



FKITMCMXIX



University of Zagreb  
Faculty of Chemical Engineering  
and Technology

# Research Projects

2017–2022



Zagreb, Croatia, 2024



**FKITM**



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Faculty of Chemical Engineering and Technology


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Zagreb, Croatia, 2024

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## || About the Faculty

The roots of the Faculty of Chemical Engineering and Technology go back to 1919 when the Technical College was founded in Zagreb with the goal "to implement a thorough theoretical, and, as much as it was possible, practical education for those technical vocations that the School was offering". One of the departments back then was the Chemical Engineering Department, whose first dean was Prof. Vladimir Njegovan, Ph.D., who tried to establish the teaching and scientific research curriculum modelled according to the practice of the European and American higher education institutions. He was particularly invested in

finding the right professors. His success is evident from the highly accomplished names like Ivan Marek, a well-known inventor of the oven for elementary organic chemical analysis, Ivan Plotnikov, a worldwide renowned photochemist, Franjo Hanaman, the inventor of the tungsten filament for electric light bulb and later on Vladimir Prelog, a future Nobel Prize Winner. In 1926, the Technical College turned into the Technical Faculty of the University of Zagreb, which enabled the teachers and their associates to perform more intensive scientific work. Along with Vladimir Prelog, who introduced organic synthesis, a great many young





scientists proved themselves in the field of Science and Technology. These were: Vjera Marjanović, Rikard Podhorsky, Karlo Weber, Matija Krajčinović and Miroslav Karšulin.

All of them went to study stays abroad to gain expertise. Upon return, they passed on the acquired knowledge, raising the level of knowledge and making an impact on the development of their profession. As early as 1935, Rikard Podhorsky keeping up with trends in Europe and based on American experiences, promoted Chemical Engineering as an exact science that is "just as necessary to a Chemical Engineer as the disciplines of Chemistry and Physics".

Due to restructuring of the Technical Faculty in 1956, the Chemical Engineering Department became part of the Chemical, Food Technology and Mining Faculty, and in 1957 it became a part of the newly founded Faculty of Technology. In that period, it became the core around which new Faculties were formed, such as i.e.,

the Faculty of Metallurgy in Sisak and the Faculty of Chemical Technology in Split. In 1978, the Faculty of Metallurgy separated from the Faculty of Technology, while the Faculty of Food Technology and Biotechnology separated in 1980. Finally, the Faculty of Chemical Engineering and Technology and Faculty of Textile Technology separated on November 16th, 1991. Hence, the long-sought independence of the Faculty was established.

Since that time until the present day, our main goal has been the high education and research in the fields of Chemical Engineering and Applied Chemistry, Materials Science and Engineering, and Environmental Engineering, by connecting science and technology with the economy and industry, as well as the public domain. The aim of these activities is achieving sustainable development by promoting innovative thinking, accelerating the transfer of knowledge and by creating and promoting new entrepreneurships.





# Faculty Highlights

## University of Zagreb Faculty of Chemical Engineering and Technology

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Dean: Prof. Ante Jukić, Ph.D.



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### Foundation

**1919** (The Chemical Engineering Department of the Technical College; Official gazette of Croatia, Slavonija, Dalmatia country's government on February 15<sup>th</sup>, 1919)

### The Study Programs and the Students

#### Study programs

- Chemical Engineering
- Materials Science and Engineering

- Environmental Engineering
- Applied Chemistry
- Chemical & Environmental Technology
- Doctoral study Chemical Engineering and Applied Chemistry

#### Postgraduate Specialist programs

- Corrosion and Protection
- Environmental Engineering
- Petroleum Refining and Petrochemical Processes

### Students (2022)

- **784** (undergraduate)
- **272** (graduate)
- **124** (doctoral studies)
- **33** (specialist programs)
- foreign students: **>30** (collaboration with ITECH, University of Lyon)

### Graduated in 2022

- **119** (undergraduates); • **114** (graduates)

### Staff

- Ph.D. students and postdocs: **85**
- Scientific and teaching positions (assistant professors, associate professors, full professors): **61**
- Lab technicians, teaching positions, administrative personnel and maintenance: **66**
- Total: **212**

### Science and Technology

#### *The value of research projects 2017–2023 (leaders and partners)*

- > 47 million € overall
- > 10 million € Faculty's part (> 160,000 € per scientist-teacher)

#### *Published research papers – WoS Core Collection (2022)*

- 143 (of which 75 Q1)  
(2.2 per scientist-teacher per year)

### Start-up/Spin-off Companies

- CWT – Comprehensive Water Technology (80 % ownership)
- ReCorrQCQ (licenced intellectual rights – part of the shares profit)

### Recognition Worldwide

#### *...professors*

- *Franjo Hanaman* – co-inventor of the tungsten filament for the light bulb
- *Vladimir Prelog* – Nobel Prize in Chemistry (1975)

#### *...alumni*

- Antibiotic azithromycin (Sumamed® Pliva – Teva, Zithromax® Pfizer)



