# FACULTY OF CHEMISTRY 2018



# ANNUAL REPORT 2018

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Brno University of Technology Faculty of Chemistry Purkyňova 464/118 612 00 Brno CRN: 00 216 305 VATIN: CZ 00 216 305 Dean's secretariat: tel. +420 541 149 301, fax: +420 541 211 697 Data box: yb9j9by E-mail: info@fch.vut.cz www.fch.vut.cz

# **INTRODUCTION**

The Faculty of Chemistry of the Brno University of Technology continues with its activities in the long tradition of chemical university education in Brno, started by the establishment of the Chemical Department of the Czech Technical University in November 1911 and interrupted in 1951 by the conversion of Brno technology into the military Technical Academy. The renewal of the Faculty of Chemistry in 1992 was a necessity both in terms of supplementing the Brno University of Technology with the field necessary for its integrated educational effect and complex scientific and research activities, and above all in terms of the industrial development needs of the region, where the interruption in the education of chemists with engineering education, lasting several decades, was clearly felt. The concept of fields of study constituted since the renewal of the Faculty's activities and from the next perspective is based on the needs of BUT development and reflects the needs and requirements of the society and the labour market in the near and far future. At present, the Faculty of Chemistry is an established and respected educational institution with strong research activities and strong links to the industrial and other application spheres.

# **MISSION**

The mission of the Faculty of Chemistry is to provide quality education in chemical disciplines and related fields. Within the framework of educational activities, the faculty emphasizes the connection of educational and creative activities with the needs of the labour market, application sphere, region and other relevant partners. To this end, it uses the excellent research infrastructure, the high potential of its staff and students, and a harmonized environment that creates individualized and optimized conditions for the study of students and the work of employees.

### VISION

Research-oriented faculty competitive in an international context, with strong links to industry, providing teaching with an emphasis on a quality basis of chemical disciplines and linking teaching with excellent material research in the field of material sciences and related fields.





# **DEAN'S FOREWORD**

Dear supporters, employees and students of the Faculty of Chemistry,

The annual report you are browsing or reading summarizes the most important results and events of last year that we have seen at our faculty. The past year was again a successful year for the faculty and brought a number of results and achievements that we can boast of, as well as a number of events that we can remember with pleasure. Personally, I am pleased that we have successfully completed the reconstruction of our largest auditorium, which can now offer our students much more comfort than its predecessor. I believe that our educators can also appreciate and well use the new multimedia technologies of the auditorium. I am also pleased with the newly opened student laboratories for teaching organic chemistry, which have undergone a complete refurbishment and thus offer a pleasant background for work and modern technologies that meet the current needs and requirements of teaching.

In the autumn of this year, our faculty once again hosted the international conference Chemistry and Life 2018, which was attended by over 160 participants from 10 countries. The conference also included a Czech and Slovak Food Science Meeting held on the occasion of the 100th anniversary of the founding of the Czechoslovak Republic and two international workshops. In order to exploit the potential of this conference for students, the student conference Chemistry is Life was organized in parallel, where many interesting contributions were presented by students of doctoral, master and bachelor programs. Support from various companies then allowed awarding the best contributions in each section.

The year 2018 was also the last year of the Material Research Center sustainability project implementation. Five years ago, we set ambitious goals for this project, which, as the final report showed, have been fully achieved and in many ways overcome. For example, I would like to mention non-public funds obtained on the basis of contractual research and other activities in the amount of CZK 32 million or 162 articles in quality impacted journals. Acknowledgment belongs to all researchers and other workers who contributed to these excellent results. At the same time, this project has created a path for the long-term sustainability and further development of MRC as the key research infrastructure of the faculty.

In conclusion, I would like to thank all students, employees and colleagues of the faculty for their efforts, work and study performance, which contributed to the successful development of the faculty in the past year. With optimism, therefore, we can expect further development of the faculty in 2019, but we must also be prepared to successfully meet all the challenges it will prepare for us this year. One of the biggest will certainly be the implementation of the methodology of evaluation of research organizations Methodology 17+. The past year showed that the faculty has great potential to stand up to the most demanding assessment, but it will be necessary to gather all the strengths and stretch them in the right direction.

prof. Ing. Martin Weiter, Ph.D.





# ACADEMIC FUNCTIONARIES

# **ACADEMIC FUNCTIONARIES**

#### Dean

prof. Ing. Martin Weiter, Ph.D.

#### Vice Deans until 31st January 2018

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### Vice Deans since 1st February 2018

doc. Ing. Petr Dzik, Ph.D. – Vice Dean for External Relations and Coop. with Industry (since 5. 9. 2018) Mgr. Martina Repková, Ph.D. – Vice Dean of bachelor and follow-up programs doc. Ing. František Šoukal, Ph.D. – Vice Dean of External Relations and Coop. with Industry (until 5. 9. 2018) doc. Mgr. Martin Vala, Ph.D. – Vice Dean of Doctoral degree, International Relations and Project Activities prof. Ing. Michal Veselý, CSc. – Vice Dean of Creative Activities, Strategic Development

#### Secretary

Ing. Roman Hladík

# **SCIENTIFIC COUNCIL**

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doc. Ing. Lucy Vojtová, Ph.D. prof. Ing. Oldřich Zmeškal, CSc.

#### **External members**

prof. Ing. Vlasta Brezová, DrSc., SUT in Bratislava doc. Ing. František Buňka, Ph.D., TBU in Zlín doc. Ing. Roman Čermák, Ph.D., TBU in Zlín prof. Ing. Jana Hajšlová, CSc., UCHT in Prague prof. Ing. Aleš Helebrant, CSc., UCHT in Prague prof. Ing. Petr Kalenda, CSc., University of Pardubice doc. Ing. Irena Kratochvílová, Ph.D., Institute of Physics of the Czech Academy of Sciences prof. Ing. Petr Mikulášek, CSc., University of Pardubice prof. RNDr. Stanislav Nešpůrek, DrSc., UWB in Pilsen prof. Ing. Jan Roda, CSc., UCHT in Prague prof. Ing. Ján Šajbidor, DrSc., STU Bratislava doc. RNDr. Zdeněk Šimek, CSc., USB in České Budějovice

# ACADEMIC SENATE OF THE FACULTY

#### Chairman

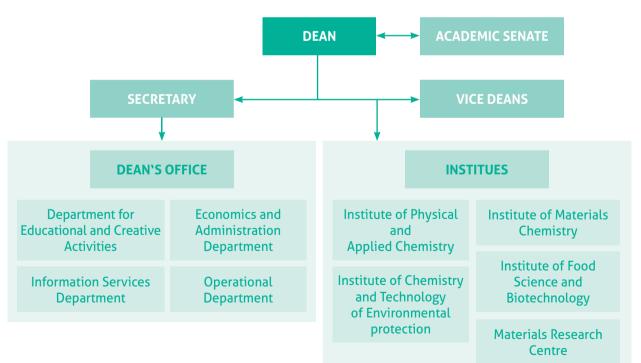
doc. Ing. Pavel Diviš, Ph.D.

