REWSLETTER_01_24

Kateřina Kupková Interview



Atomic engineering to develop new materials



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Experience from CEETe to be applied in Riga and beyond

Thanks to the research teams, we have managed to achieve the desired goals, some of which we have made voluntarily even more ambitious.

Dear REFRESH friends,

After three years of preparations, we are excited to announce that this February we received the final confirmation of financial support for the REFRESH project. Although we started working on the project in 2022, we have so far implemented everything in a "cost-saving" manner. In hockey terminology, we are at the end of the first period of the game and are now entering the next stage with full confidence in the financial support from the Just Transition Operational Programme. But even before that, we were not idle, and together with other project partners, we achieved several significant outputs. You can read about some of them on the following pages.

From the very start, we have believed that our ambitious goals can only be achieved by bringing new people - top researchers, early-career researchers, and doctoral students to the region to complement the current research teams. It's great that we are succeeding in this. Over 85 new researchers have joined the project, with 19 of them belonging to the world's elite! In total, the REFRESH family now consists of more than 300 employees. However, we are definitely not stopping there, as we already know other names that will be joining our research teams. We are about halfway through the recruitment process.

Thanks to the research teams, we are successfully meeting the set goals, some of which we voluntarily made even more ambitious. We are already focusing on ensuring the sustainability of the project, and we are particularly active in the area of submitting European project applications. We have been granted a total of 12 new projects, and more are on the way. Our researchers have also published several research papers in prestigious scientific journals.

Since collaboration is the key, I am glad we are also actively involving industrial partners. We have already managed to fulfill one third of the planned collaboration volume. This topic is also discussed in the newsletter in an interview with Kateřina Kupková, the Vice President of the Confederation of Industry and Transport of the Czech Republic and the CEO and Chair of the Board of Directors of the joint-stock company Lenzing Biocel Paskov.

We are trying to maximize creating new connections, we have had several meetings with potential partners, we continue to work on activities within the project and we are also developing cooperation with other strategic projects within the OP Just Transformation in the region. I am glad that the TRAUTOM Competence for the 21st Century project has joined the SMARAGD strategy and other projects are also showing interest in participating. We are heading in the right direction on the path to a smart and green region.

Thank you all for your support and have a great read,

Igor Ivan Director of REFRESH

$\begin{array}{l} \text{REFRESH - indicators} \\ \text{goals} \times \text{current status} \end{array}$



The new REFRESH logo serves the project

Connecting top researchers with companies and public administration to kickstart the transformation of the Moravian-Silesian region into a smart and green region. This main goal and idea of the REFRESH project is also symbolized by its logo which is an important tool for building and promoting the brand.

"We managed to lay the groundwork for the largest project in the history of the university which deserves a logo with a clear reference to VSB-TUO and its content. A logo that suits the project. I think it is simple yet adequately captures the essence of the project," said Igor Ivan, the project director. The symbolism of the logo is based on the name REFRESH itself which refers to the process of renewal. The parts of the name emphasize the reutilization of resources (RE) and the freshness and originality of the project's goal **C**RESH.

The symbol itself contains elements of cyclical, sustainable use of natural resources, while the leaf symbol emphasizes green energy. The color scheme of the logo is based on both the color scheme of the VSB-TUO logo and the motto of the entire SMARAGD strategy, "from black to green."

OREFRESH

Mazin Abed Mohammed



Mazin Abed Mohammed, an expert in artificial intelligence, machine learning, biomedical computing, and bioinformatics, has joined the Industry 4.0 & Automotive Lab. As part of the project, he will be a key contributor to the newly established Laboratory of Intelligent Sensorics and Advanced Signal Processing at the Faculty of Electrical Engineering and Computer Science (FEI).

A graduate of the University of Anbar, Mohammed came to VSB-TUO through Universiti Teknikal Malaysia Melaka and has previously worked at the prestigious University of Deusto in Spain as part of the eVIDA Laboratory. His

arrival in Ostrava was driven by both the cutting-edge scientific environment at FEI, as well as the existence and focus of the REFRESH project.