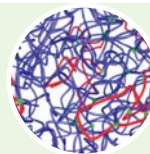
## Areas of Research and Development

### CLEAN WATER

- preparation of drinking water
- waste water treatment



### POLYMER MATERIALS AND NANOCOMPOSITES



### INORGANIC MATERIALS

- composites and biomaterials
- cement, ceramic coatings



### ENERGY AND THE ENVIRONMENT

- batteries and super condensers
- fuel cells and photovoltaic cells



### OPTIMISING, MEASURING AND PROCESS CONTROL

- Industry 4.0



### ORGANIC SYNTHESIS

- pharmaceuticals
- medicinal diagnostics chemistry



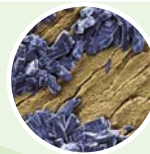
### CORROSION AND PROTECTION

- surface treatment
- inhibitors, cathode protection



### BIOTECHNOLOGIES

- enzyme technology
- microbiology and composting



### REACTION AND PROCESS ENGINEERING

- equipment and plant design, plant design, microreactors



### NEW TECHNOLOGIES

- pyrolysis, gasification and green hydrogen
- nanofluids



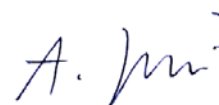
## Foreword by the Dean

Ever since it was founded as part of the Technical College in 1919, the Faculty of Chemical Engineering and Technology of the University of Zagreb has been emphasising scientific research, starting with the most important task, *i.e.*, the selection of the University professors. The inheritance of our founders has not faded with time, nor has it been neglected, and today it is a live part of the academic culture that we conduct and promote. Excellence in scientific research secures the transfer of knowledge on a prominent level at the modern University. This also applies to the transfer of knowledge to the industry and the public stakeholders. Thus, our basic assignment of educating top experts in the fields of Chemical Engineering, Materials Science and Engineering, Environmental Engineering and Applied Chemistry has been successful, and we have reached the goals that result in the improvement of society and the nation as a whole. We can boast about our worldwide recognized achievements: the tungsten filament of Professor Franjo Hanaman, an expert in inorganic chemistry, the Nobel Prize in Chemistry awarded to Professor of Organic Chemistry Vladimir Prelog in 1976, the synthesis of Pliva's antibiotic azithromycin and the industrial scale up that our alumni have accomplished, and many more valuable results and contributions.

In this book, a concise array of research and development projects from 2017 to 2022 is presented. The topics that we are researching

are various and interdisciplinary, and most of them are conducted in collaborations with the industrial stakeholders. The value and the number of the projects, and the scope of the published scientific research papers in the top global journals per professor rank us at the top of the list at the University of Zagreb, as well as in Croatia. In the times to come, we would like to uphold our leading position and upgrade our performance as well. We would like to contribute, initiate and be open towards associates by following strategic and developmental tendencies of the University of Zagreb, the Republic of Croatia, and the European Union. By adding new content and lab equipment, we want to upgrade and introduce the state-of-the-art education and study programs, as well as continue with the already started path of internationalising our study programs. Furthermore, we would like to additionally promote and extend the transfer of knowledge to the economy sector and increase the exports of products and services with the end goal of significantly influencing the development policies.

All of the above makes the Faculty of Chemical Engineering and Technology of the University of Zagreb an excellent choice and a confirmed associate for creating and implementing developmental and research assignments. Therefore, I hereby invite you to support us and join us in our future work!



Prof. Ante Jukić, Ph.D.

Dean





## Foreword by the Vice Dean for Research and International Collaboration

The Faculty of Chemical Engineering and Technology has a long tradition of scientific research in the fields of Chemical Engineering, Chemistry, and Interdisciplinary Fields. We are quite productive as scientists and certainly belong among the most productive faculties of the University of Zagreb according to the number and quality of scientific papers that stem from a large number of scientific and other projects conducted by our institution.

This issue represents an overview of Faculty's projects that were started in the period from 2017 until 2022. As part of the University of Zagreb, with 63 professors we can be proud of 48 projects, worth over EUR 40 million, of which the Faculty's part is about EUR 11 million, while the rest are of our partner institutions, industry partners and scientific institutions.

The projects are necessary for financing scientific research, for hiring young experts and Ph.D. candidates that will pass on their findings to a new position in the industry. By doing so, they raise the competence of our

economy, and the country as well. Furthermore, the projects enable cooperation with experts in the country and abroad working on attractive current and socially useful topics.

The bond between scientific and teaching activities is unbreakable and it is a key component for maintaining and raising the quality of the teaching, scientific and professional activities, as well as for the development of the field altogether. That is why I believe we have been highly successful as a Faculty and that we can be proud of our achievements and results with hope to be equally successful in the upcoming period.

I want this book to be an overview of what we can do to our future partners and that it helps in initiating new collaborations. I would like to thank all of the professors for finding the time to describe their projects and contributing, along with their usual obligations. Also, I would like to thank them for their effort to write and compete for the projects. I am grateful to the institutions that have been financing our projects.



