

HISTORY OF THE INSTITUTE OF INORGANIC - CHEMISTRY IN THE TECHNICAL UNIVERSITY AT BUDAPEST

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Received: July 15, 1991

Abstract

The Institute of Inorganic Chemistry at the Technical University of Budapest was established in 1921. The present work includes its history, development and introduces its results. The work is divided into 3 parts according to the activities of the heads of Department: László Putnoky /1921-1947/, János Proszk /1948-1963/ and József Nagy /1963-/.

Keywords: History of Institute.

Professor László Putnoky /1921-1947/

At the József Technical University in the early years of the 20th century Professor Lajos Ilosvay, Head of the Institute for General Chemistry held lectures on inorganic chemistry in courses of a subject called 'Chemia'. On 6th August, 1918 László Putnoky was appointed associate professor at the above-mentioned institute in order to lead an independent group of inorganic chemistry and to teach inorganic chemistry.

In 1921 the Institute of Inorganic Chemistry was established after separating from the Institute of Chemistry. The head of the newly-formed institute became Dr. László Putnoky /1881-1948/. On 21st May, 1921 he was appointed full professor. This day can be considered to be the establishment of the Department [1].

László Putnoky graduated from the Fridericana Technical University of Karlsruhe where he joined Professor Haber's research group. He worked on his MSc thesis beside Professor Donan at Muspratt Laboratory at the Technical University of Liverpool. Later, he started to work at the Nobel-prize winner Professor Rutherford's Laboratory together with György Hevesy and Hans Geiger. After leaving the Victoria Technical University of Manchester he spent some time in Paris with Le Chatelier at the Sorbonne. In 1913 he returned to Karlsruhe to defend his MSc thesis.

Then he came back to Budapest where he became Assistant Professor at the Electrochemical Department of the Technical University.

He also took part in World War I as an artillery officer. After his discharge he became an assistant of Prof. Ilosvay at the Department of General Chemistry.

When he was appointed full professor of the Department of Inorganic Chemistry he did his best to organize it modelled on the most progressive western universities. He made a special point of the education. He participated in constructing a new curriculum, he had wide correspondence about it with well-known professors of European Universities. He updated the equipment of the laboratories, and increased the number of students from 20 to 100 being able to work in the laboratory at the same time. He held lectures on general and inorganic chemistry and on qualitative chemical analysis in 3 semesters. Laboratory practice on qualitative chemical analysis was also part of the studies where he required high-level work of the students. He also held seminars so that students could understand the material much better and he introduced the system of regular tests in the course of the school-year. He stressed the importance of the chemical engineer's way of thinking beside the basic knowledge. His scientific work was not neglected either. His research activities were concentrated mainly on solving problems of industrial interest, first of all in the field of potter's craft, glass-making and aluminium industry. Although he did not publish his significant results in these areas, several scientific papers of his appeared in the field of inorganic and analytical chemistry. He regularly attended conferences abroad as well. He wanted to introduce the young Hungarian chemists' results to the world.

He achieved international recognition for his scientific work and was elected Full Member of the British Chemical Society, Deutsche Chemische Gesellschaft and Deutsche Bunsen Gesellschaft as well.

During the Second World War the bigger part of the chemistry building was destroyed, the stock of chemical agents was ruined. He and his colleagues made enormous efforts to rebuild them and to create the conditions of education. Already on 26th April, 1945 the lectures started in a redecorated room of the ruined building. Prof. Putnoky gave the whole curriculum in 8 lessons a week till 20th May. During those years he devoted all his energy to the reconstruction and re-establishment of the conditions of education.

In 1947 Prof. Putnoky retired. The Department of Inorganic Chemistry was taken over on the head of the Department of General Chemistry Prof. Dr. Jenő Plank. He read the lectures and examined the students. Dr. Gyula Straub senior lecturer was responsible for managing the Department.

Professor János Proszk /1948–1963/

In October of 1948 Dr. János Proszk, the Professor of the Department of General and Inorganic Chemistry of the University in Sopron was appointed Professor and Head of the Department of Inorganic Chemistry at Budapest Technical University.

János Proszk /1892–1968/ graduated from the Pázmány Péter University of Sciences in Budapest. During his studies he became a research student beside Prof. Buchböck at the Institute of Chemistry No. III. He wrote his MSc thesis here in 1913. Then he was on scholarship in Berlin for a year where he worked with Prof. Nernst. His scientific career was interrupted by the World War, he was serving 4 years in the front-line.