Before the arrival of the elite researcher, there was a close collaboration in the areas of machine learning, Edge/Fog Computing, blockchain, biomedical computing, big data analysis, and advanced signal processing methods. Now, researchers are exploring further opportunities to utilize these progressive technologies in fields such as biomedicine, industry, telecommunications, the automotive industry, and other applications. The shared vision is to utilize unique datasets that will be generated within the concept of the Laboratory of Intelligent Sensorics and Advanced Signal Processing. This includes industrial data for predictive maintenance, biomedical data for monitoring workers or drivers, data from automotive systems, smart buildings, and more.

Meet Our Researchers

Radek Martinek



A cybernetics professor focuses primarily on sensors, testing, measurement, and application of advanced signal processing methods and artificial intelligence. The main priority of his research activities is the high applicability of outputs and the introduction of new experimental algorithms in the field of cybernetics and biomedical engineering.

As part of the REFRESH project and its Industry 4.0 & Automotive Lab, he is building a Laboratory of Intelligent Sensors and Advanced Signal Processing Methods with unique software and hardware for so-called rapid prototyping. This allows for a quick transition from

theoretically designed hypotheses to implemented solutions in industry. A strong emphasis is placed on interdisciplinary research activities in the area of applying hybrid methods of signal processing and machine learning for sensor systems. Research in this unique laboratory focuses on the most advanced approaches in data analysis from sensors, especially for monitoring biosignals, processing signals for environmental monitoring and digitizing production processes in industry, and artificial intelligence applications. All of these are key areas for the region's transformation.

He is the author of more than 300 publications with over 2,000 citations, and his H-index accounts for 24 according to the WoS database. In addition, he is also the author of three licensed outputs and the principal investigator of several contract research projects with significant partners. He holds 11 Czech national patents and leads or co-leads dozens of projects with budgets in the millions of Euro.

Akbulut Hatem



His current research focuses on several areas related to Li-ion batteries. He is working on the development of traditional Li-ion batteries with liquid electrolytes, synthesis of new types of cathode materials with special nanoarchitecture, development of nanocomposite anodes with added nano silicon, and production of carbon-enhanced metal oxides or graphene aerogel negative electrodes to increase the energy density of Li-ion batteries. Another area of his research focuses on the production of solid Li-ion batteries. An important aspect of this work is the training of early-career researchers in the field of electrochemical energy storage in the laboratories of

Sakarya University and NESSTEC. Within the REFRESH project, he is investigating materials for accumulating and storing electrical energy.

He has been involved in more than 20 national and 12 international projects dealing with lithium batteries and the development of nanocomposite materials. He is the founder of the Li Battery Research, Development, and Application (LİPGUM) group at the laboratory of Sakarya University.

Štěpán Kment



After completing his PhD in solid-state physics and (photo)electrochemistry in 2010 at the Faculty of Nuclear Sciences and Physical Engineering at the Czech Technical University in Prague, he spent a year as a postdoctoral researcher at the University of Nebraska in the USA. He has collaborated with various international institutions, including Friedrich Alexander University in Erlangen, Germany, and spent 15 years at the Institute of Physics of the Czech Academy of Sciences.

At VSB-TUO, where he habilitated in 2022, he works at the Materials-Envi Lab in the Center for Nanotechnologies. His research focuses

on developing new materials and nanostructures for applications in sustainable and green energy. In recent years, he has been studying various types of hybrid nanostructures and co-catalysts functioning as photocatalysts, and describing the mechanistic functionality of related photocatalytic processes. His current research is focused on plasmonic materials and photocatalytic processes at the single-atom level. He is also working on these topics in the REFRESH project.

Since 2011, he has been working as a researcher and educator at Palacky University and since 2015, as the head of the Photoelectrochemistry group at the Czech Advanced Technology and Research Institute (CATRIN). He is the author or co-author of more than 130 scientific publications cited more than 5700 times. His H-index according to Google Scholar accounts for 39. He was the principal investigator of the OP Research, Development, and Education project with a budget of EUR 5 million. He is currently the principal investigator of the European project Horizon Europe - REA with a budget of EUR 1.5 million, and within his group, he is also working on the GACR EXPRO project with a budget of EUR 2 million.

Aristeidis Bakandritsos



Aristeidis Bakandritsos began his successful international researcher career as an assistant professor in the Department of Materials Science at the University of Patras in Greece, where he established a laboratory and led students to prestigious publications on surface modification and functionalization of nanomaterials. In 2008, he joined the research group of Professor Em. Giannelis at Cornell University. In 2016, he moved to Palacky University, where he currently heads a research group at the Czech Advanced Technology and Research Institute (CATRIN), and since 2019 he has also been a senior researcher at VSB-TUO in the Materials-Envi Lab at the

Center for Nanotechnologies. His research focuses on the development of functional nanomaterials and their applications in energy storage, catalysis, environment, and biomedicine.

