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Milestones chemical technology institute: our past and present

The article is devoted to the 95th anniversary of the Chemical technological Institute (CTI) of the Ural Federal University named after the first President of Russia B. N. Yeltsin (UrFU), which will be held in October 2015. Over the years Chemical technological Institute (CTI) has undergone many structure transformations in accordance with the tasks which were set before it the time and the development of our country. Currently this is a fairly large educational and research Institute, which employs more than 100 lecturers including more than 70 associate professors – candidates (PhD), 30 professors – doctors of Sciences (Hb), 3 academics and 1 corresponding member of RAS, trained more than 850 students.

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In October 2015 the Chemical Technology Faculty (CTF) of the Ural Polytechnic Institute named after S. M. Kirov (UPI), and now the Chemical Technology Institute (CTI) of the Ural

Federal University named after the first President of Russia B. N. Yeltsin (UrFU) celebrates its 95th Foundation Anniversary.

Let's remember how it was

In March 17, 1920 the Chemical Faculty was formed as a result of the division of the Chemical-Metallurgical Faculty of the Ural Mining Institute into separate faculties – chemical and metallurgical. In October 1920 it became part of the Polytechnic Institute, which, along with Mining and other institutions was included in the newly created structure of the Ural State University. In the first academic year in the Chemistry Department were enrolled 145 students.

The first dean of the Faculty was arrived in Ekaterinburg professor of the Petrograd Institute of Technology, electrochemist Alexander Evmenievich Makovetskiy. He can rightly be called the father of the Ural School of chemical engineers. Thanks to the energy A. E. Makovetskiy in the Chemistry Department operated the laboratories for qualitative and quantitative analysis, organic and inorganic chemistry, physical chemistry, dry distillation of wood. And the laboratories were

available to the students of all faculties and the workers' school. On his initiative in Germany and England were purchased thousands of books and dozens of magazines, which laid a solid Foundation of the scientific library of the Institute.

In February 1922 the chemical and metallurgical faculties again united in the Chemical-Metallurgical Faculty (CMF). The Chemistry Department CMF was training in six specialties, such as "The main chemical productions", "Technology of silicates", "Technological Electrochemistry", "Technology of nonferrous, noble and rare metals," "Pyrogenic processes" and "Pulp and paper industry".

In May 6, 1925 the Ural State University was renamed the Ural Polytechnic Institute.

In June 11, 1929, by the decision of Council of People's Commissars of the RSFSR the chemical branch of the CMF was converted into chemical faculty, the dean of which is approved by Nikolai Rogatkin. In 1929/1930 academic year to the first year of the chemistry Department was taken 220 people.

In 1930 the UPI was transferred under the supervision of the Supreme Council of National Economy, its faculties were transformed into a branch of the technical colleges and for some time have any of the Ural Institute of Chemical Technology (UICT) subordinate to Slavhimprom VSNKh of the USSR.

In the 1930/1931 academic year UICT began work composed of five departments of: the main chemical industry; pyrogenic productions; hardware and design; silicate; engineering and economics.

In May 28, 1934 the branch technical colleges were merged into the Ural Industrial Institute (UII), in its composition on

the rights of the faculty of chemical technology entered UICT, and in December 17, 1934 UII was named after S. M. Kirov.

At the beginning of the Great Patriotic War many teachers, researchers and students of the faculty went to the defense of our motherland. The remainder of the team together with the whole country worked under the motto: "All for front, all for victory!" Students and lecturers of the chemistry Department have been created and introduced in manufacture of sulfamide drugs, which contributed to the recovery of the wounded soldiers; developed new catalysts for the flameless combustion of gasoline to use in tactical aircraft to heat engines and cockpit; work on the development and intensification of production of coke and chemical products of coking on the plants of the Urals.

In February 1948 UII was renamed the Ural Polytechnic Institute named after S. M. Kirov.

In December 24, 1992 UPI was renamed the Ural State Technical University (USTU-UPI).

In April 2008, USTU-UPI was named after the first President of Russia B. N. Yeltsin.

In April 2010 the Ural Federal University named after the first President of Russia B. N. Yeltsin was created. In August 30, 2011 on the basis of the Chemical Technology Faculty was established the Chemical Technology Institute.