Prof. Zvezdana Findrik Blažević, Ph.D.

*Vice Dean for Research and  
International Collaboration*





**HRZZ**

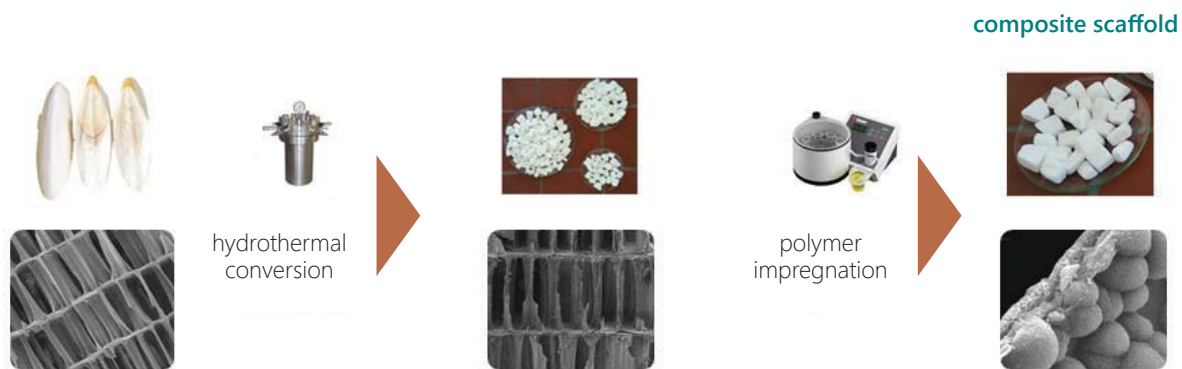
Croatian Science  
Foundation

Croatian Science  
Foundation  
PROJECTS

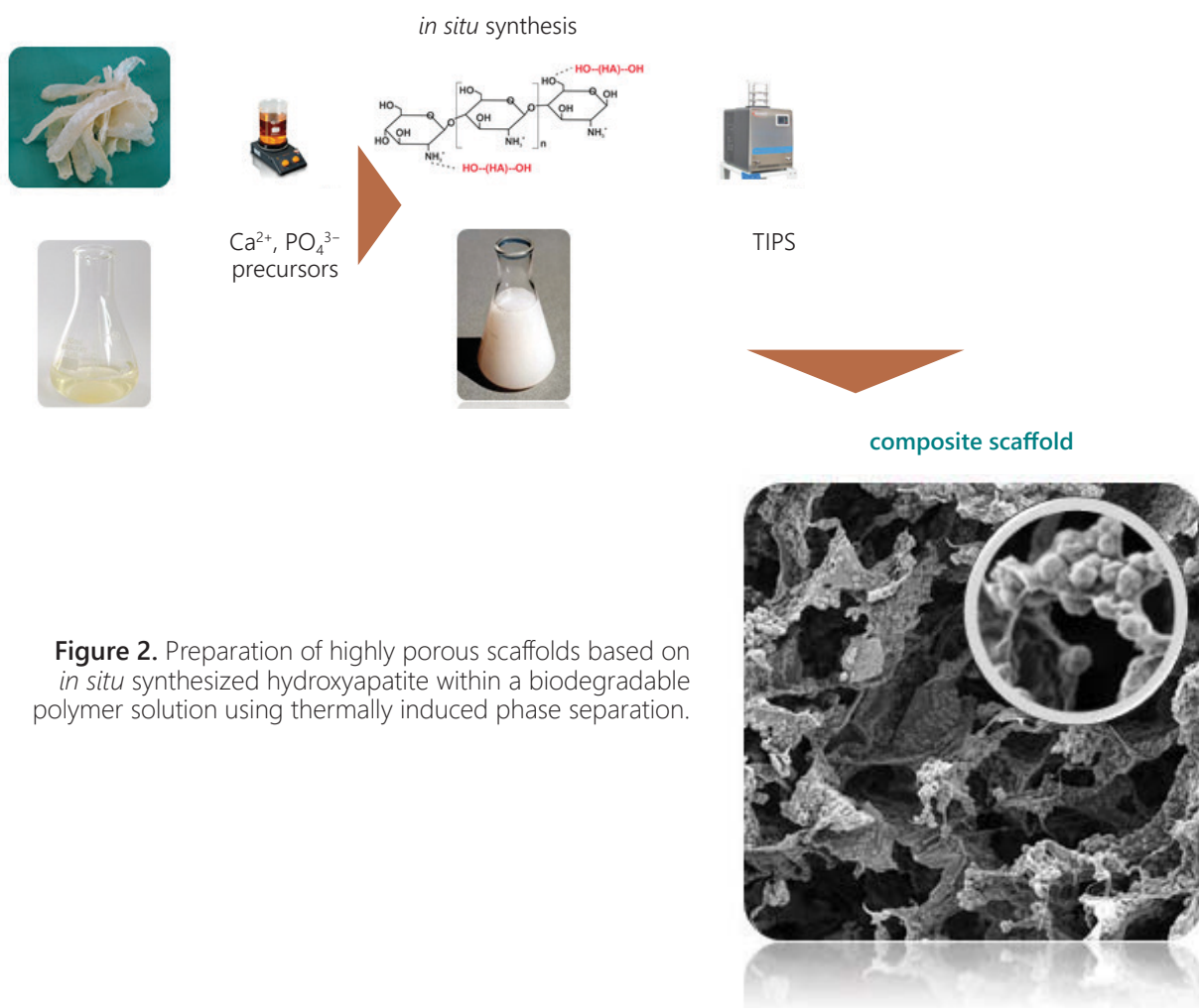


Name of the project	<b>Development of Biocompatible Hydroxyapatite Based Materials for Bone Tissue Engineering Applications</b>
Acronym	<b>HaTEA</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Research Projects (IP-2014-09)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• Pliva Croatia Ltd. (Croatia)</li> <li>• Centre for Biomaterials and Tissue Engineering, Polytechnic University of Valencia (Spain)</li> <li>• Biomedical Research Networking Centre in Bioengineering, Biomaterials and Nanomedicine (Spain)</li> <li>• University of Zagreb Faculty of Mechanical Engineering and Naval Architecture (Croatia)</li> <li>• University of Zagreb Faculty of Veterinary Medicine (Croatia)</li> <li>• University of Zagreb School of Dental Medicine (Croatia)</li> <li>• University of Skopje, Faculty of Dentistry Ss. Cyril and Methodius (North Macedonia)</li> </ul>
Funding	131,772.65 €
Funding UNIZG FCET	131,772.65 €
Duration	1 <sup>st</sup> March 2017 – 28 <sup>th</sup> February 2021
Leader (UNIZG FCET)	Prof. Hrvoje Ivanković, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Marica Ivanković, Ph.D.</li> <li>• Dajana Milovac Lerga, Ph.D.</li> <li>• Assist. Prof. Anamarija Rogina, Ph.D.</li> <li>• Antonia Ressler, Ph.D.</li> <li>• Leonard Bauer, Ph.D.</li> <li>• Klaudia Paljar, dipl. chem. eng.</li> </ul>
Abstract	<p>The challenge of bone tissue engineering is to develop bone scaffolds that allow good integration with the surrounding tissues. Particular systems of interest are scaffolds based on hydroxyapatite (HAp), due to its chemical and structural similarity to the inorganic matrix of natural bone and excellent bioactivity. To overcome disadvantages such as poor mechanical properties of HAp it has been combined with polymers and metals. This project aims to investigate methods to improve mechanical and biological properties of investigated scaffolds.</p>
Key words	bone tissue engineering, hydroxyapatite, bone scaffolds, biomedical application