He is the author of more than 120 peer-reviewed publications, which have received over 6000 citations according to the Scopus database. His H-index is 39. Over the past eight years, he has headed research projects leading to publications in top journals such as Nature Nanotechnology, Nature Communications, ACS Nano, Advanced Materials, Advanced Energy Materials, and others. He supervises several postdoctoral researchers and coordinates projects from HORIZON, MSCA, and national grants programs. Currently, under the auspices of VSB-TUO, he is collaborating with partners from Germany, Italy, Greece, and other countries on two prestigious European projects (GlaS-A-Fuels, MERGE) focused on the production of the new generation of biofuels and the usage of atomic engineering in catalysis.

Aviezer Moshe Tucker



Philosopher, political scientist, and historian currently heads the Centre for Philosophy of History and Historiography at the Faculty of Arts, University of Ostrava. He is also a research fellow at the Davis Center at Harvard University, focusing on Central and Eastern Europe.

Aviezer Tucker studied history at Tel Aviv University and received his PhD in philosophy from the University of Maryland, College Park. In 1998 and 1999, he was a postdoctoral fellow at Columbia University in New York. From 2011 to 2014, he was the deputy director of the Energy Institute at the University of Texas at

Interview

Austin, where he led a research project on the geopolitical, political, and social aspects of unconventional energy (shale gas and oil) on a global scale and energy issues in Central and Eastern Europe. He has also provided consultancy on energy policy concerning political and social impacts.

His research has long focused on two thematic areas. The first is the history, theory, and methodology of historical sciences, epistemology (theory of knowledge) of our understanding of the past, philosophy of science, history of ideas, and intellectual history. In addition, he studies politics, geopolitics, and energy policy. He has published numerous articles and books on these topics and has taught at several universities, as well as lectured for non-academic audiences such as managers, politicians, government officials, and opinion makers.

Kateřina Kupková

The SMARAGD vision and the REFRESH pillar project give me hope for the future The connection between academic staff and companies is the key feature of REFRESH. Only through close mutual contact, researchers can respond to real-world needs and come up with innovations that will not only remain on paper or behind the walls of laboratories. The perspective from practice will be provided by the Vice President of the Confederation of Industry and Transport of the Czech Republic and the CEO and Chair of the Board of Directors of the joint-stock company Lenzing Biocel Paskov, **Kateřina Kupková**. As the Vice President of the Confederation of Industry and Transport of the Czech Republic, you are a member of the project's Board of Directors. What would you like to bring?

As the Vice President of the Confederation of Industry and Transport and also the director of a company, I know the problems and pitfalls that industrial enterprises face, and what troubles them. Whether it is a lack of qualified workforce, Europe's strong dependence on raw material supplies from Asia, energy demands, and many others. I believe that within the Board of Directors, I will be able to apply more than 20 years of industry experience. I can support the connec-

How do you view REFRESH?

I think that an initiative of this type is very important for our region. It is still early to evaluate. However, the vision of SMARAGD and the cornerstone project REFRESH give me hope for the future. This is primarily because our region will develop in fundamental areas – energy production, materials technology, environmental technology, and autonomous transport. Moreover, everything will be analyzed and evaluated from a socio-economic perspective. Our region will not be able to function if we do not update our industrial sector and implement high technologies.

What aspect of the project do you consider crucial?

The most important thing for me is the close collaboration of experts with universities and especially with real-world settings in industrial enterprises. The level of applied research in the Czech Republic is not sufficient. I believe that the RE-FRESH project will be a demonstration of how research, development, and innovation can be effectively linked to the practical world.

tion between science and practice, which I see as crucial.

What benefits can this bring to both sides, universities and companies, and how can the Moravian-Silesian region benefit?

I am convinced that our whole society and region will benefit from the REFRESH project. Interesting topics and technologies will attract smart and experienced professionals to the region. This will enable technology development, support the restructuring of industrial companies in the region, and also lead to the creation of new jobs. We need universities to respond to the needs of the industry and educate professionals who will succeed in the job market. The REFRESH project combines all these areas in its expert living laboratories, which I see as a fantastic idea.