The leaders of the CTI were N. N. Rogatkin (1927–1929, 1937–1938), S. G. Mokrushin (1930, 1937), I. G. Shcherbakov (1934–1937), I. Y. Postovsky (1938–1942), A. I. Levin (1942–1947), Z. V. Pushkareva (1947–1949), V. L. Zolotavin (1949–1951), B. I. Timin (1951–1953), V. M. Cherkasov (1953–

1958), V. D. Nikitin (1958–1962), B. V. Bezezin (1962–1965), A. V. Pomosov (1965–1974), I. I. Kalinichenko (1974–1982), V. N. Desyatnik (1982–1987), O. N. Chupakhin (1987–1988), A. I. Matern (1988–2007), from 2008 to present time the Institute is headed by V. L. Rusinov.

Currently at the Institute for 10 departments work more than 100 teachers, including more than 70 associate professors – candidates of sciences, 30 professors – doctors of sciences, 3 academics and 1 corresponding member of Russian Academy of Sciences, the Institute has about 850 students. The Institute has a wide creative relationships with Ural Branch of Russian Academy of Sciences, a number of industrial enterprises of Sverdlovsk, Orenburg, Chelyabinsk regions, the Perm and Stavropol territory. All Departments are actively engaged in scientific work. More than 40 people are trained in graduate school. For the last five years at CTI protected 4 doctoral and 47 master's theses. In the ranking of hit consistently

is in the top among three institutes of the Ural Federal University.

Teachers, postgraduates and students of the faculty work closely with the Catholic University (Leuven, Belgium), Karl-August University (Germany), with a number of foreign firms. Many teachers, postgraduates and students of the Institute were trained at the Nankai University (Tian-Zhin, China), Howard University (Washington, USA), the University of Maryland (USA), Catholic University (Leuven, Belgium), the University of Geneva (Switzerland), the University of York (UK). Just a 95-year history of the CTI was released 15 461 specialists (engineers, bachelors, masters). In addition, faculty of the departments of the Institute provide educational process at the Institutes of Materials Science and Metallurgy (IMS-Mt), Fundamental Education (InFE), Ural Power Engineering (UralENIN), Physics and Technology (IPT), Mechanical Engineering (IME), Radio electronics and Information Technologies (IRIT-RTF).

Department of Organic & Biomolecular Chemistry

From 1924 to 1926 the department was headed by Karmanov S. G., from 1926 to 1976 – by Academician of the RAS Postovsky I. Ya., from 1976 to the present – by Academician of the Russian Academy of Sciences, doctor of chemical sciences Chupakhin O. N.

The department offers two master programs: “Comprehensive chemical and physical study and expert evaluation of organic materials” and “Medical chemistry”, one profile bachelor – “Chemical technology of synthetic biologically active substances, pharmaceutical preparations and cosmetics”. Scientific directions of the Department

belong to different research areas of organic chemistry and organic synthesis, medicinal chemistry, materials science, namely: “Integrated chemical and physical research and expert assessment of organic materials” and “Medical Chemistry”, and one bachelor's degree program – “Chemical technology of synthetic biologically active substances, chemical and pharmaceutical preparations and cosmetics”.

Research areas of the department belong to different fields of research including organic chemistry and organic synthesis, medicinal chemistry, materials science, namely:

- nucleophilic aromatic substitution of hydrogen in heteroaromatic and aromatic systems;

- development of methods for the synthesis of heterocycles based on tandem nucleophilic reactions of various types;

- construction of heterocyclic compounds, including those having a fluorine atom in the side chain or the aromatic ring;

- development of methods for the synthesis of fluoroquinolone antibiotics and other inhibitors of DNA gyrase;

- search for substances with antiviral activity;

- synthesis of substances with pharmacological activity, such as anticoagulants, antiplatelet agents, anesthetics, etc.;

- design of anti-tuberculosis drug;

- synthesis of isotope-labeled organic compounds;

- development of methods for preparing substances with a critically high nitrogen content;

- development of methods for the synthesis of effective complexing agents for special purposes;

- development of agents for the extraction of rare earth elements, highly sensitive sensors and fluorescent labels;

- development of highly effective catalytic systems, including systems for asymmetric synthesis.