Web page	<a href="https://www.fkit.unizg.hr/HaTEA">https://www.fkit.unizg.hr/HaTEA</a>





**Figure 1.** Preparation of a highly porous hydroxyapatite scaffold using the hydrothermal method and surface modification with biodegradable polymers using vacuum impregnation.



**Figure 2.** Preparation of highly porous scaffolds based on *in situ* synthesized hydroxyapatite within a biodegradable polymer solution using thermally induced phase separation.

Name of the project	<b>Direct Reuse of Municipal Wastewater for Agricultural Irrigation with Membrane Technologies</b>
Acronym	<b>ReHOHMem</b>
The name of the programme and funding agency	<i>Program for encouraging research and development activities in the field of climate change for period 2015 and 2016 with the support of the Ministry of Environmental and Nature Protection, Ministry of Science and Education, Environmental Protection and Energy Efficiency Fund and Croatian Science Foundation</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• Agroproteinka d.d. (Croatia)</li> <li>• Međimurske vode d.o.o. (Croatia)</li> <li>• Ruđer Bošković Institute (Croatia)</li> <li>• Pliva Croatia Ltd. (Croatia)</li> </ul>
Funding	198,143.04 €
Funding UNIZG FCET	198,143.04 €
Duration	1 <sup>st</sup> April 2017 – 31 <sup>st</sup> March 2019
Leader (UNIZG FCET)	Assoc. Prof. Davor Dolar, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Krešimir Košutić, Ph.D.</li> <li>• Prof. Danijela Ašperger, Ph.D.</li> <li>• Mr. sc. Marinko Markić</li> <li>• Marko Racar, Ph.D.</li> </ul>
Abstract	The goal of the project is to demonstrate the possibility of reuse of municipal wastewater for irrigation purposes using environmentally sustainable membrane technologies and to increase agricultural production by increasing water availability through the integrated and sustainable use of water resources. The project examines the application of environmentally sustainable membrane technologies of microfiltration, ultrafiltration, nanofiltration and reverse osmosis as well as a membrane bioreactor for the recovery of municipal wastewater and its use in agriculture.
Key words	reuse, municipal wastewater, membrane processes, irrigation
Web page	<a href="https://dolardavor.wixsite.com/rehohmem">https://dolardavor.wixsite.com/rehohmem</a>