#### **Chamber of Academic Staff**

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### **Chamber of Students**

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# **ORGANISATIONAL SCHEME**

# **DEAN'S OFFICE**

# **Dean's Secretariat**

Mgr. Ilona Pipková Ing. Ivana Stašková (April-May 2018)

# Department for Educational and Creative Activities

Ing. Hana Alexová, Head of Department Bc. Romana Němcová Mgr. Alena Sýkorová Eva Šmírová

# **Economics and Administration Department**

Ing. Ladislav Poláček, Head of Department Eva Čermáková (since 1. 3. 2018) Věra Hampelová Ingrid Kašpárková (February 2018) Ing. Libuše Komárková Stanislava Pokorná (until 31. 1. 2018) Lucie Smetanová Eva Vizentová Ivana Vyskočilová

#### **Information Services Department**

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#### **Operational department**

Ing. Jiří Toufar, Head of Department Ing. Petr Bartoň Ing. Karel Bednařík, Ph.D. Petra Bojanovská (until 28. 2. 2018) Roman Buriánek Zuzana Ceypová (since 15. 6. 2018) Věra Couralová Marta Černá Eliška Fadrná Pavel Fadrný Hana Filipská (since 12. 3. 2018) Miroslava Kolářová Jiří Liška (until 30. 4. 2018) Lukáš Ondráček Hedvika Polášková Eva Svánovská (since 26. 3. 2018) Květoslava Šašáková (PL) Petr Škárka Zlata Škárková (until 31. 1. 2018) Kateřina Štaudová Karel Štefka lveta Trávníčková (PL) Eva Vovčenková Ilona Žáková Jindřich Žampach Ing. Pavel Žampach





# INSTITUTE OF PHYSICAL AND APPLIED CHEMISTRY

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prof. Ing. Miloslav Pekař, CSc., +420 541 149 330, pekar@fch.vutbr.cz

#### **DEPUTY DIRECTOR**

doc. RNDr. František Krčma, Ph.D., +420 541 149 407, krcma@fch.vutbr.cz

#### **SECRETARY**

Daniela Macháčová, 541 149 331, fax +420 541 149 398, machacova@fch.vutbr.cz

The Institute offers students two bachelor student programs and follow-up master's programs with the same name in both stages: Consumer Chemistry and Chemistry for Medical Applications. The aim of the Consumer Chemistry study is to provide general education in the field of chemistry and technical chemistry, extended to the theory and practice of the consumer chemical industry. It offers students education applicable especially in specialized low-tonnage production. The graduate will acquire basic knowledge and skills (including laboratory) in the field of inorganic, organic, physical and analytical chemistry and chemical engineering. This foundation is developed in the fields of applied physical chemistry and chemical physics, colloid chemistry, photochemistry, modern electronics and material printing. The study of Chemistry for Medical Applications is also focused on general chemical and technical-chemical education, which is extended in professional study courses by disciplines related to the use of chemistry in various fields of medicine. The graduate is a chemist educated in the basics of pharmacological, biochemical, medical-biological, biotechnological and bioengineering issues. His education also includes modern disciplines of nanotechnology or medical nanobiotechnologies. Graduates are applicable in chemical, but especially in pharmaceutical, biomedical and biotechnological practice. Teaching at the Institute generally emphasizes independent activity, developing individual skills and their involvement in teamwork. For students with a deep interest in chemistry and creative activities, the Institute offers doctoral studies in the programs Physical Chemistry and Chemistry, Technology and Properties of Materials.

The Institute offers to the professional public all forms of cooperation in the field of its competences, both educational and scientific-research and development – e.g. specialized training courses, consultations, measurement and determination on the instruments of the Institute, custom or joint research and development, strategic partnership in research, development and innovation. The Institute is professionally specialized in applied physical chemistry including colloid chemistry, photochemistry, electronics and plasmochemistry. It can thus offer expertise in the field of development and testing of dispersion systems and gels, controlled release, classical and material printing, photochemical-functional products, materials for organic electronics or photovoltaics, plasmochemical treatment and processes, etc. The creative activity of the Institute is closely linked with the Materials Research Centre at the Faculty.

prof. Ing. Miloslav Pekař, CSc.

### **PROFESSORS AND ASSOCIATE PROFESSORS**

doc. Ing. Petr Dzik, Ph.D. prof. Ing. Martina Klučáková, Ph.D. doc. Ing. Zdenka Kozáková, Ph.D. doc. RNDr. František Krčma, Ph.D. prof. Ing. Miloslav Pekař, CSc. doc. Ing. Ota Salyk, CSc. doc. Mgr. Martin Vala, Ph.D. prof. Ing. Michal Veselý, CSc. prof. Ing. Martin Weiter, Ph.D. prof. Ing. Oldřich Zmeškal, CSc.

#### **PH.D. STUDENTS**

Ing. Kateřina Bílková Ing. Jiří Ehlich Ing. Pavel Florián Ing. Roman Halaksa Ing. Rychard Heger Ing. Anna Holubová Ing. Jakub Horák Ing. Michal Hrabal Ing. Stanislav Chudják Ing. Sabína Jarábková Ing. Adam Jugl Ing. Edita Klímová Ing. Michaela Maráčková (Plesníková) Ing. Matouš Kratochvíl Ing. Pavel Kolesa Ing. Jan Kotouček

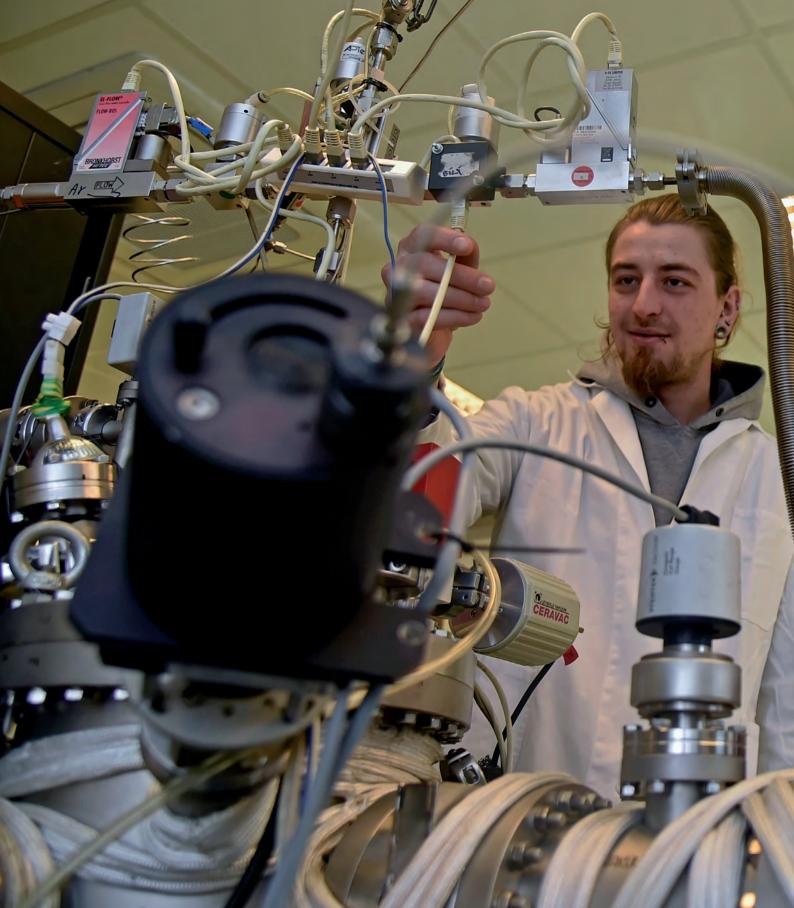
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# INSTITUTE OF MATERIALS CHEMISTRY

prof. RNDr. Josef Jančář, CSc., +420 541 149 310, jancar@fch.vut.cz (until 5. 9. 2018) doc. Ing. František Šoukal, Ph.D., +420 541 149 492, soukal@fch.vut.cz (since 5. 9. 2018)