What are your hopes for REFRESH?

I hope for the success of the project. This depends on people and their performance. I wish all those involved in the project a lot of energy, optimism, patience, and joy from achieving their goals.

Researchers utilise atomic engineering to develop new materials

Researchers from VSB-TUO have joined forces with recognized research teams from Germany, Italy, and the Czech Republic as part of a three-year European project SAN4Fuel with a grant of EUR 1.5 million. The aim is to utilise a groundbreaking scientific method - atomic engineering - and develop new materials for obtaining "green" energy and reducing carbon dioxide emissions in the atmosphere.

As for the research part of the project, the main focus lies on the issues of hydrogen production by solar water splitting, electrochemical conversion of waste carbon oxide, and especially engineering at the level of individual atoms. This ap-



proach enables the development of new materials that will significantly increase the production of green hydrogen or advance the possibilities of transforming carbon oxide into useful chemical substances with high added value.

The research team also wants to focus on computer-aided material design and gain an understanding of their functionality. They use a unique supercomputer at VSB-TUO to model processes. "Through computational chemistry approaches, we aim to understand the mechanisms by which individual atoms enhance the efficiency of key photochemical and photoelectrochemical processes, and based on this knowledge, optimize a new generation of materials for energy. As for the experimental part in Ostrava, we explore the possibilities of atomic engineering for photochemical conversion and removal of carbon oxide which contributes to global climate change significantly," explained Radek Zbořil, scientific director of the Materials & Environment Lab at VSB-TUO.

REFRESH will contribute to increased safety of autonomous mobility

The unique C-ITS polygon, a polygon for cooperative intelligent transport systems, is being established in the Ostrava campus and adjacent urban district Ostrava-Poruba as part of the project Cybersecurity for cooperative, connected, and automated mobility using V2X (SECURE-RIDE) which has received support from the Technology Agency of the Czech Republic in the DELTA 2 programme. Thanks to its connection with the REFRESH project, the polygon will be expanded with, for example, an industrial 5G network, leading to further advancement in research in the area.

"Currently, collision avoidance systems are being developed within the project to reduce the risk of collisions between cars and pedestrians at a designated location in Ostrava-Poruba. We are experimentally testing pre-application concepts on the university campus. Our intention is to subsequently implement collision avoidance measures on Opavska Street or on Hlavni Street in Ostrava-Poruba," explained the team leader and scientific director of the Industry 4.0 & Automotive Lab, Petr Šimonik.

Given the extensive vision of autonomous and connected mobility in Ostrava, some of the research tasks will be performed by the team from the living laboratory of Industry 4.0 & Automotive Lab. "The synergy of the two projects creates an environment for the utilization of innovations focused on autonomous mobility of personal and commercial vehicles and the safety of road users in the Ostrava urban area," added Šimoník.

The European Innovation Council project aims to develop next-generation biofuels

Developing technology that converts waste bioethanol into advanced biofuels such as butanol and hydrogen is the goal of the prestigious European project GlaS-A-Fuels: Single-Atom Photocatalysts Enhanced by a Self-Powered Photonic Glass Reactor to Produce Advanced Biofuels. Researchers from the Materials & Environment Lab are also involved in the project implementation.



"To convert bioethanol into butanol and hydrogen, we will use solar radiation as an energy source and atomic catalysts to accelerate and control the chemical reaction. The innovation also lies in the design of a photonic glass reactor that uses light and a thermoelectric module to increase the efficiency of bioethanol conversion. These significant innovations will dramatically increase the selectivity of bioethanol conversion and the production of

hydrogen as a green fuel," explained the head of the implementation team from VSB-TUO, Aristeidis Bakandritsos.

The Ostrava team will leverage their experience in graphene chemistry and atom ic engineering to develop new catalysts. The goal is to replace expensive metals such as gold or platinum, maximize the use of solar energy, and effectively control the chemical process towards key energy products, namely hydrogen and butanol. Researchers will also focus on optimizing the production of catalysts on a semi-industrial scale and developing recycling solutions.

CEETe experience shared with another international project

Creating and deploying a new digital twin of a positive energy district that enables real-time monitoring, visualization, and management of energy flows in a selected area is the task of the international consortium of the Horizon Europe project ExPEDite: Enabling Positive Energy Districts through a Planning and Management Digital Twin. The experience gained by researchers from CEETe, VSB-TUO, will be essential for the project led by Riga Technical University. It will be applied and developed further on the university campus.