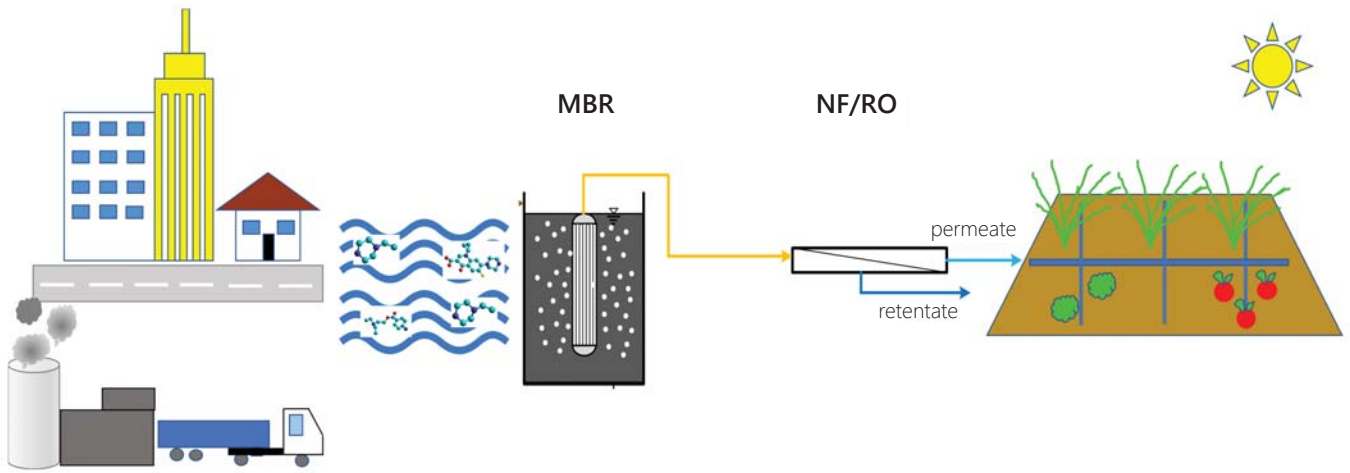


Figure 1. Reuse of municipal wastewater for agricultural irrigation.



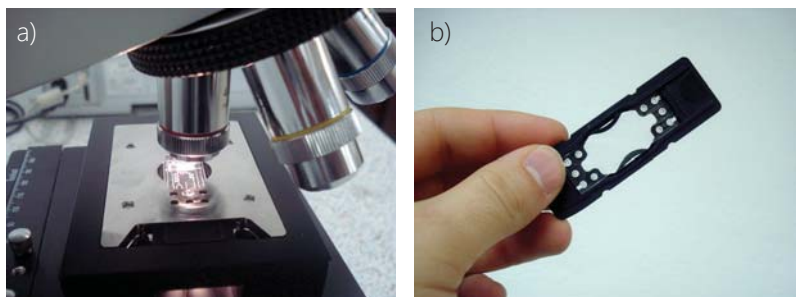
Figure 2. Membrane bioreactor pilot plant.



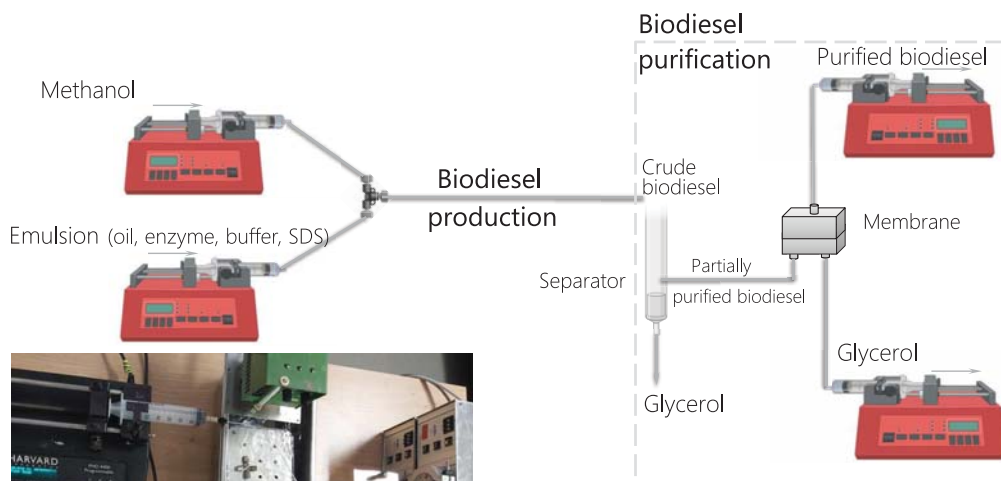
Figure 3. UF-NF-RO pilot plant.