#### **DEPUTY DIRECTOR**

Mgr. František Kučera, Ph.D., +420 541 149 343, kucera-f@fch.vutbr.cz

#### SECRETARY

Michaela Mrkvicová, +420 541 149 311, mrkvicova@fch.vutbr.cz

The Institute of Materials Chemistry is responsible for bachelor's and follow-up master's study program Chemistry and Technology of Materials. The aim of the bachelor program is to provide students with a good knowledge of the basic principles of inorganic, organic, physical and analytical chemistry and chemical engineering, as well as a basic orientation in macromolecular chemistry and in the structure and properties of solids, i.e. inorganic materials, polymers and metals. In the follow-up study the theoretical knowledge and practical skills needed in engineering practice are deepened, especially in the synthesis and characterization of polymer, composite, ceramic and construction materials, in plastics processing technology and polymer composites production, in production technologies of ceramic and construction materials and in surface treatment of metals and other materials. The best graduates can continue in doctoral studies in two fields, namely Chemistry, Technology and Properties of Materials and Macromolecular Chemistry.

The Institute of Materials Chemistry offers business entities the possibility to consult practical production technological problems, chemical, structural and physico-mechanical analysis of both raw materials and final products. We provide special measurements of chemical, physical, structural, thermomechanical, corrosion and processing properties of building materials, ceramics, plastics, composites and metals. We also provide custom development of new materials for construction, construction applications, automotive, electronics and electrical engineering, ballistic protection, reconstruction medicine, biodegradable packaging, IT hardware, 3D print, adhesives and anti-corrosion treatment of metals. We specialize in functional nanomaterials, low-density construction and insulating materials, geopolymers and other cement-free mortars, controlled life-time materials, refractory materials, high-performance concretes, hybrid cements, materials with high content of secondary raw materials, polymeric and inorganic biomaterials, materials based on PLA and PHB biopolymers and corrosion protection of magnesium alloys.

### **PROFESSORS AND ASSOCIATE PROFESSORS**

prof. RNDr. Vladimír Čech, Ph.D. prof. Ing. Jaromír Havlica, DrSc. prof. RNDr. Josef Jančář, CSc. prof. Ing. Petr Ptáček, Ph.D. prof. Ing. Tomáš Svěrák, CSc. doc. RNDr. Jaroslav Petrůj, CSc. doc. Ing. František Šoukal, Ph.D. doc. RNDr. Jiří Tocháček, CSc. doc. Ing. Lucy Vojtová, Ph.D.

#### RESEARCHERS

doc. Dr. Abdelmohsan Abdellatif, Ph.D. Mgr. Martin Boháč, Ph.D. Ing. Miroslav Černý, Ph.D. Ing. Pavel Doležal, Ph.D. Ing. Leoš Doskočil, Ph.D. Ing. Silvestr Figalla, Ph.D. Ing. Stanislava Fintová, Ph.D. Ing. Bc. Soňa Kontárová, Ph.D. prof. Ing. Dr. Martin Palou Ing. Josef Petruš, Ph.D. Ing. Petr Poláček, Ph.D. Ing. Tomáš Solný, Ph.D. Ing. Jakub Tkacz, Ph.D.

#### **PH.D. STUDENTS**

Ing. Jan Bednárek Ing. Denisa Beranová Ing. Martin Bránecký Ing. Martin Buchtík Ing. Juliána Drábiková Ing. Juliána Drábiková Ing. Juliána Drábiková Ing. Jan Hajzler Ing. Jan Hajzler Ing. Petr Hrubý Ing. Pavel Huljak Ing. Martin Janča Ing. Jakub Kotek Ing. Jan Kotrla Ing. Ondřej Koutný Ing. Jiří Kratochvíl Ing. Michaela Krystýnová

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# **TECHNICIANS**

- Jana Čížková Bc. Kamila Herkusová Ing. Šárka Holcnerová Lubomír Mikšík Michaela Mrkvicová Jana Šprtová Ing. Alena Vomáčková
- Ing. Michal Marko Ing. Jozef Minda Naghmed Abouali Galedari, MSc. Ing. Lukáš Matějka Ing. Veronika Melčová Ing. Přemysl Menčík Ing. Jakub Palovčík Ing. Jakub Palovčík Ing. Tomáš Plichta Ing. Tomáš Porubský Ing. Aneta Pospíšilová Ing. Nikola Šuleková Ing. Jaroslav Vlasák Ing. Jan Vojtíšek Ing. Milan Zvonek Ing. Kateřina Žáková



# INSTITUTE OF CHEMISTRY AND TECHNOLOGY OF ENVIRONMENTAL PROTECTION

doc. Ing. Jiří Kučerík, Ph.D., +420 541 149 340, kucerik@fch.vut.cz

#### **DEPUTY DIRECTOR**

prof. RNDr. Milada Vávrová, CSc., +420 541 149 432, vavrova@fch.vut.cz

#### **SECRETARY**

MVDr. Helena Zlámalová Gargošová, Ph.D., +420 541 149 436, zlamalova@fch.vut.cz

#### **SECRETARY**

Svatava Wilczewská, +420 541 149 341, wilczewska@fch.vut.cz

The Institute of Chemistry and Technology of Environmental Protection provides education in the bachelor, master and doctoral study programs of the same name. Fields can be defined as environmental engineering, based on thorough knowledge of analytical chemistry and chemical technologies, supported by knowledge of other disciplines such as ecotoxicology, applied biology and organic chemistry. At the basic research level, the Institute focuses on the development of methods for wastewater analysis with special focus on the detection of pharmaceutical, hormone, fragrance and artificial sweetener residues, the development of methods for analysis of soil organic matter dynamics and its quality and analysis of microplastics in soils, development of pre-concentration techniques for analysis of platinum metals and synthesis of a wide range of biologically and optically active organic compounds. At the technological level, the field is focused primarily on water treatment technology, soil fund and air protection, general and special industrial toxicology and ecotoxicology, technological processes of municipal waste disposal, plastic biodegradation, preparation of environmentally applicable materials and monitoring and optimization of processes in photovoltaic and thermal systems.

In 2018, the ICHTEP staff participated in the international exchange projects CEEPUS and NETCHEM and further solved a number of projects together with industrial partners and research organizations. Intensive cooperation is carried out with the AdMaS Research Center (FAST, VUT) and with Bionic E&M s.r.o. with which are mainly solved the issues concerning the treatment of sewage sludge and waste water treatment. Within the framework of the contract research ICHTEP employees solved a number of projects with the industrial sphere (e.g. Nafigate, a.s., AVX Czech Republic, s.r.o. and others). International cooperation is actively developed especially with universities and academic and industrial institutions in Germany (University of Koblenz-Landau, University of Applied Sciences Dresden, LKS mbH, Lichtenwalde), Italy (University of Palermo), Scotland (University of Highlands and Islands), Austria (Johannes Kepler University, Linz), France (University of Ruan), USA (Ohio State University), Japan (Kyushu University, Fukuoka) and Israel (Volcani Center, Bet Dagan).