Over the years, the department graduated 22 doctors and 135 candidates of chemical sciences. Four employees of the department have been elected to the Russian Academy of Sciences – Academicians I. Ya. Postovsky, O.N. Chupakhin, V.N. Charushin and corresponding member of the RAS V.L. Rusinov.

Department of Physical and Colloid Chemistry

Department of Physical and Colloid Chemistry was founded in 1920. The department was headed by professor Pershke V.K. (1920–1931), docent Zinoviev E.I. (1931–1933), doctor of chemical sciences, professor, Honored worker of science and technology of the RSFSR Mokrushin S.G. (1933–1971), professor, Honored worker of science and technology of the RSFSR Kitaev G.A. (1971–1996), doctor of chemical sciences, professor Makurin Yu.N. (1996–2002), and since 2002 to present time it is headed by professor, Honored worker of higher school Markov V.F.

The department offers 3 master programs: “Technology of materials and products of optoelectronics and sensorics”, “Physicochemical technologies of crystals and infrared optical fibers”, “Chemical thin-film technologies in optoelectronics

and nanoelectronics”, and one bachelor’s degree program – “Physicochemical technologies of materials of electronic technology and power industry”.

Academics, graduate and undergraduate students of the department are engaged in scientific research in the following areas:

- quantum chemical modeling of the structure, functional properties and reactivity of molecules;

- development of technology of hydrochemical synthesis of thin films of dielectric, semiconductor and metal materials;

- development of new, including nanostructured, sensor materials for infrared technology and chemical analysis;

- study and development of new fiber materials, scintillators, and based on them creation of optical fibers for infrared region of the spectrum;

– synthesis and study of properties of new X-ray contrast agents for medicine.

The department has trained more than 90 candidates and 6 doctors of sciences.

Department of Technology of Inorganic Substances

Department of Technology of inorganic substances was founded in 1920. The department was headed by professor Yushkevich N. F. (1921–1923), professor Makovetskiy A. E. (1923–1929), professor Shabalin K. N. (1929–1937), professor Kuz'minykh I.N. (1937–1943), professor Vilnyansky Ya.E. (1943–1973), docent Chukhlantsev V.G. (1973–1978), professor Desyatnik V.N. (1978–2001), professor Trifonov K. I. (1997–1999), and since 2001 to present time it is headed by professor Katishev S. F.

The department implements the master program “Chemical Technology of basic inorganic synthesis” and the bachelor’s degree program “Chemical technology of inorganic substances”.

Scientific fields of the department are:

- physical chemistry and technology of melts containing rare earth elements;
- development of methods of physicochemical analysis of ionic equilibria in complex composition solutions;
- physicochemical basis of preparation of magnesium chloride feed to electrolysis;
- effective ways of using waste products of hydrofluoric and phosphoric acids and fluorides;
- development and simulation of technologies for processing man-made structures.

To date the department has trained 2 Academicians, 4 laureates of the State Prize, 5 doctors and 50 candidates of sciences.

Department of processes and apparatus of chemical technology

Department of processes and apparatus of chemical technology was established in 1920. The department was headed by professor Makovetskiy A. E. (1920–1932), professor Plyusnin V.G. (1932–1936), professor Shabalin K. N. (1936–1966), professor Zaostrovsky F.P. (1967–1991), professor Pospelov F.M. (1992–1995), professor Ermakov A. A. (1995–2010), and since 2011 to present time it is headed by professor Ermakov S. A.

The department trains bachelors in the profile “Basic processes of chemical production and chemical cybernetics”.

Academics, staff, graduate and undergraduate students of the department are involved in fundamental and applied research in two areas:

- intensifying the mass and heat transfer under conditions of hydrodynamic instability of the phases contact surface in liquid-liquid systems;
- hydrodynamic separation of heterogeneous gas systems.

Department of Technology of Electrochemical Production

Department of Technology of Electrochemical Production was founded in 1923. The department was headed by professor Shcherbakov I.G. (1923–1938),

professor Esin O. A. (1938–1944), professor Levin A.I. (1944–1978), professor Pomosov A.V. (1978–1988), professor Rudoi V.M. (1988–1998), professor

Samoilenko V. N (1998–2000), and since 2000 to present time it is headed by professor Zaykov Yu. P.