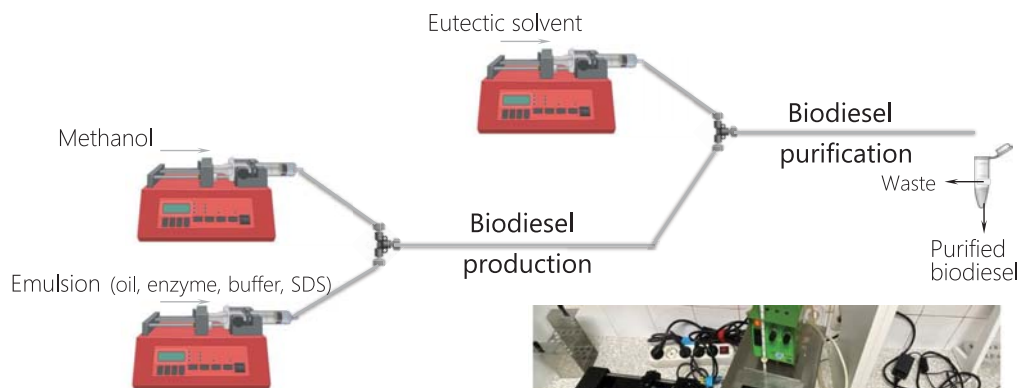
Name of the project	<b>Development of Integrated Micro-System Based Biocatalytic Process for Biodiesel Production</b>
Acronym	<b>DeMSy(BioPro)2</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Research Projects (IP-2016-06)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• Josip Juraj Strossmayer University of Osijek Faculty of Food Technology Osijek (Croatia)</li> <li>• University of Zagreb Faculty of Food Technology and Biotechnology (Croatia)</li> </ul>
Funding	99,628.38 €
Funding UNIZG FCET	99,628.38 €
Duration	1 <sup>st</sup> May 2017 – 30 <sup>th</sup> April 2021
Leader (UNIZG FCET)	Prof. Bruno Zelić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Assist. Prof. Anita Šalić, Ph.D.</li> <li>• Martin Gojun, Ph.D.</li> </ul>
Abstract	<p>Nowadays, as the availability and accessibility of fossil fuels is significantly decreasing, the production of biofuels from various renewable sources is becoming more and more interesting. Biodegradability, non-toxicity and low pollutant emissions are just some of the properties that make biodiesel a more environmentally friendly fuel.</p> <p>The aim of this project is to develop an integrated microsystem for the biocatalytic production of biodiesel from waste food oils. For the first time, an integrated microreactor system for continuous biodiesel production and purification is being developed.</p>
Key words	biodiesel, lipase, purification, microreactor, integrated process
Web page	<a href="https://hrzz.hr/razvoj-integriranog-mikrosustava-za-biokataliticku-proizvodnju-biodizela">https://hrzz.hr/razvoj-integriranog-mikrosustava-za-biokataliticku-proizvodnju-biodizela</a>



**Figure 1.** a) Microreactor with housing and b) microreactor.



**Figure 2.** Scheme of an integrated microsystem for the production and purification of biodiesel by ultrafiltration.

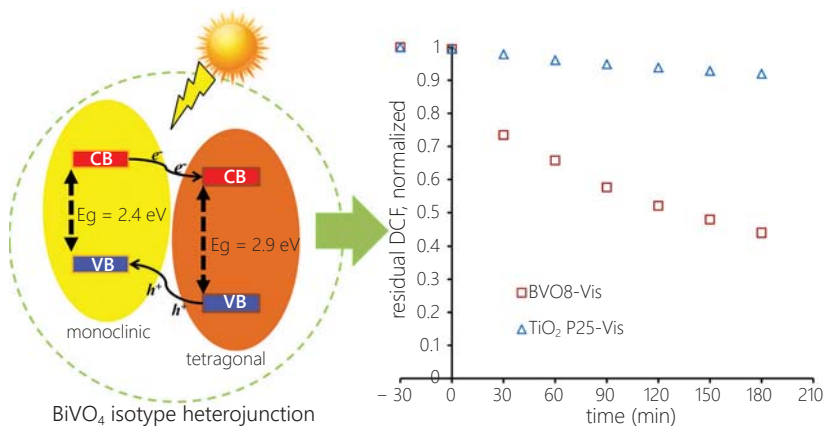


**Figure 3.** Scheme of an integrated microsystem for the production and purification of biodiesel by extraction with eutectic solvents.



