



Kammel's Quo Vadis Hydrometallurgy 6

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Hydrometallurgy 6**



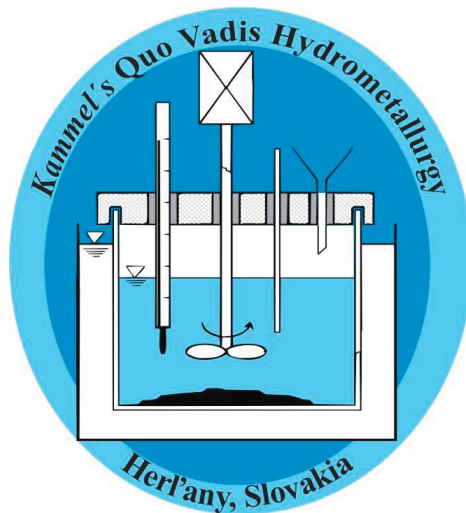
**Frantisek Kukurugya
Dusan Orac**



6th International Conference

*on the Occasion of 60. Anniversary of the
Technical University of Kosice and Faculty of Metallurgy*

Kammel's
Quo Vadis Hydrometallurgy 6



04. – 07. June 2012

*Herľany, Kosice
Slovak Republic*



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Herlany, Kosice

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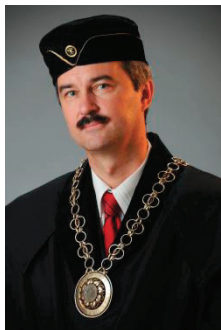
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60th ANNIVERSARY OF FACULTY OF METALLURGY OF TECHNICAL UNIVERSITY OF KOSICE



The 60 years is in the human life a very important jubilee. The same age reached also our Faculty of Metallurgy of Technical university of Košice. The faculty was established based on the Governmental Decree No. 30/52 on July 8, 1952 as one of three faculties of the former Higher Technical School in Košice which was later transformed into existing Technical University of Košice. The Faculty has its roots in deep history and is pride of it spiritual heritage as the successor of famous Mining Academy, established back in 1762 in Banská Štiavnica by Austrian sovereign Maria Theresa. The Mining Academy which was the first world-wide university with specialized education in metallurgy and mining is celebrating the 250th anniversary of its genesis this year.

The Faculty of Metallurgy of Technical University of Košice has by its focusing on the metallurgy an unique position in the Slovak republic. The metallurgy as a base stone of heavy industry in Slovakia has a long-ago very favourable conditions for its development. It belonged and furthest belongs to the corner-stone of industry in Slovakia. It was predetermined by nature conditions, raw materials, ability and expertness of Slovaks, hundred years of traditions and experience.

The Faculty of Metallurgy became a source of academically educated experts for steel factories established in Košice and Podbrezová, for producers of copper in Krompachy, aluminium in Žiar nad Hronom, producers of ferroalloys on Orava, many metallurgy companies in Czech republic, as well as many other small metallurgical and foundry factories often connected with the factories of heavy industry.

The eighty-nine new adepts of metallurgy enter their study in the first school year 1952/53. The study lasted 5 years and 50 of them successfully completed their study in 1957 in the three study specializations:

- Metallurgy of Non-Ferrous Metals,
- Metal Science and Heat Treatment,
- Foundry.

The decision of central federal organs in Prague in the eightieth caused that the study was shortened to 4 years. The study block system in the final classis was also established, but it not reached, in spite of good meaning, good application.

The new approach of metallurgy engineer's education was introduced from school year 1990/91. Duration of study was changed back to 5 years. The study was realized in one study specialization Metallurgy within the nine study programs:

- Metallurgy of Iron and Steel,
- Metallurgy of Non-Ferrous Metals,
- Foundry,
- Materials Science,
- Thermal Energetic,
- Metals Forming,
- Technology of Ceramics Materials,
- Economics and Management in Industry,
- Gas Industry.

The Master study was from the school year 2001 organized in six accredited subject fields with eleven specializations:

Metallurgy, with specializations:

- Metallurgy of Iron and Steel
- Metallurgy of Non-Ferrous Metals
- Foundry

Material Science, with specializations:

- Material Science of Metallic and Non-Metallic Materials
- Metallurgical Metal Forming

Energetic Engineering, with specializations:

- Thermal Energetic
- Gas Distribution and Utilization

Industrial Ceramics, with specializations:

- Refractory Ceramics
- Technical Ceramics and Glass

Environmentalistics, with specialization:

- Recycling and Waste Treatment

Management in Industry, with specialization:

- Integrated Management in Metallurgy

Since the academic year 2004/2005 began at the Faculty the study process in accordance to the new Law about universities from 2002. That means an introducing of study in accredited three levels of study specializations with appropriate study programs in bachelor, master and doctoral study.

