolium salts and polymers prospective in organic synthesis as medicines, energy-powered, gas-generating and anticorrosive substances, sorbents of heavy and precious metals and materials for molecular electronics (P. N. Gaponik, O. A. Ivashkevich);
- development of new methods for the synthesis and investigation of properties of biologically-active compounds of albuminous-peptide group (V. M. Shkumatov);

• scientific foundations for the development of new chemical sensors (E. M. Rakhman'ko, G. A. Branitsky, V. V. Egorov, M. I. Ivanovskaya, A. V. Yukhnevich);

• investigation of radiation-induced free-radical processes of damage of biologically important substances and the development of methods for the creation of inhibitors of homolytical reactions with useful medicine properties (O.I.Shadyro);

• quantum-chemical calculations of complex molecular systems (O. A. Ivashkevich, V. S. Gurin);

• scientific foundations for the processing of various types of electronic scrap and other industrial wastes, containing precious metals and the development of methods for the assay and recovery of precious metals (S. K. Rakhmanov, O. A. Ivashkevich, G. M. Korzun, I. D. Makuta).

At the present time, Institute consists of 18 research subdivisions including laboratory of physical chemistry and modification of cellulose (head of laboratory is the academician F.N.Kaputsky), laboratory of medicinals based on the modified polysaccharides (Ph. D. T. L. Yurkshtovich), laboratory of ultradispersed and nanostructured systems (Ph. D. G. P. Shevchenko), laboratory of thermodynamics of organic substances (prof. G. Y. Kabo), laboratory of chemistry of thin films (prof. G. A. Branitsky), laboratory of chemistry of condensed systems (prof. O. A. Ivashkevich), laboratory of physical chemistry of solid state (Ph. D. E. N. Naumovich), laboratory of ionometry and chemical metrology (prof. V. V. Egorov), laboratory of cellulose solutions and products of their processing (Ph. D. D. D. Grinshpan), laboratory of gas sensors and monitoring systems (Ph. D. V. G. Guslev), laboratory of structural-chemical modification of polymers (prof. L.P.Krul), laboratory of chemistry of precious metals (Ph. D. I. D. Makuta), laboratory of free-radical processes (prof. O. I. Shadyro), laboratory of biochemistry of medicinals of albuminous-peptide type (prof. V. M. Shkumatov), laboratory of stabilization of polymers (Ph. D. V. P. Prokopovich), laboratory of physical chemical methods of investigations (Ph. D. L. S. Ivashkevich), sector of fire-extinguishing materials (Ph. D. V. V. Bogdanova) and sector of inorganic sorbents and anticorrosive coatings (Ph. D. V. O. Shablovsky). The Institute staff amounts to 200 persons including more than 70 professors and philosophy doctors.

The structure of Institute is continually changed adapting to the modern economic and social conditions. Along with traditional laboratories and sectors, new subdivisions appear, namely, laboratories of double subordination. Such laboratories were founded jointly with Borisov pharmaceutical plant, Belarusian National Technological University and «Unidragmet BSU» enterprise. The main tasks of these laboratories are the development of industrial basis for the practical realization of applied elaborations carried out at the Institute and chemical department and the involvement of scientific and technical potential of other organizations for solution of these problems.

During the period of 1998–2000, three scientific-industrial enterprises, namely, «Unidragmet BSU», «Unitekhprom BSU» and «Unikhimprom BSU» were established on the basis of laboratories and personnel of Institute. The first one deals with processing of electronic scrap and other wastes containing precious metals and production of gold, silver, platinum and palladium bars of London Good Delivery standard for the replenishment of State reserve of precious metals. Besides, the enterprise produces a wide variety of materials and chemicals con-

taining precious metals. The main direction of activities of «Unitekhprom BSU» is production of more than 60 types of diagnostic sets for chemical and biochemical analyses in medical institutions. The «Unikhimprom BSU» enterprise deals with a building of plants for the production of diesel fuel by chemical processing of a rape oil.

It should be noted that Institute is closely related with the chemical department of the Belarusian State University. A considerable part of scientific investigations carrying out at the Institute and the chemistry department has a common subject-matter. Many lecturers of the chemistry department, post-graduate students and students take part in investigations performing in Institute. At the same time, researches of the Institute participate in teaching and educational process including lecturing of general and special courses, organization and carrying out a laboratory and practical lessons on X-ray analysis, electron microscopy, electron diffraction, IR-spectroscopy, calorimetry, thermometry, chromatography, biochemistry and others.

Over 25 years, 18 doctoral and 140 Ph. D. thesis's were defended at the Institute including 8 doctoral and 23 Ph. D. thesis's defended during last 5 years, 25 monographs and collections of papers, more than 3500 papers in reviewed scientific journals and about 3000 posters were published by Institute research workers. The objects of intellectual property created at the Institute are defended by more then 760 patents.

The developed scientific potential allows the Institute to be reckoned among the leading research chemical institutes in the Republic of Belarus. At the present time the Institute is a head organization in the carrying out and realization of State scientific-technical programs «Medical preparations», «Small-scaled chemistry» and a State program «Precious metals and stones».

The Institute has a close relations with a wide variety of world leading research centers including Thermodynamic Research Center of the National Institute of Standards and Technology (USA, Boulder, Colorado), Joint Institute of Nuclear Research (Dubna, Russia), Max Plank Institute (Berlin, Germany), Tubingen University (Germany), Institute for physical chemistry of Hamburg University (Germany), Moscow State University (Russia) and many others.

The main stages of the Institute development and the fundamental results of investigations carried out at the Institute over 20 years of its activity are considered in a collection of papers [1]. In this book, the main results obtained during last 5 years are presented.

REFERENCE

1. Chemical problems of development of new materials and technologies. A collection of papers in honour of 20th anniversary of the Research Institute for Physical Chemical Problems of the Belarusian State University / Ed. by V. V. Sviridov. Minsk: BSU, 1998. 588 p.