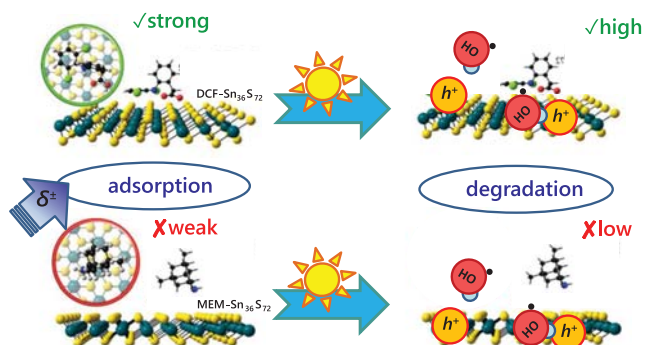
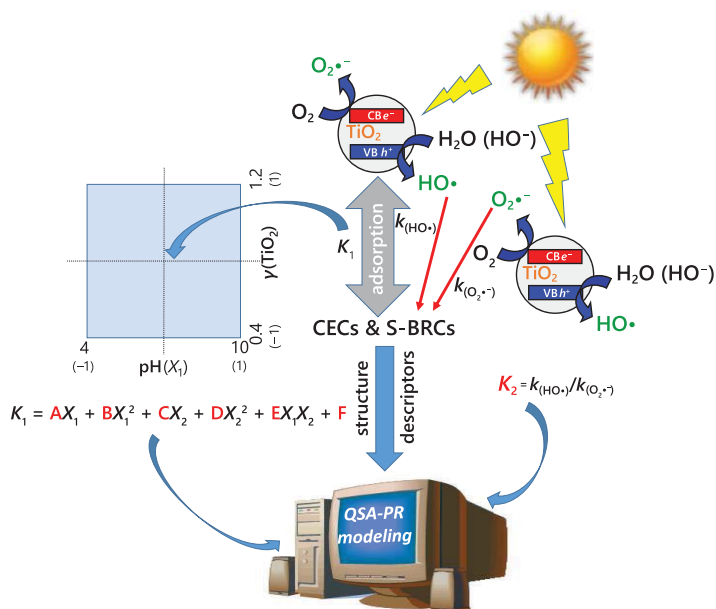


Name of the project	<b>Nano-Sized Solar-Active Catalysts for Environmental Technologies</b>
Acronym	<b>NaSCEnT</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Research Projects (IP-2018-01)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• IMDEA Energy Institute (Spain)</li> <li>• University of Cincinnati (USA)</li> <li>• Institute of Analytical and Physical Chemistry for Environment and Materials, University of Pau (France)</li> <li>• Faculty of Chemistry and Chemical Technology, University of Ljubljana (Slovenia)</li> </ul>
Funding	136,392.83 €
Funding UNIZG FCET	136,392.83 €
Duration	1 <sup>st</sup> October 2018 – 31 <sup>st</sup> September 2022
Leader (UNIZG FCET)	Prof. Hrvoje Kušić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Ana Lončarić Božić, Ph.D.</li> <li>• Prof. Marijana Kraljić Roković, Ph.D.</li> <li>• Assist. Prof. Marin Kovačić, Ph.D.</li> <li>• Daria Juretić Perišić, Ph.D.</li> <li>• Tayebah Sharifi, Ph.D.</li> <li>• Klara Perović, mag. ing. oecoling.</li> <li>• Antonija Tomić, mag. chem. ing.</li> <li>• Josipa Papac Zjačić, mag. ing. oecoling.</li> <li>• Gabrijela Radić, mag. chem. ing.</li> </ul>
Abstract	<p>The main goal of NaSCEnT is to develop novel nano-sized catalyst material (NCM) tailored to effectively harvest solar irradiation for simultaneous solar driven water purification and H<sub>2</sub> production. Accordingly, NCM will be prepared by coupling semiconducting composites, made of TiO<sub>2</sub> and semiconducting materials (SnS<sub>2</sub>, BiVO<sub>4</sub>, and α-Fe<sub>2</sub>O<sub>3</sub>), and graphene oxide and its reduced form (GO/RGO). The NaSCEnT targets treatment of water polluted by pharmaceuticals. Their by-products, low C-atom species, may mimic the role of lower C-atom alcohols, commonly used in H<sub>2</sub> production in water splitting. The optimization and evaluation of solar/NCM system effectiveness, comprehending ecological, energetic and economic aspects will be performed integrating modeling and experimental approaches.</p>
Key words	catalytic nanomaterials, water purification, pharmaceuticals, hydrogen evolution
Web page	<a href="https://www.fkit.unizg.hr/NaSCEnT">https://www.fkit.unizg.hr/NaSCEnT</a>



**Figure 1.** Tailoring of BiVO<sub>4</sub> photocatalysts with adjustable ratio of different crystal phases and its application in water purification for the removal of pharmaceuticals under solar radiation.