"CEETe is our input capital. It includes several sources of electrical and thermal energy, storage elements such as batteries or heat storage in hot water, as well as other technologies for processing alternative fuels and a control system. Our ambition in the project is to extend the CEETe model to cover the entire campus of the VSB-TUO through digital twin modelling and to integrate additional energy sources in the area into the system. Our solution will be replicated by colleagues in the Latvian capital," explained Lukáš Prokop from the ENET Centre, one of the departments of the Centre for Energy and Environmental Technologies.

In addition to the digital twin, the project's outputs will include practical guidelines, reusable models, algorithms, and training materials that will help other cities replicate the digital twin for their purposes and under their specific conditions. The methodology will serve for the transformation of urbanized areas into positively energy-efficient districts.

The three-year project got a total grant of Eur 6.7 million. The Czech Republic is also represented in the consortium by the Technological Platform for Energy Security of the Czech Republic. Domestic experts will collaborate with partners from Italy, Greece, Portugal, Finland, Spain, Cyprus, Latvia, and Belgium.

Income Growth in Research and Development

European Projects

In 2024, VSB-TUO is involved in a total of 34 European projects, which represents an increase of 62% compared to 2021.

Knowledge Transfer

In 2023, VSB-TUO received a total of CZK 190 million from knowledge transfer, which represents an increase of 22% compared to 2021.

Total Funding for Research and Development

In 2023, VSB-TUO received a total of CZK 1.757 billion from domestic and foreign funding as well as supplementary activities for research and development activities. This represents an 8% increase compared to 2021.



Number of VSB-TUO papers published in high-impact factor journals according to WoS (D1)



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Precision Engineering of Nanorobots: Toward Single Atom Decoration and Defect Control for Enhanced Microplastic Capture

Anna Jancik-Prochazkova, Hana Kmentova, Xiaohui Ju, Stepan Kment, Radek Zboril, Martin Pumera

Advanced Functional Materials

nature communications Acidic graphene organocatalyst for the superior transformation of wastes into high-added-value chemicals

Aby Cheruvathoor Poulose, Miroslav Medved, Vasudeva Rao Bakuru, Akashdeep Sharma, Deepika Singh, Suresh Babu Kalidindi, Hugo Bares, Michal Otyepka, Kolleboyina Jayaramulu, Aristides Bakandritsos & Radek Zbořil

Nature Communications



Fast and selective reduction of nitroarenes under visible light with an earth-abundant plasmonic photocatalyst

Aby Cheruvathoor Poulose, Giorgio Zoppellaro, Ioannis Konidakis, Efthymis Serpetzoglou, Emmanuel Stratakis, Ondřej Tomanec, Matthias Beller, Aristides Bakandritsos & Radek Zbořil

Nature Nanotechnology



Silica-supported Fe/Fe-O nanoparticles for the catalytic hydrogenation of nitriles to amines in the presence of aluminium additives

Vishwas G. Chandrashekhar, Thirusangumurugan Senthamarai, Ravishankar G. Kadam, Ondřej Malina, Josef Kašlík, Radek Zbořil, Manoj B. Gawande, Rajenahally V. Jagadeesh & Matthias Beller

Nature Catalysis



Use of thermal analysis for the study of the adsorption of pharmaceuticals from water

Jan Bednárek, Pavel Šiler, Jiří Švec a Martina Vráblová.

Surfaces and Interfaces



Discovering Electrochemistry with an Electrochemistry Informed Neural Network (ECINN)

Haotian Chen, Minjun Yang, Bedřich Smetana, Vlastimil Novák, Vlastimil Matějka, et al.

Angewandte Chemie International Edition



Photocatalytic reduction of CO_2 over Ti_3 + self-doped TiO_2 -based nanomaterials

Rudolf Ricka, Agnieszka Wanag, Ewelina Kusiak-Nejman, Dariusz Moszyński, Miroslava Filip Edelmannová Ét Al.

Journal of <u>CO</u>, Utilization



Sicharth Sabyasachi, Arvind R. Singh, Revati Godse, Supriya Jaiswal, Mohit Bajaj, Vojtech Blazek, Lukas Prokop, Stanislav Misak, et al.