Currently, the department offers one bachelor's degree program: "Technology of electrochemical productions", master programs: "Electrochemical processes and productions", "Hydrogen and electrochemical power industry", "Technology of chemical and electrochemical materials protection".

The cooperation of the department with factories of OJSC "Gazprom" has resulted in the opening a new form of specialists education which is applied bachelor's program.

The main *scientific fields of the department* are basic research in the field

of electrodeposition and electrocrystallization of metals, protection against materials corrosion, production of current sources:

- model description of electrocrystallization of metals in the form of dendrites;
- electrolysis in nonferrous metallurgy;
- electrolytic molding of gold and silver articles;
- study of corrosion protective properties of paint coatings and protective alloys;
- improvement manufacturing processes and electrical characteristics of a lead accumulator.

More than 40 graduates of the department became doctors of sciences and 170 are candidates of sciences.

Department of chemical technology of fuel and industrial ecology

Department of chemical technology of fuel and industrial ecology was founded in 1923.

The department was headed by professor Rogatkin N. N. (1923–1944), professor Syskov K. I. (1944–1947), professor Gofman M. V. (1947–1967), professor Kharlampovich G. D. (1967–1997), docent Shishov M. G. (1997–2008), and since 2008 to present time it is headed by docent Stakheev S. G.

Currently, the department offers the following bachelor's degree programs: "Chemical technology of natural energy resources" and "Environmental protection and rational use of natural resources", as well as the following master programs:

"Chemical technology of natural energy resources and carbon materials" and "Industrial ecology and rational use of natural resources".

The main scientific fields of the department are:

- optimization of processes of coal processing and products produced from them in different pyrogenetic processes;
- environmental impact assessment of projects and the development of environmental design documentation.

22 graduates of the department became doctors of sciences and 130 are candidates of technical and chemical sciences.

Department of Machines and Apparatus for Chemical Productions

Department of Machines and Apparatus for Chemical Productions was organized in 1932. The department was headed by professor Dal'-Chumachenko V.I.

(1932–1941), professor Shabalin K. N. (1941–1960), professor Volgin B. P. (1960–1977), Berezin B. V. (1977–1982), docent Yugay F. S. (1982–1996), profes-

sor Chernomurov F. M. (1996–2006), and since 2006 to present time it is headed by professor Khomyakov A. P.

Today, the undergraduate training is implemented on the bachelor's degree programs «Machines and apparatus for chemical productions», «Machines and apparatus for food production», and on master's degree program «Machines and apparatus for chemical productions».

The main scientific research fields of the department relate to:

- development of heat and mass transfer apparatus based on the Venturi tube;
- implementation of high-speed spray type apparatus for the treatment of process gases in a variety of productions;
- removal of harmful impurities, cooling, absorption;
- development of systems of gas purification from dust, mist, vapor, based on ejection type scrubbers;
- modernization of evaporation and heat exchange equipment, boiler deaerators;

Department of Analytical Chemistry

Department of Analytical Chemistry was founded in 1933. The department was headed by docent Levin A. B. (1933–1938), professor Tananaev N. A. (1938–1959), professor Podchaynova V. N. (1960–1977), professor Polezhaev Yu. M. (1977–2000), since 2000 to present time it is headed by professor Matern A. I.

The department offers two master programs «Electrochemical methods and sensors for environmental and biological objects monitoring», «Instrumental methods of research in the pharmaceutical industry». From 2015 the department offers one bachelor's degree program: «Instru-

- study of wear of parts of hydraulic machines at cavitation and hydroabrasive impact;

- development of apparatus in the field of resource and energy saving technologies;

- use of hydrodynamic cavitation systems for dissipative heating; homogenizing and pasteurizing liquids for food and industrial use;

- applying the principle of evaporation-condensation heat exchange to create technological and power equipment, utilization of secondary energy resources;

- development and implementation of energy technological complexes, providing the ultimate closure of material and energy flows within the unit, department, factory;

- investigation of processes and development of equipment for the food industry.

The department has prepared 13 laureates of Lenin and State Prizes of the USSR Council of Ministers Prize, 7 doctors of sciences, 107 candidates of sciences.

mental methods of analysis of natural and technical objects».