The scientific and research orientation of the Institute determines the teaching within the field of Chemistry and Technology of Environmental Protection, from which students choose the possibilities of their own specialization. During the study they are educated on how to analyse individual pollutants and propose measures to protect the basic components of the environment, i.e. air, water, soil and biota. Vocational subject deals with the issue of transformation of toxic substances in the individual components of the environment, decontamination and remediation technology, disposal of old contaminants and technology of waste treatment. Students are also acquainted with analysis and evaluation of risks including prevention and liquidation of chemical accidents. They are able to apply their knowledges within the framework of chemical and nuclear safety, which is also related to the issue of nuclear chemistry and ionizing radiation. In accordance with the legislation in force they manage to carry out environmental impact studies (EIA), have an overview of quality systems and ISO standards. Studying enables students to acquire the necessary knowledges and practical experiences, which they can subsequently use in the labour market after graduation. Thanks to this, graduates are able to work as managers, engineers and technologists in all areas of the chemical and biotechnology industry, especially water management, waste water treatment plants, air and soil protection technology, etc.

doc. Ing. Jiří Kučerík, Ph.D.

#### **PROFESSORS AND ASSOCIATE PROFESSORS**

prof. Ing. Josef Čáslavský, CSc. (until 31. 8. 2018) doc. Ing. Jozef Krajčovič, Ph.D. doc. Ing. Jiří Kučerík, Ph.D. prof. RNDr. Milada Vávrová, CSc. doc. MVDr. Helena Zlámalová Gargošová, Ph.D.

#### **ASSISTANT PROFESSORS**

Ing. Karel Bednařík, Ph.D. PhDr. Gabriela Clemensová Mgr. Helena Doležalová Weissmannová, Ph.D. RNDr. Lenka Fišerová, Ph.D. Mgr. Renata Komendová, Ph.D. Ing. Josef Kotlík, CSc. Mgr. Martina Repková, Ph.D. Ing. Veronika Řezáčová, Ph.D.

#### **TECHNICAL AND ECONOMIC WORKERS**

Ing. Jakub Fojt (until 31. 8. 2018) Mgr. Pavel Fojt (until 31. 7. 2018) Ing. Ján Jančík Ing. Anna Jančík Procházková (1. 5. 2018 – 31. 7. 2018) Pavla Kleinová Mgr. Jan Richtár (until 30. 4. 2018) Ing. Petra Suková Ing. Tereza Švestková Ing. Petra Venská Svatava Wilczewská

#### **SCIENTIFIC RESEARCHER**

Ing. Ludmila Mravcová, Ph.D.

#### **LECTOR**

Ing. Marta Skoumalová

#### **PH.D. STUDENTS**

Ing. Hana Barboříková Ing. Martina Číhalová Ing. Pavel Dobiáš Ing. Šárka Doležalová Mgr. Pavel Fojt Ing. Jakub Fojt Ing. Radek Hájek Ing. Marie Hejsková Pekárková Mgr. Petr Chrást Ing. Nikola Jančová Ing. Stanislav Ježek Ing. Lucie Kabelíková Mgr. Radek Kavřík Ing. Veronika Kerberová Ing. Veronika Konečná Ing. Alena Kořínková PharmDr. Ing. Silvie Kotlíková Mgr. Blanka Krejčí Ing. Pavlína Landová Ing. Petr Levek Ing. Jiří Marek Ing. Eva Matejčíková Ing. František Mikšík Ing. Jana Oborná Ing. Pecina Václav Ing. Michal Petrulák Ing. Veronika Píšťková RNDr. Helena Půčková Mgr. Jan Richtár Ing. Martin Skrášek Ing. Petra Suková Ing. Jiří Sýkora Ing. Šilhánková Lenka Ing. Tereza Švestková Ing. Jana Valíčková Ing. Petra Venská Ing. Libuše Vítková



# INSTITUTE OF FOOD SCIENCE AND BIOTECHNOLOGY

prof. RNDr. Ivana Márová, CSc., +420 541 149 419, marova@fch.vutbr.cz

#### **DEPUTY DIRECTOR**

Ing. Eva Vítová, Ph.D., +420 541 149 475, vitova@fch.vutbr.cz (until 31. 8. 2018) doc. Ing. Stanislav Obruča, Ph.D., obruca@fch.vutbr.cz (since 1. 9. 2018)

#### SECRETARY

Hana Dršková, +420 541 149 321, drskova@fch.vutbr.cz

The Institute of Food Science and Biotechnology ensures the implementation of the bachelor study program Chemistry and Technology of Foodstuffs. Within this program it offers study fields Biotechnology and Food Science. Students of the above mentioned bachelor programs have the opportunity to continue in the follow-up master's study program Chemistry and Technology of Foodstuff in the study field of Food Science and Biotechnology. The Institute also provides a doctoral study program Chemistry and Technology of Foodstuffs with a study field Food Science and in the same field implements habilitation and professorship. The study is focused on gaining the active knowledge and skills needed in the control and management of modern food and biotechnology production, fermentation technologies and other food, pharmaceutical and chemical technologies, in work in food, biotechnology, genetic, biochemical, microbiological and chemical laboratories. The concept of the field is in line with current requirements for specialized and highly qualified workers in modern biotechnology and food production, research and development laboratories, in control and inspection institutions and in commercial companies.

Graduates of the above-mentioned study programs will find employment:

- in the agro-food complex
- in biotechnology processes in the chemical and pharmaceutical industries
- in new areas of the environmental protection industry
- in state audit institutions
- in the development of new technologies and research
- in business organizations.

The scientific focus of IFSB FCH BUT in Brno is based on current trends in the development of modern food sciences. The main areas of research include analytical-technological area focused on the development and optimization of technological processes, analysis of quality and safety of food, its ingredients, food raw materials and final products and development of modern methods of analysis of content substances. Another part of the research is directed to the area of biotechnology and focuses on the development and optimization of processes aimed at processing and valorization of waste from food and agricultural production and their use for the production of industrially important metabolites and substances with high added value. Modern molecular biotechnology and its applications for the identification and quantification of microorganisms in food are also part of the scientific focus of the Institute. In recent years, nanotechnologies and their use in food and cosmetics have also been actively developed. In all these areas, the IFSB is open to cooperation. Currently, some IFSB laboratories are involved in the research program of the Materials Research Centre within the NPU project (Biotechnology and Biomaterials Group, Elemental Analysis Laboratory). In 2018, the IFSB staff participated in several international projects (LipoFungi, cooperation with Norway), projects of grant agencies (GAČR, TAČR Gama - VUT Šance) and a number of collaborations with industrial sphere (e.g. Nafigate, a.s., Favea a.s., Pharmaceutical Biotechnology, s.r.o., Dekonta a.s., Vinselekt Michlovský a.s., Vinařství Velké Bílovice, s.r.o., Photon System Instruments, s.r.o., Milcom a.s., EVECO, s.r.o., Brno). The Institute has a certified

sensory laboratory that provides certified courses and evaluators' examinations to the professional public. IFSB cooperates with a number of foreign and domestic institutions in solving the research tasks of all the above mentioned directions, student theses, specialized analyses and technology transfer (e.g. Research Institute of Brewing and Malting in Prague, Research Institute of Veterinary Medicine in Brno, CEITEC in Brno, RBIP in Holovousy, Institute of Scientific Instruments of the Czech Academy of Science in Brno, Institute of Inorganic Chemistry of the Czech Academy of Sciences, Czech Globe etc.). International cooperation is actively developed especially with universities and academic and industrial institutions in Norway (University Trondheim, NMBU As, FTIRScreen As), Sweden (University Lund), Spain (University Huelva), Austria (Vienna, TU Graz), Italy (University Sassari, University of Perugia) and Slovakia (SUT in Bratislava, Institute of Chemistry SAV, FFBT SUT).

prof. RNDr. Ivana Márová, CSc.