Alexandria Engineering Journal

0



Programming self-assembling magnetic microrobots with multiple physical and chemical intelligence

Carmen C. Mayorga-Martinez, Jaroslav Zelenka, Tomas Pribyl, Adaris Lopez Marzo, Ondrej Zivotsky, Tomas Ruml, Martin Pumera

Chemical Engineering Journal



Trouble with the Bottle Beverage Containers and the Widening Waste Crisis in Socialist Hungary

Viktor Pál

Journal of Contemporary History



From malware samples to fractal images: A new paradigm for classification

Ivan Zelinka, Miloslav Szczypka, Jan Plucar, Nikolay Kuznetsov

Mathematics and Computers in Simulation



Methodology for mapping the economic and social benefits of cultural and creative industries at a national level

Establishing a comprehensive framework for mapping the cultural and creative industries (CCIs) at the national level is crucial for the project's continuity, as it is essential for effectively targeted support for CCIs from the public sector. The findings will help emphasize the economic advantages of CCIs for the economy and social cohesion. The project was implemented in partnership with the Ministry of Culture, with consulting support from the Czech Statistical Office and the National Information and Consulting Centre for Culture (NIPOS).

Expanding the strategic plan "fajnOva CENTRUM" - Přívoz project

The continuity lies in expanding the fajnOVA strategic plan to include the Přívoz area, known for its socio-economic challenges. The project aimed to revitalize this part of the city, focusing on improving economic, social, and environmental aspects. The findings of the study were used to expand the strategic plan of the Moravská Ostrava and Přívoz city district.



The German-Czech meeting brought together academics and representatives of companies



The first German-Czech meeting, aimed at bringing together representatives of companies from Germany and the Czech Republic with academics, met the organizers' expectations. Participants from both countries gathered at the Moravian-Silesian Innovation Center on April 11th. The event, organized by the Fraunhofer Innovation Platform at VSB-TUO (FIP-AI@VSB-TUO), also highlighted the potential for collaboration within the REFRESH project, in which Fraunhofer is a partner.

"The Fraunhofer-Gesellschaft, our important partner, has a strong track record in applied research and implementing results into practice. We want to learn from them and strengthen our partnership within the Fraunhofer Innovation Platform at VSB-TUO," said Igor Ivan, the Vice-Rector of VSB-TUO and Director of RE-FRESH.

VSB-TUO researchers participated in the scientific networking event between the Czech Republic and Taiwan

The primary goal of the online networking event held on April 9 by the Czech Liai-

son Office for Education and Research in Brussels and the Czech Economic and Cultural Office in Taipei was to strengthen and promote scientific collaboration in material research between the Czech Republic and Taiwan. Four universities from the Czech Republic were present at the event. VSB-TUO was represented by Radek Zbořil, a physical chemist and the head of the Materials & Environment Lab.



"Together with colleagues from Taiwan, we have discovered several common research interests, especially in green energy. One particularly intriguing opportunity is the proposal from National Yang Ming Chiao Tung University to utilize a special synchrotron facility that uses high-energy X-ray radiation to analyze the properties of the materials we are working on. Additionally, collaboration opportunities in photochemical hydrogen production have been found with colleagues from the National Taiwan University of Science and Technology," Zbořil stated.

Apart from VSB-TUO, Charles University, the University of Chemistry and Technology Prague, and the Czech Technical University in Prague also participated in the event.

Leading experts of nanomaterial science gathered in Ostrava

The NanoLumCat Ostrava- Revealing the Future of Light Transformation workshop, held in April at the IT4Innovations National Supercomputing Centre at



VSB-TUO, attracted leading material scientists from various countries including Italy, Germany, Spain, Poland, Slovakia, China, and the Czech Republic. The event focused on carbon dots and monatomic catalysis for renewable energy sources. The workshop was organized under the auspices of the SAN-4Fuel project and the Global Experts Programme.

"The purpose of the gathering of leading experts was to reveal the latest advancements in carbon dots and monatomic catalysis research and to boost a new era in research and technology development in the field of nanomaterials for sustainable development. I am very pleased that prominent researchers from both theoretical and experimental chemistry accepted the invitation. We were able to cover a very broad area of research from design, through the synthesis, and material characterization to specific applications in the field of med-

ical imaging, light sources, and photocatalysis," said one of the main organizers of the event, Michal Otyepka from the National Supercomputing Centre IT4Innovations.