In the present time the Faculty of Metallurgy offers wide spectra of accredited study programs in all three degrees of study. For graduates of high schools with leaving examination offers since the academic year 2012/2013 a study in ten bachelor's modern conceived study programs. In the Master study, which takes two years, student has an option to choose from nine study programs. For graduates of Master degree are in the bid eight doctoral study programs. Study programs of all three study levels covering the most modern trends in specializations as follows: Metallurgy, Materials, Energetics, Chemical technologies, Environmental engineering, Chemistry and Quality of Production. As well as in the past we aim for quality and professional education of our students because the pedagogical process is based on the permanently excellent and qualitative research work of research and pedagogical staff and good co-operation with our industrial partners.

During 60 years of our existence the study completed 5364 students of Master degree, 100 of them from the foreign, namely from Algeria, Angola, Ecuador, Ethiopia, Yemen, Jordan, Korea, Cuba, Laos, Madagascar, Mongolia, Nigeria, Peru, Syria, Vietnam, Libya and Thailand. His/her study completed 282 students of doctoral study and obtained the title the candidate of sciences and 192 students obtained the title of PhD.

The faculty staff consists of 78 members, including 16 regular professors, 34 associate professors and 21 assistant professors with PhD. degree. There are 8 emeritus professors at the Faculty.

The structure of Faculty of Metallurgy has changed and in the present time the Faculty is administratively divided into 8 departments:

- Department of Chemistry,
- Department of Ferrous and Foundry Metallurgy,
- Department of Non-Ferrous Metals and Wastes Treatment,

- Department of Materials Science,
- Department of Metals Forming,
- Department of Furnaces and Thermal Technology,
- Department of Ceramics
- Department of Integrated Management.

The words like iron, steel, aluminium, copper, refractory ceramics and energetics traditionally sounds in the scientific direction of Faculty. These are the key words, which we be found throughout the whole existence of the Faculty of Metallurgy. It is necessary to realize that the Faculty focuses and will be further focusing on the progressive technologies in the production, treatment and application of these materials. It is necessary to underline that the Faculty of Metallurgy covers by all its activities the whole life cycle of metal from the primary metallurgy up to the recycling of the metal from the metallic waste. The Faculty deals also with highly attractive topics such as renewable sources of energy, biometallurgy and nanomaterials.

The Faculty of Metallurgy maintains permanent qualitative co-operation with the industry and the most significant partners are the companies as follows: U. S. Steel Košice, s.r.o., Slovalco, a.s., Žiar nad Hronom, Železiarne Podbrezová, a.s., Žiarska hutnícka spoločnosť, a.s., Žiar nad Hronom, Sapa Profily a.s., Žiar nad Hronom, NEMAK Slovakia, s.r.o., Žiar nad Hronom, OFZ, a.s., Istebné, SPP, a.s., Bratislava, Eustream, a.s., Bratislava, s.r.o., Bratislava, VSS Foundry s.r.o., Košice, GETRAG FORD Transmissions Slovakia, s.r.o., Kechnec, Enel - Slovenské elektrárne Vojany, SMZ, a.s., Jelšava, Refrako Košice, s.r.o., Embraco Slovakia s.r.o., Spišská Nová Ves, Kovohuty Krompachy, a.s., Safina Slovakia, s.r.o., Zlievareň SEZ, a. s. Krompachy, Constellium Extrusions Děčín, s.r.o., MOPS PRESS, s. r. o., Snina and many others.

In the co-operation with our industrial partners The Faculty has exploited the “*Joint Research Laboratory and Water Model of Continuous Steel Casting*” (U. S. Steel Košice) and the “*Waste Recycling Centre*” (Aluminium Hydro, Norway and Slovalco, a.s., Žiar nad Hronom). The Faculty of Metallurgy was the leader in the building of „*The Electron Microscopy Centre*“, in co-operation with the Institute of Materials Research of the Slovak Academy of Sciences and the Faculty of Natural Science UPJŠ in Košice.

The Faculty of Metallurgy is a stable member of 17 industrial unions, associations and societies. The faculty is solving annually about 100 projects for industrial partners based on the contractual cooperation.