#### **PROFESSORS AND ASSOCIATE PROFESSORS**

doc. Mgr. Václav Brázda, Ph.D. doc. Ing. Pavel Diviš, Ph.D. prof. RNDr. Jiří Doškař, CSc. doc. Ing. Adriána Kovalčík, Ph.D. doc. Ing. Stanislav Obruča, Ph.D. prof. RNDr. Ivana Márová, CSc. doc. Ing. Eva Vítová, Ph.D. doc. Ing. Bohuslav Rittich, CSc. (until 31. 7. 2018) doc. RNDr. Alena Španová, CSc. (until 31. 8. 2018)

#### **TECHNICIANS**

Radka Nováková Lenka Somrová

#### **ASSISTANT PROFESSORS**

PhDr. Miroslav Hrstka, Ph.D. Ing. Andrea Hároniková, Ph.D. Ing. Petra Matoušková, Ph.D. Ing. Jaromír Pořízka, Ph.D. Ing. Štěpánka Trachtová, Ph.D. (MD) RNDr. Mária Veselá, Ph.D. RNDr. Milena Vespalcová, Ph.D. Ing. Eva Vítová, Ph.D. Ing. Jana Zemanová, Ph.D. (MD)

#### **PH.D. STUDENTS**

Ing. Jitka Bokrová Ing. Lenka Butorová – Burdějová Ing. Dana Byrtusová Ing. Robert Čuta Ing. Lenka Fialová Ing. Michaela Fričová Ing. Viliam Hlaváček Ing. Julie Hoová Ing. Helena Hudečková Ing. Aneta Chytilová Ing. Zuzana Jurečková Mgr. Jana Konečná Ing. Iveta Kostovová Ing. Dan Kučera Mgr. Vojtěch Kundrát Ing. Martina Mahdalová Ing. Nadzeya Mikheichyk Ing. Lucie Müllerová Ing. Milan Němeček Ing. Renata Pavelková Ing. Iva Pernicová Ing. Iva Pernicová Ing. Marek Rapta Ing. Marek Reichstädter Ing. Denisa Romanovská

RNDr. Petr Ryšávka Ing. Peter Sadel Ing. Eva Slaninová Ing. Kateřina Sůkalová Ing. Martin Szotkowski Ing. Michal Sýkora Ing. Václav Štursa Ing. Elena Šťávová Ing. Barbora Tomanová Ing. Martin Vaněk Ing. Martin Vysoká



# MATERIALS RESEARCH CENTRE

prof. Ing. Miloslav Pekař, CSc., +420 541 149 330, pekar@fch.vut.cz

#### **MANAGER OF THE CENTRE**

Mgr. Zuzana Burešová, +420 541 149 814, buresova@fch.vut.cz

#### **FINANCIAL MANAGER OF THE CENTRE**

Mgr. Lucie Hrbková, +420 541 149 482, hrbkova@fch.vut.cz

#### **BUSINESS MANAGER OF THE CENTRE**

Mgr. Martin Bartoš, +420 541 149 446, bartos@fch.vut.cz

#### **SECRETARY**

Dagmar Terichová, +420 541 149 813, terichova@fch.vut.cz

The Materials Research Centre is a regional research Centre with an emphasis on applied research in two research areas - inorganic materials and advanced organic materials and biomaterials. The Centre itself does not provide any field of study or program, but it offers students high-quality instrumentation background, especially for the development of their doctoral, diploma and bachelor theses. It also offers background for laboratories in the field and enables the implementation of specialized practices of the field (program) Chemistry for medical applications. Students can use the Centre equipment either independently after appropriate training or as services (measurements and evaluation by Centre experts), depending on the nature and extent of the required activities. Centre staff is also available to students for specialized consultations in the areas of methodologies or techniques used or materials studied in the Centre.

In 2018, two education-oriented OP RDE projects were implemented at the MRC. The first is focused on the modification and re-accreditation of the existing doctoral program Chemistry, Technology and Properties of Materials, preparation and accreditation of a new doctoral study program Biophysical Chemistry in Czech and English and its introduction as a so-called "double degree" program in cooperation with a partner Huelva University in Spain. The second project is focused on the acquisition of instrumentation that will serve the above mentioned doctoral fields.

The Centre offers the professional public cooperation in various fields of material research and related instrumental-analytical techniques - e.g. custom or joint research and development, strategic partnerships in research, development and innovation, consultations, specialized measurements and determinations on the instruments of the Centre. The Centre's specialization is expressed by the names of its six laboratories: of inorganic binders and ceramic materials; metals and corrosion; biocolloids; biotechnology and biomaterials; organic electronics and photonics; bioplastics. More information can be found on the website: www.materials-research.cz.

In 2018, the Center succeeded in developing an industrial partnership in the field of applied research, both in the form of contract research and joint projects. In the course of 2018, 13 projects with commercial partners were running in the Centre and the volume of contract research reached CZK 13.7 million. Two patent applications were filed for MRC. The Centre was also successful in the field of

international projects, in 2018 launched the project "Interaction of different (methylated) humanic acids with organic ionic compounds" in cooperation with IHSS, USA and continued the international project "Lipofungi" funded by the Norwegian government (cooperation with NMBU As and several Norwegian industrial entities, 2017-2019) focused on biotechnological utilization of waste animal fat. Furthermore, the solving of the SoMoPro project continued that was focused on the utilization of selected regional wastes for the production and application of PHA and the H2020 - MSCA-RISE-2016 project, where the Centre is the coordinator of the whole consortium. At the end of 2018, two international GAČR projects were obtained - an international project focused on the production of PHA by autotrophic organisms (in cooperation with BOKU Tulln, Austria) and an international project focused on Hyaluronan-cationic vesicular complexes (in cooperation with the Ministry of Science and Technology (MOST), Taiwan).

At the national level, MRC manages grants from the Technology Agency of the Czech Republic (TACR), the Czech Science Foundation (GACR) and various regional and national programs. In total, over 30 national and international projects were administered in 2018.

#### SCIENTIFIC RESEARCHER – Senior researcher

Ing. Eva Bartoníčková, Ph.D. doc. Ing. Pavel Diviš, Ph.D. Ing. Pavel Doležal, Ph.D. prof. Ing. Jaromír Havlica, DrSc. Ing. Andrea Hároniková, Ph.D. Ing. Lukáš Kalina, Ph.D. prof. Ing. Martina Klučáková, Ph.D. doc. Ing. Jozef Krajčovič, Ph.D. Ing. Ondřej Kroutil, Ph.D. doc. Ing. Jiří Kučerík, Ph.D. Ing. Michal Kunc, Ph.D. RNDr. Stanislav Luňák, CSc. prof. RNDr. Ivana Márová, CSc. Ing. Jiří Másilko, Ph.D. doc. Ing. Stanislav Obruča, Ph.D.