Speakers included Dirk M. Guldi, a renowned researcher in the field of time-resolved spectroscopy from Friedrich Alexander University in Erlangen-Nuremberg, Germany; Andrey Rogach from the City University of Hong Kong, an expert in the synthesis, assembly, and optical spectroscopy of colloidal semiconductor and metal nanocrystals and their hybrid structures, and the head of the Global Experts Programme grant at VSB-TUO; Paolo Fornasiero and Michele Melchionna from the University of Trieste; and Leticia Gonzáles, an expert in the interaction of light and molecules from the University of Vienna.

REFRESH and LERCO projects are eager to collaborate

The joint workshop primarily centered around presenting the research plans of the REFRESH project and selected research directions of the LERCO project. The meeting brought together representatives from VSB-TUO, the University of Ostrava, and the University Hospital Ostrava with the goal of exploring potential collaborations and research synergies. With funding of approximately CZK 4.5 billion from the Operational Programme Just Transformation, these two projects will support the development of not only universities, but also the Moravian-Silesian Region in the coming years.

"We do not see the projects as a competition in which one university should win over another. On the contrary, we want to look for ways in which we can support each other and organize cooperation. Both projects should act as a starting point for developing additional major projects, rather than as the ultimate objective," said Václav Snášel, Rector of VSB-TUO.

Both universities agreed on further meetings to suggest specific collaborative solutions using the gathered information.

Onsemi seeks VSB-TUO graduates and research collaboration



During a joint meeting in March, representatives from VSB-TUO and Onsemi from Rožnov pod Radhoštěm discussed collaborating on research activities and utilizing university graduates. Guests from the multinational company also visited several departments at the University.

Onsemi specializes in automotive and industrial applications and is driving advancements in the electrification and safety of vehicles, sustainable energy networks, industrial automation, 5G technology, and cloud infrastructure. With its diverse and innovative product portfolio, the company develops smart power and sensing technologies to address complex global challenges.

REFRESH and Fraunhofer-Gesellschaft representatives finetuned further cooperation



Representatives of the Fraunhofer-Gesellschaft and the REFRESH project convened at VSB-TUO in February to share information on ongoing research and projects, as well as explore potential collaboration opportunities. The prestigious German research institution, which focuses mainly on applied research, is one of the key partners of REFRESH. One of the goals was to introduce the project's living laboratories and explore avenues for further integration.

"The colleagues from VSB-TUO displayed an excellent level of academic research, both in terms of projects and outputs. Our common challenge is to detect research projects we are working on directly beneficial to the industry. I see the potential for fruitful cooperation due to the abundance of innovative ideas, projects, and teamwork," said Martin Dix, Director of Fraunhofer IWU and member of the Supervisory Board of the Fraunhofer Innovation Platform at the VSB-TUO (FIP-AI@VŠB-TUO).

Quantum Key Distribution specialist shared his expertise in Italy

An introduction to the principles of cryptography, as well as the possibilities to counter upcoming threats in this area, was brought by a seminar by Miroslav Vozňák from the Faculty of Electrical Engineering and Computer Science of VSB-TUO which took place on 24 May at Ca' Foscari University of Venice. The requested seminar was part of the Colloquium on Technical Physics.

According to cryptography experts, it is evident that conventional encryption algorithms currently in use will be compromised by high-performance quantum computers. It is only a matter of time and progress in the development of quantum processors whether this will happen within ten or twenty years.

"If you ask me how to address the impending threats to cryptography in use today, we fortunately have an answer. There are two viable solutions: Post-Quantum Cryptography (PQC) and Quantum Key Distribution (QKD))," explained Professor Vozňák. In his presentation, he discussed the principles of cryptography, introduced the Open Quantum Safe project which implements PQC, and focused on the importance of Quantum Key Distribution. Additionally, he shared insights from his involvement in the H2020 OpenQKD and NATO Quantum5 projects.

REFRESH workshop: Result overview and quick information exchange

The first joint workshop of research programme leaders from VSB-TUO and the University of Ostrava, as well as other members of the project team and representatives of the Moravian-Silesian Innovation Center, was organised in May by the REFRESH project. In addition to the need to acquaint researchers with the up-todate overview of the project, which was the content of the recently submitted first implementation report, the meeting also aimed at exchanging information across living labs and research programmes.







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