Along with scientific projects based on the international scientific co-operation, the Faculty continues to build international relationships, also in the form of the educational projects, taking part in the international scientific conferences abroad and short mobilities. The Faculty has maintained fruitful collaboration with the renowned universities such as RWTH Aachen, University of Technology Helsinki-Espoo, Bergakademie Freiberg, MISIS Moscow, AGH Krakow, Politechnika Slaska Gliwice (Katowice), Politechnika Rzeszowska, Rzeszow, Sveučilište u Zagrebe, Faculty of Chemical Technology VŠCHT Prague and many others. In particular, the contacts and co-operation with the universities, which are, similarly as the Faculty of Metallurgy the cultural heirs and spiritual followers of the Academy of Mining of Banská Štiavnica: University of Miskolc, VŠB Technical University of Ostrava and Montanuniversität in Leoben.

Thanks to the good international co-operation and related activities, graduates of the Faculty successfully exercisable on employment market not only in Slovak and Czech republics but also on European and world-wide market as an equivalent graduates from foreign schools.

Dear colleagues, I would like to express my honest thanks to all employees of Faculty of Metallurgy which to endeavour during the whole history its development. Dear colleagues thank you for your high quality and sacrifice work. Due to your merit our students were privileged to study on the Faculty, which is traditionally considered among to the best faculties of the technical direction in Slovakia. I wish you the strong healthiness, a lot of happiness and many career and personal achievements.

Dear participants of the conference “*Kammel's Quo Vadis Hydrometallurgy 6*”, it is my pleasure to welcome you in occasion of its 6st proceedings. New era constantly provides new challenges for our engineers. Our equipment, systems and procedures are being constantly evaluated by our scientists who always strive for the best solution and approaches. Of course, that requires very sophisticated and complex solutions. I am pretty sure that this conference brings many valued information, new opinions and experience.

Dear participants of conference, dear colleagues, I wish you a pleasant conference atmosphere and fruitful discussion.

With traditional metallurgical greeting
Zdar Boh!

Assoc. Prof. Dr. Ing. Peter Hornak
Dean of the Faculty of Metallurgy

FOREWORD



This proceedings contains the papers presented at the international conference *Kammel's Quo Vadis Hydrometallurgy 6* held at Košice – Herľany (Slovak Republic), on June 4 – 7, 2012.

The topics of the *Kammel's Quo Vadis Hydrometallurgy 6* are closely linked with the topics of *Quo Vadis Hydrometallurgy I to V*, conferences that were held in 1995, 1998, 2001, 2004 and 2008 respectively and were met with positive response from the members of the scientific community. The presence of the noted experts from sphere of hydrometallurgy and environmental protection from many countries was a proof of constantly increasing interest in this subject.

It is our pleasure to find out that a number of international cooperation projects started at the time of *Quo Vadis Hydrometallurgy* conferences, which have been persisting and developing to this day. The personal contacts between teams solving the scientific issues on the bilateral basis or in the frame of the European projects realized at the occasion of *Quo Vadis Hydrometallurgy* are the proof of the above.

Agenda of this conference as theoretical and technological aspects of hydrometallurgical production of non-ferrous metals, among which rates the processing, detoxification and liquidation of the wastes, points out on the significance of these issues which are to be solved even in the system of quality management. Therefore the results of this conference will be gradually implemented not only in the scientific sphere but also in the educational process at the Faculty of Metallurgy. This will support the preparation of young educated experts which we will possibly meet on the occasion of the next *Kammel's Quo Vadis Hydrometallurgy 7* in 2016.

Last but not least allow me to mention that such important event would not have been possible without the aid of co-organizers and sponsors. I would like to express my sincere gratitude particularly to Amedis, spol. s r.o., Kovohuty, a.s., PANalytical B.V., Potraviný FRESH s.r.o., Sapa Profily a.s., VWR International GmbH, ŽP VVC, s.r.o., Faculty of Metallurgy of Technical University of Kosice and Fund of R. Kammel, n.f. for their valuable contribution.

On a personal basis, I would also like to express my appreciation to Frantisek Kukurugya, Andrea Miskufova, Dusan Orac, Martina Petranikova, Henrieta Sebekova, Zita Takacova and Tomas Vindt of the Department of Non-ferrous Metals and Waste Treatment of Faculty of Metallurgy of Technical University of Kosice staff for their valuable assistance.

Zdar Boh!

Tomas Havlik
Conference chairman