In 1919 he was appointed Assistant Professor at the Institute of Chemistry No. II. of the Pázmány Péter University of Sciences where he carried on with his research and tutorial work.

In 1924 he was elected Head of the Chemical Institute of Mining and Forestry Engineering College. At that time he was an associate professor but soon he became full professor. It was him who organized the chemical education in Sopron while he continued his scientific research and published several papers. The book entitled 'Practice of Physical Chemistry' was written by him and his colleague, Tibor Erdey-Gruz. This book has had several editions since then, generations of chemists have used and studied it [2].

When in 1948 he was appointed professor at the Technical University of Budapest, the reconstruction was still going on, the work of the Department extended, the number of students was constantly growing, undergraduates with a specialized matriculation exam, foreign and evening students started their studies here. The number of staff members rising, the area of the Department became wider.

One of professor Proszk's most valuable work is his text-book written together with professor Béla Lengyel and professor Pál Szarvas entitled 'General and Inorganic Chemistry' which included the most up-to-date scientific results of the time as well [3].

The practical training in inorganic chemistry was totally reformed, too. The scope of qualitative chemical analysis was enlarged: new inorganic chemical preparations were produced, basic physico-chemical measurements were added. In this way first-year students were able to obtain practical knowledge as well as a real view of general and inorganic chemistry.

Under Prof. Proszk's guidance the education of postgraduates in the field of corrosion was started in the school-year of 1963–64.

His scientific activity was continued during his various educational works, what is more, during those years he achieved significant results in several fields of research. His research covered 3 main fields. What he loved the best was probably the field of electrochemistry he had already started at Prof. Buchböck's Institute. He also had important results in polarography and coulometry which he published in several papers. He was the author of the monograph entitled 'Polarography', the only comprehensive publication on this subject in Hungarian [4].

His theoretical electrochemical research has great importance, too.

His other main field of interest was the theoretical investigation of organo-silicon compounds and their industrial production and use. His most outstanding results were achieved in this field. In 1953 he was awarded Kossuth-Prize for this activity together with two colleagues Iván Lipovetz and József Nagy [5].

His third field of interest included the investigation of liquid-vapour state, in which not only experimental work was carried out but also the correlation calculation of numerical values of different physical properties.

In 1956 Dr. János Proszk was elected Associate Member of the Hungarian Academy of Sciences. In 1962 he was awarded the Labour Order for his scientific and tutorial activity. In 1963 he became a Professor of fifty years' standing. He retired in this very year but went on working at the Department, took part in the activity of the Hungarian Academy of Sciences and in that of Hungarian Chemical Society and was also a founding member of the Museum of Hungarian Chemistry in Várpalota.

As a result of serious heart disease he passed away on 5th June, 1968. One of the last polyhistor, a determinant personality of the Faculty of Chemical Engineering passed away [6].

Professor József Nagy (1963 -)

Dr. József Nagy received his BSc from the Faculty of Chemical Engineering of the Technical University of Budapest, in 1952. Even as a university student he participated in the research on organo-silicon monomeric compounds and in the work connected with the industrial production of polymers, for the result of which he was awarded Kossuth-Prize together with Iván Lipovetz and János Proszk.

His main research interests include: the investigation of the bond- and molecular structure of organo-silicon compounds and the creation of the technological basis for domestic silicone production.

In 1961 he received his Ph.D. and in 1984 the degree of Doctor of Chemical Sciences as recognition of his work done in the field of bond

structure of organo-silicon compounds. In acknowledgement of his scientific activity he was awarded Eötvös-Prize (1991) as well.

Under Professor József Nagy's leadership the Department of Inorganic Chemistry was concerned with the following fields of research in compliance with its traditions and character:

- production of organoelement compounds and organo-silicon polymers, study and development of domestic production technologies for polymers
- thermoanalytical investigation of inorganic compounds and metal complexes, study of the stability of organo-silicon polymers and kinetic evaluation of their thermal degradation
- study of the surface condition of metals mainly from the point of view of the corrosion behaviour of metals, and investigation of various methods of corrosion protection (layers, inhibitors)

The most important features of the above-mentioned areas can be summarized as follows:

The examination of the organoelement compounds started in 1950 at the Department. The main goal is the production and structure examination of organo-silicon compounds, the quantumchemical interpretation of inorganic chemical bonds, production of new materials /e.g. high-temperature-resistant polymers/. The exploration of the possibilities of application of silicone polymers.