Currently, the department of analytical chemistry of the CTI conducts active scientific research. Main research fields are:

- development of sensors, instruments and automated electrochemical complex for environmental monitoring of heavy metals in online mode;

- studies of antioxidant and anti-radical activity of solutions;

- non-enzymatic methods for determining diagnostically significant parameters;

- development of methods for electrochemical immunoassay;

- study of the toxicity of nanoparticles;
- study of mechanisms electro-transformations of organic compounds and pharmaceuticals;

- definition of basic substance and impurities in pharmaceuticals.

Department of Technology for Organic Synthesis

Department of Technology for Organic Synthesis was established in 1947. Department was headed by professor, Honored worker of science and technology of the RSFSR Pushkareva Z. V. (1947–1982), professor Shishkina V. I. (1982–1988), professor Mokrushin V. S. (1988–2008), from 2008 to present time it is headed by professor Bakoulev V. A.

The department of TOS offers bachelors 3 bachelor's degree programs: "Chemical technology of organic substances", "Biotechnology" and "Food biotechnology". 6 master's programs are implemented: "Chemical technology of fine organic synthesis", "Chemical technology of biologically active substances", "Chemical technology of basic organic and petrochemical synthesis», «Chemical technology of plastics," "Medical biotechnology",

"Food biotechnology" (in Russian and English).

The main research fields of the department are:

- fine organic synthesis in the field of heterocyclic and natural compounds;
- creation of new advanced materials;
- development of new and improvement of the known technological processes;
- nanotechnologies based on organic compounds;
- medical, food and environmental biotechnology.

Among the graduates and staff of the department 370 people defended their candidate's dissertations, 40 – doctoral dissertations, 20 graduates received the State Prize, 15 became heads of departments of various universities.

Department of Immunochemistry

Department of Immunochemistry was founded in 2000 on the initiative and with the participation of Academician Chereshev V. A., who heads the department from the first days of creation and to present time.

The department offers master program "Immunobiotechnology."

Scientific activity of the department is connected with the research in the field of biochemistry and immunochemistry. One of the research fields is the study of non-enzymatic protein glycosylation reaction that underlies the pathogenesis of many social diseases. The second field

is the study of mechanisms of cytokine regulation of physiological processes in blood cells and vascular walls in hyperglycemia. This work is done in collaboration with the Institute of Immunology of the Russian Academy of Sciences.

Currently, the Chemical Technology Institute offers three directions for undergraduate students: "Biotechnology", "Chemical technology", "Energy and resource saving processes in chemical technology, petrochemistry and biotechnology", as well as offers the same directions and the direction "Chemistry" for masters. The Institute implements 12 individ-

ual bachelor's degree programs within the undergraduate education and 24 master programs, including one in English.

In 2008, the educational program "Technology of electrochemical production" (TECP) passed the procedure of public and professional accreditation of the Association of Engineering Education of Russia. Specialization TECP is the only specialization in the Urals region, which is assigned a European quality mark EUR-ACE®.

In June 2012 the basic education program "Biotechnology" passed the procedure of public and professional accreditation of the Public Accreditation Agency for Higher Education Quality Assurance and Career Development and confirmed the conformity of the quality of training of graduates of the program to quality standards and quality assurance, established on the basis of the recommendations of the European Association for Quality Assurance in Higher education.

In addition to academic work lecturers and staff are actively engaged in scientific research. Due to the internationalization the research received a powerful impetus for development. The number of articles

and books published in international journals in English has been increased. Original chemical compounds with biological activity have been synthesized. Students under the guidance of lecturers are actively involved in implementation of sophisticated chemical experiments. Foreign scientists from leading universities around the world often come to the Institute to delivery lectures to staff and students. On the other hand, our undergraduate and graduate students regularly travel abroad (Australia, Austria, England, Belgium, Germany, China, USA and Japan) for undertaking scientific internships. There they can get a new experience, gain new knowledge and improve spoken English. Our staff and graduate students often win grants for the implementation of scientific research and participation in Russian and international conferences.

In conclusion we would like to congratulate all the academics, staff, students and graduates of the Chemical Technology Institute with the upcoming anniversary! We wish you all success and new victories! We love CTI! We wish CTI all the best!