#### Ing. Tomáš Opravil, Ph.D. prof. Dr. Ing. Martin Palou doc. RNDr. Jaroslav Petrůj, CSc. prof. Ing. Petr Ptáček, Ph.D. Mgr. Radek Přikryl, Ph.D. doc. Ing. Ota Salyk, CSc. doc. Ing. František Šoukal, Ph.D. doc. Mgr. Martin Vala, Ph.D. doc. Ing. Eva Vítová, Ph.D. Ing. Jaromír Wasserbauer, Ph.D. prof. Ing. Martin Weiter, Ph.D. doc. Mgr. Ivaylo Zhivkov, Ph.D. prof. Ing. Oldřich Zmeškal, CSc. doc. Ing. Josef Chladil, CSc. prof. Ing. Tomáš Podrábský, CSc.

#### SCIENTIFIC RESEARCHER – Junior researcher

Ing. Vlastimil Bílek, Ph.D. Mgr. Martin Boháč, Ph.D. Ing. Matěj Březina, Ph.D. Ing. Leoš Doskočil, Ph.D. Ing. Juliána Drábiková, Ph.D. Ing. Miloš Dvořák, Ph.D. Ing. Vojtěch Enev, Ph.D. Ing. Patricie Heinrichová, Ph.D. Ing. Michal Kalina, Ph.D. Ing. Andrea Kargerová, Ph.D. Ing. Iva Kolářová, Ph.D. Ing. Jan Koplík, Ph.D. Ing. Bc. Soňa Kontárová, Ph.D. Ing. Petr Kosár, Ph.D. Mgr. Alexander Kovalenko, Ph.D. Ing. Jitka Krouská, Ph.D. Ing. Petra Matoušková, Ph.D. Ing. Miroslava Mončeková, Ph.D. Ing. Filip Mravec, Ph.D. Ing. Radoslav Novotný, Ph.D. Ing. Jaromír Pořízka, Ph.D. Ing. Jan Pospíšil, Ph.D. Mgr. Jan Richtár Ing. Petr Sedláček, Ph.D. Ing. Jiří Smilek, Ph.D. Ing. Tomáš Solný, Ph.D. Ing. Stanislav Stříteský Ing. Pavel Šiler, Ph.D. Ing. Eva Štěpánková, Ph.D. Ing. Jiří Švec, Ph.D. Ing. Tereza Švestková Ing. Jakub Tkacz, Ph.D. Ing. Alžběta Vargová Ing. Tereza Venerová, Ph.D.

#### **TECHNICAL SUPPORT**

Ing. Martin Buchtík Pavel Fadrný Ing. Silvestr Figalla, Ph.D. Ing. Stanislava Fintová, Ph.D. Ing. Jakub Fojt doc. Ing. Branislav Hadzima, Ph.D. Ing. Šárka Holcnerová Bc. Matyáš Horálek Ing. Ján Jančík Ing. Romana Kratochvílová Leona Kubíková Mgr. Vojtěch Kundrát Ing. Aneta Marková Ing. Lukáš Omasta Ing. Marta Skoumalová Ing. Halina Szklorzová Ing. Martin Szotkowski Ing. Jan Truksa Ing. Martin Vaněk Jana Čížková Bc. Lujza Štulrajterová Ing. Ivana Stehnová Administrativa Ing. Hana Alexová Pavla Dobrovská Mgr. Jana Foltýnová, DiS. Mgr. Tomáš Hebký Marta Horáčková Mgr. Alena Sýkorová Eva Vizentová

#### **STUDENTI Ph.D.**

Ing. Jan Bednárek Ing. Denisa Beranová Ing. Jitka Bokrová Ing. Dana Byrtusová Ing. Martin Cigánek Mgr. Jan Dvořák Ing. Jiří Ehlich Ing. Eva Fryšová Ing. Lucie Galvánková Ing. Jan Haizler Ing. Roman Halaksa Ing. Richard Heger Ing. Petra Holínková Ing. Julie Hoová Ing. Michal Hrabal Ing. Petr Hrubý Ing. Helena Hudečková Ing. Aneta Chytilová Ing. Martin Janča Ing. Anna Procházková Jančík Ing. et Ing. Sabína Jarábková Ing. Adam Jugl Mgr. Jana Konečná Ing. Jan Kotrla Ing. Matouš Kratochvíl Ing. Michaela Krystýnová Ing. Jakub Křikala Ing. Dan Kučera Ing. Michal Marko Ing. Lukáš Matějka Ing. Veronika Melčová Ing. Přemysl Menčík Ing. Jozef Minda Ing. Lucie Müllerová Ing. Ivana Nováčková Ing. Jakub Palovčík

Ing. Renata Pavelková Ing. Iva Pernicová Ing. Tomáš Porubský Ing. Lenka Punčochářová Ing. Marek Rapta Ing. Veronika Richterová Ing. Denisa Romanovská Ing. Jan Rybárik Ing. Eva Slaninová Ing. Marcela Smilková Ing. Šárka Sovová Ing. Petra Suková Ing. Václav Štursa Ing. Nikola Šuleková Ing. Libor Tomala Ing. Monika Trudičová Ing. Šárka Tumová Ing. Tomáš Velcer Ing. Petra Venská Ing. Jan Vojtíšek Ing. Marie Vysoká Ing. Kateřina Žáková







Study programs	type	length	title
Chemistry and Technology of Foodstuffs	В	3	Bc.
Chemistry and Chemical Technologies	В	3	Bc.
Chemistry and Technology of Environmental Protection	N	2	Ing.
Chemistry and Technology of Foodstuffs	N	2	Ing.
Chemistry for Medical Applications	N	2	Ing.
Chemistry, Technology and Properties of Materials	N	2	Ing.
Consumer Chemistry	N	2	Ing.
Chemistry, Technology and Properties of Materials	D	4	Ph.D.
Chemistry and Technology of Foodstuffs	D	4	Ph.D.
Chemistry and Technology of Environmental Protection	D	4	Ph.D.
Physical Chemistry	D	4	Ph.D.
Physical Chemistry	D	4	Ph.D.
Macromolecular Chemistry	D	4	Ph.D.
Macromolecular Chemistry	D	4	Ph.D.
Chemistry and Technology of Foodstuffs	D	4	Ph.D.
Chemistry, Technology and Properties of Materials	D	4	Ph.D.

1150

The aim of the faculty in the educational field is to offer a diversified approach to quality education in order to seek out and develop students' talents, reduce study failure rate and to allow disadvantaged groups (e.g. socially and culturally disadvantaged) access to quality education.