The preparative group created organo-silicon model compounds suitable for quantumchemical definition of different chemical bonds. This work was carried out in co-operation with foreign universities /Graz, Karlsruhe/. The physico-chemical investigations of the model compounds and the necessary quantumchemical calculations have been done by the theoretical group in the frame work of both a nation-wide and an international co-operation.

This kind of study of the model compounds allowed the exploration of various bonds of silicon in different organo-silicon monomer compounds, linear and cyclic oligosilanes and siloxanes.

The photo-electrospectroscopic research team formed in 1985 gave an impulse to the theoretical research. An instrument was designed and constructed according to the team's own plans, its capacity and parameters are competitive with those of other foreign equipment [7].

Numerous results have been achieved in this field and most of the investigations have been carried out in the frame work of an international co-operation. Among others, photo-electron spectroscopy the following compounds were studied by: trimethylsilyl substituted aromatic compounds, cyclic and linear polysilanes, pseudo-halides, phosphorus-, and boron-containing heterocycles, etc.

Besides its theoretical research the Department has played an important role in exploring the sources of raw materials and in the production conception of domestic materials and also contributed to the spreading of home application of silicone-based products.

According to the catalytic polycondensation procedure worked out and patented at the Department [8], silicone polymers have been produced in the quantity of 50 tons/year at the Association of Fine Chemicals since 1986.

The kinetic investigation of condensed procedures, the optimization of the compounds of one- and two-component silicone rubber products vulcanised at room-temperature, the selection of their catalysts, starting the domestic production of these systems at the Association are all included in the Department's activity. Within the frame work of this co-operation the production technology of the silicone-rubber polymer vulcanized by heating and that of premixtures are ready for domestic manufacturing.

Further technological experiments are going on for the production of additional cross-linked silicone rubber products.

The Department took part in discovering the application possibilities of silicone products and in their spreading in industry. /Preparation of electrically conductive silicone rubbers, working out the production conditions of plate-insulators made of silicone rubber, study of biologically active organo-silicon compounds, production of types of medicines ensuring the adsorption of chemical agents through human skin./

The Department carried out extensive investigations keeping in view the domestic protection of monuments in the field of application possibilities of silicone-based hydrophobic building materials e. g. domestic types of limestone.

The Department has been maintaining a fruitful technical relationship with the West-German silicone-producing company Wacker Chemie GmbH. The scientific co-operation signed in 1983 made this contact even tighter [9]. Our Department carries out technological research and investigations for the above-mentioned firm but at the same time we are supplied with the latest technological knowledge and applications, which can be used in Hungary straight away.

In 1973 a thermoanalytical team was founded at our Institute as well. Their research interests focus on the area of study of the thermal behaviour of inorganic materials, investigation of the stability of metal-complexes, isothermal examination of thermostability of inorganic polymers and kinetic evaluation of their thermal degradation. The team's work fits into the silicone-chemical and corrosion research going on at our Department and provides valuable information.

The electrochemical research started under the guidance of professor. János Proszts served as a basis of metal corrosion investigations currently carried out at our Institute. The goal of the research is to study the surface condition of solid materials using electrochemical methods, first of all from the point of view of corrosion behaviour of metals /Fe, Al/. Recently, the investigation of corrosion inhibitors has been emphasized and that of the different corrosion-preventive layers has got great importance, too. This topic is tightly connected with the education of postgraduate corrosion engineers.

Table 1
Scientific activity of the Institute of Inorganic Chemistry

	Publications in Hungarian	Publications in foreign languages	Books	Patents	Dissertations	Lectures*
1950-60	47	34	4	17	4	
1961-70	33	94	4	7	12	58
1971-80	61	164	6	4	42	273
1981-90	86	161	4	17	30	336

*registered since 1963

Finally, in *Table 1* you will find the most important data concerning the scientific activity of our Institute [10]. The activity in the education at the Department, the co-operation with Wacker Chemie GmbH and the most important data of each research-team will be the subject of an independent publication.

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