## STUDY PROGRAMS

12 13 12 13 11 10 9 8 8 7	4 1!	TRIPS OF ST 17 18 <sup>19</sup> 16		NTS	1 9 8 2 7 6	AR .0 <sup>11</sup>					2	
	1	Austria	11	20 %			4					
	2	Norway	9	16 %		_1	Bulgaria	7	17 %			
	3	Portugal	6	11 %		2	Spain	6	15 %			
	4	Slovenia	3	5 %		3	Brazil	6	15 %			
	5	Germany	3	5 %		4	Italy	4	10 %			
	6	Spain	3	5 %		5	Lithuania	3	7 %			
	7	France	2	4%		6	Turkey	3	7 %		191	
	8	Belgium	2	4%		7	Taiwan	2	5 %		-	
	9	Italy	2	4 %		8	Bosnia	2	5 %		- 10.00	
	10	Taiwan	2	4 %		9	Jordan	2	5 %			
	11	Hungary	2	4 %		10		1	2 %	-		
	12	Lithuania	1	2 %		11		1	2 %	-		
	13	Sweden	1	2 %	ALC: NO. OF COMPANY	12		1	2 %			
	14	Poland	1	2 %		13	Austria	1	2 %			
	15	Great Britain	1	2 %		-	France	1	2 %			
	16	Denmark	1	2 %		15	Poland	1	2 %			
	17	Brazil	1	2 %		1						
	18	Russia	1	2 %								
	19	Switzerland	1	2 %								

The Faculty of Chemistry makes the best effort to increase international cooperation, mutual mobility and joint projects in educational and creative activities. The aim is to create an environment that will have a clear international character, taking into account the world context and international experience in the preparation and implementation of study programs and joint research projects.

## INTERNATIONALIZATION OF STUDY, STUDENT TRIPS ABROAD

2 – ČERPACÍ CHARAKTERISTIKA

> The Faculty of Chemistry actively reflects current social development and closely monitors the latest scientific knowledge as well as the needs of its partners. A natural part of faculty activities is the external communication together with the promotion of the results achieved, ensuring the presence in the public space and social prestige. These goals are achieved through ever increasing and intensifying cooperation with employers, graduates, application sphere, regional players, secondary schools and other partners, as well as the public domain and public institutions. Events were organized with many years of tradition, such as the Chemistry Day, Open Days, European Researchers'. Night and the Faculty participated also at events organized by other organizations, such as the Science Festival, Science Play, Science at School, May Festival, Chemical Olympics and others. The Faculty participated in post-secondary and lifelong education fairs. In the framework of the commenced implementation of the project "MOST" of Operational program Research, development and education, monitoring and analysis of the requirements and needs of employers of graduates resulted in the re-accreditation of the original Bachelor's degree programs as separate programs and in the accreditation of new professional bachelor program. For the promotion of study and science and research, the printed media, TV as well as other multimedia channels (see updated information on the faculty and BUT website) were used. Attention was paid to capturing new trends in communication (social networks), ensuring visibility and the presence of the Faculty in these new media. New version of the faculty website using a new visual concept unified throughout BUT is optimized for viewing on mobile devices and was launched by the Faculty of Chemistry as the first of BUT faculties. A great variety of activities targeted at graduates, including the preparation of the Faculty's graduate club, was conducted.

## MARKETING

## SH/TH

mit to

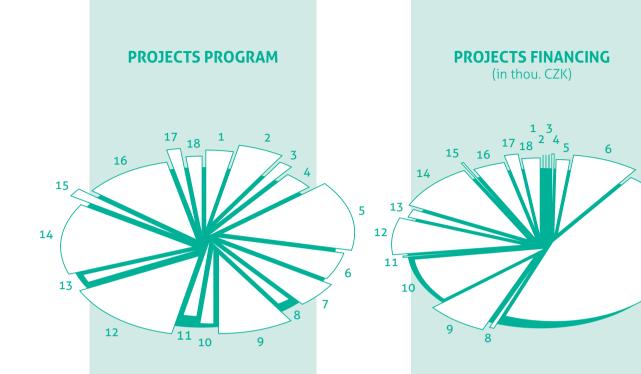
9

RIOT

6

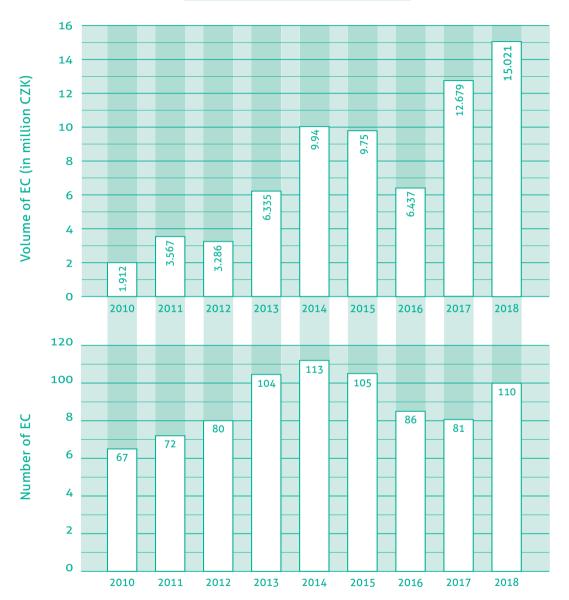
## RESEARCH ACTIVITIES OF THE FACULTY AND COOPERATION WITH THE APPLICATION





1	AKTION	2
2	CEEPUS	3
3	Visegrad Fund	1
4	R and D projects abroad	2
5	Development programs	8
6	OP VVV NIV	3
7	OP VVV IV	3
8	COST	1
9	Specific research	5
10	NPU	1
11	Czech-Norwegian program	1
12	GACR	8
13	MICR	1
14	MIT CR	8
15	MH CR	1
16	TACR	6
17	SoMoPro	1
18	H2020	1

1	AKTION	81
2	CEEPUS	89
3	Visegrad Fund	38
4	R and D projects abroad	248
5	Development programs	1 784
6	OP VVV NIV	8 0 3 4
7	OP VVV IV	46 936
8	COST	630
9	Specific research	7 572
10	NPU	9 1 5 6
11	Czech-Norwegian program	237
12	GACR	7 707
13	MICR	1 439
14	MIT CR	9 970
15	MH CR	372
16	TACR	4 059
17	SoMoPro	1 735
18	H2020	2 012



#### **ECONOMIC CONTRACTS**

The priority objective of the Faculty of Chemistry in this area is to support quality research with high social benefits so that the results of research and development are internationally relevant and effectively transferred to the application sphere. A prerequisite for achieving this is to ensure the sustainability and efficiency of the utilization of the built research capacities, largely made up of the Materials Research Centre. The Faculty of Chemistry reflects the current social development, the latest scientific knowledge and the needs of partners in its activities. At the same time, it actively communicates and promotes its results and opinions, thus increasing its prestige in public space.

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### PUBLICATION ACTIVITY

1	journal article (WoS)	
2	book or chapter in boo	ok
3	functional sample	9000 ST-55
4	research report	1
5	utility model	
6	article in proceedings	

ST-7



## PUBLICATION 12 ACTIVITY

VYSOKA ŠKOLA CHEMICKO-TECHNOLOGICKA PARDUBICE

ST-FF-20

POT

1 - 26048

HALVIIC RA BIBLICKA

£1092.

MARAN-SNI

ST-FF-20

OV&, M n kest SOCH!



## COOPERATION

1.1

20

#### **ACADEMIC INSTITUTIONS**

Institute of Biophysics AS CR, Brno CIRIMAT-ENSIACET, Toulouse, France **CNRS Lyon, France** Columbia University, Department of Chemistry, USA Department of Chemistry, University of Torino, Italy Department of Organic Chemistry, Moscow State University, Moscow, Russia Ecole Nationale Superiére de Chimie de Paris, Paris, France Ecole Polytechnique, Palaiseau, France Environmental Research Institute, North Highland College UHI, Thurso, Scotland Faculty of Electrical Engineering and Communication, BUT in Brno Faculty of Civil Engineering, Czech Technical University in Prague Faculty of Technology, Tomas Bata University, Zlín Institute of Physics AS CR, Prague Institute of Physics of the Serbian Academy of Sciences, Zemun, Serbia Institute of Physics of SAS, Bratislava, Slovakia Institute of Chemistry, Bratislava, Slovakia Institute of Geology and Geochemistry of Petroleum and Coal, RWTH Aachen University, Aachen, IRCELYON, Lyon, France Julius-Maximilians-Universität Würzburg, Germany Laboratory of Polymer Chemistry, Shizuoka University, Japan Masaryk University Brno, Faculty of Medicine, Brno

Masaryk University Brno, Faculty of Science, Brno Max Planck Institute for Colloids and Interfaces, Germany Max Planck Institute for Polymer Research, Germany Institute of Microbiology AS CR, v.v.i., Prague Moscow State University, Russia MUAF Brno, Faculty of Agronomy MUAF Brno, Faculty of Horticulture National Institute of Chemistry, Ljubljana, Slovenia National Institute of Standards and Technology, Colorado, USA NTNU Trondheim, Norway Open University, Milton Keynes, UK Pannon Egyetem (University of Pannonia), Veszprem, Hungary Purdue University, West Lafayette, Indiana, USA Royal Institute of Technology Stockholm, Sweden Silvio Conte National Polymer Research Center, University of Massachusetts, USA STU Bratislava, Faculty of Chemical and Food Technology, Slovakia Technical University of Lisbon, Portugal Universidad de Girona, Spain Universita degli Studi di Trento, Trento, Italy University Ghent, Belgium University of Akron, Department of Polymer Science, USA University of Belgrade, Serbia University of Greenwich, London, UK University of Illinois - Champaign, Department of Materials, USA

University of Kaiserslautern, Institute for Composite Materials, Germany University of Kragujevac, Serbia University of Ljubljana, Slovenia University of Lodz, Poland University of Michigan, USA University of Nis, Serbia University of Nova Gorica, Slovenia University of Novi Sad, Serbia University of Regensburg, Germany University of Sarajevo, Bosnia a Herzegovina University of Sheffield, Department of Engineering Materials, Sheffield, UK University of South Florida, Department of Physics, USA University of Zagreb, Croatia Charles University, IFF, Prague Comenius University Bratislava, Slovakia University Marne la Vallée, France Palacký University Olomouc, Faculty of Science University of Pardubice, Faculty of Chemical Technology University of Piere et Marie Curie, Paris, France University of Porto, Portugal University of Poitiers, France University of Veterinary Medicine, Kosice, Slovakia Institute of Analytical Chemistry of AS CR, Brno Institute of Inorganic Chemistry SAS Bratislava, Slovakia Institute of Plasma Physics, v.v.i., AS CR, Prague Institute of Geotechnics of the Slovak Academy of Sciences, Kosice, Slovakia

Institute of Macromolecular Chemistry of AS CR, v.v.i., Prague Institute of Scientific Instruments of AS CR. Brno Institute of Construction and Architecture of SAS, Bratislava, Slovakia Institute of Rock Structure and Mechanics AS CR, Prague Institute of Systems Biology and Ecology AS CR, Brno Institute of Theoretical and Applied Mechanics AS CR, v.v.i. University of Veterinary and Pharmaceutical Sciences, Brno University of Chemistry and Technology, Prague Research Institute of Brewing and Malting a.s., Brno Wiezmann Institute of Science, Israel University of West Bohemia in Pilsen

#### COMPANIES

ACOindustries, Přibyslav ADM, a.s., Brno AGRA GROUP, a.s., Střelské Hoštice Agrobac, Slušovice Agrofrukt – družstvo Hustopeče, Hustopeče Agrotestfyto, s.r.o., Kroměříž Amagro, s.r.o., Prague Aromatica, v. o. s., Šlapanice ASIO, s.r.o., Brno Asociación de la Industria Navarra, Spain Barum-Continental, a.s., Otrokovice Bavarian Company for Applied Energy Research, Germany BioVendor, CTPark Modřice, Brno-Modřice Bohemia Beverage Industry Group, s.r.o., Rohatec Brněnské vodárny a kanalizace, a.s., Brno CAB minerals, s.r.o., Brno CARMEUSE CZECH REPUBLIC, s.r.o., Mokrá u Brna CEMMAC s.r.o., Horné Srnie, Slovakia Centro de Nanotecnologia e Materiais Técnicos, Funcionais e Inteligentes, Potugal Centro Richerche Fiat S.C.p.A., Italy Centrum organických syntéz, s.r.o., Pardubice Continental Automotive Czech Republic s.r.o., Jičín; Brandýs nad Labem ContiPro, a.s., Horní Dobrouč CPN, s.r.o., Dolní Dobrouč Českomoravský cement, a.s., Mokrá u Brna Český metrologický institut, Brno

ČEZ Energetické produkty, s.r.o., Hostivice D PLAST-EFTEC a.s., Hrádek nad Nisou DAIDO METAL CZECH s.r.o., Brno DCT Czech s.r.o., Černá Hora Deutsches Textilforschungszentrum Nord-West, Germany Devro, a.s., Svitavy ENVITES, spol. s r.o., Brno EPCOS s.r.o., Šumperk Favea, s.r.o., Kopřivnice FLSmidth s r.o., Brno Fosfa a.s., Břeclav Fundació Privada CETEMMSA, Spain Generi Biotech, s.r.o. Hradec Králové Grado Zero Espace SRL, Italy GUMOTEX, a.s., Břeclav Hamé, FRUTA Podivín HELUZ cihlářský průmysl v.o.s., Dolní Bukovsko Helvetia Pharma a.s., Prague IFE-CR, a.s., Brno-Modřice IMI International s.r.o., Brno, Humpolec ITW PRONOVIA, s.r.o., Velká Bíteš Kingspan, a.s., Hradec Králové KLIMATEX, a.s., Brno KNORR-BREMSE Systémy pro užitková vozidla ČR, s.r.o., Stráž nad Nisou Lasaff re-Česko, Olomouc LAVIMONT BRNO, a.s., Brno Limagrain Central Europe Cereals, s.r.o., Prague METEA, a.s. Brno Milcom, a.s., Prague Miltra B, s.r.o., Městečko Trnávka Mlékárna Valašské Meziříčí NAFIGATE Corporation, a.s., Prague Nano33, s.r.o., Pilsen Nanocyl S.A., Belgium

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#### **BACHELOR DEGREE PROGRAMS**

#### Chemistry and Chemical Technologies

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#### Macromolecular Chemistry

Ing. Silvestr Figalla

### Chemistry and Technology of Foodstuffs

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### Chemistry, Technology and Properties of Materials

Ing. Barbora Ševčíková, Ph.D. Ing. Juliána Drábiková, Ph.D. Ing. Matěj Březina, Ph.D.

### Chemistry and Technology of Environmental Protection

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