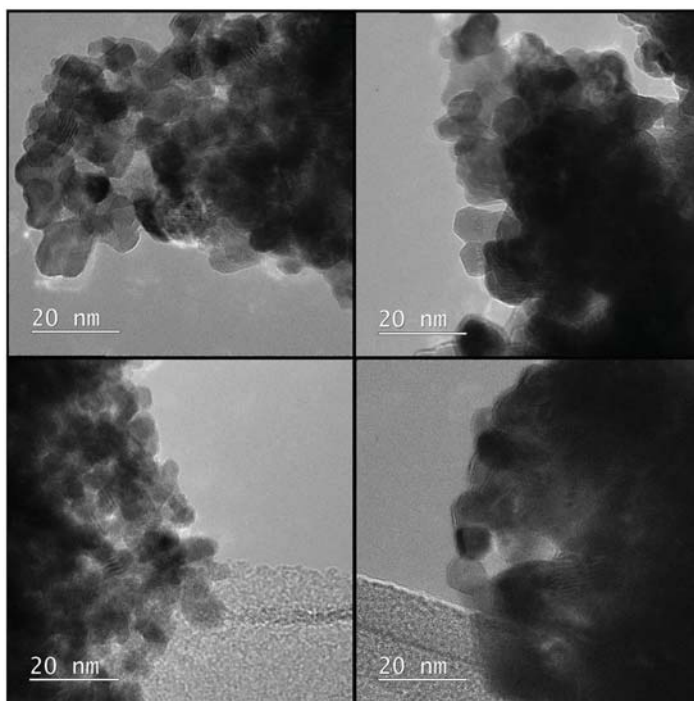
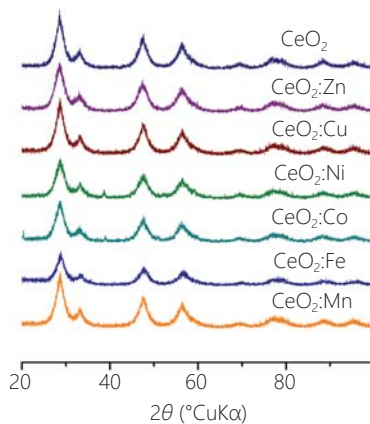
**Figure 2.** Development of prediction model for the simulation of photocatalytic degradation of recalcitrant organics by integrating different types of computational approaches.



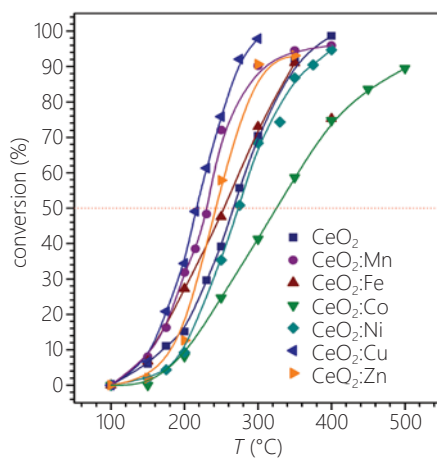
**Figure 3.** Simulation of photocatalytic mechanism for degradation of organic pollutants with TiO<sub>2</sub>/SnS<sub>2</sub> composite under solar radiation.

Name of the project	<b>Hydrothermal Synthesis of Doped Ceria Nanocatalyst</b>
Acronym	<b>HOuDiNI</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Research Projects (IP-2018-01)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Funding	63,043.33 €
Funding UNIZG FCET	63,043.33 €
Duration	1 <sup>st</sup> October 2018 – 30 <sup>th</sup> November 2022
Leader (UNIZG FCET)	Prof. Stanislav Kurajica, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Juraj Šipušić, Ph.D.</li> <li>• Prof. Gordana Matijašić, Ph.D.</li> <li>• Marina Duplančić, Ph.D.</li> <li>• Katarina Mužina, Ph.D.</li> <li>• Matija Gretić, Ph.D.</li> <li>• Ivana Katarina Ivković, mag. ing. cheming.</li> </ul>
Abstract	<p>Ceria nanoparticles doped with transition metal ions intended for use as a heterogeneous catalyst for the removal of volatile organic compounds were prepared by hydrothermal synthesis and systematically investigated. Special attention was paid to ceria nanoparticles doped with Cu and Mn.</p> <p>The ability of these metals to enter the crystal lattice of ceria in the course of hydrothermal synthesis as well as their structure, microstructure, chemical properties, thermal stability and catalytic activity in the oxidation process were investigated.</p> <p>New knowledge was gained about doped ceria prepared by hydrothermal synthesis. The stability of the nanocatalyst based on grain growth kinetics was evaluated as well.</p>
Key words	ceria, hydrothermal synthesis, dopants, catalytic activity, thermal stability
Web page	<a href="https://www.fkit.unizg.hr/Houdini">https://www.fkit.unizg.hr/Houdini</a>
Awards	<ul style="list-style-type: none"> <li>• S. Kurajica, State Award of Science, Annual award for the field of technical sciences for 2020, 2021, Republic of Croatia</li> <li>• K. Mužina, L'Oreal-UNESCO Award for Women in Science, Zagreb, Croatia, 2022</li> </ul>

**Figure 1.** X-ray powder diffraction confirmed that samples of doped ceria were prepared by hydrothermal synthesis.



**Figure 2.** Transmission electron microscopy confirmed that the samples consist of nanoparticles.



**Figure 3.** The catalytic properties of the obtained material were tested in the toluene oxidation process.

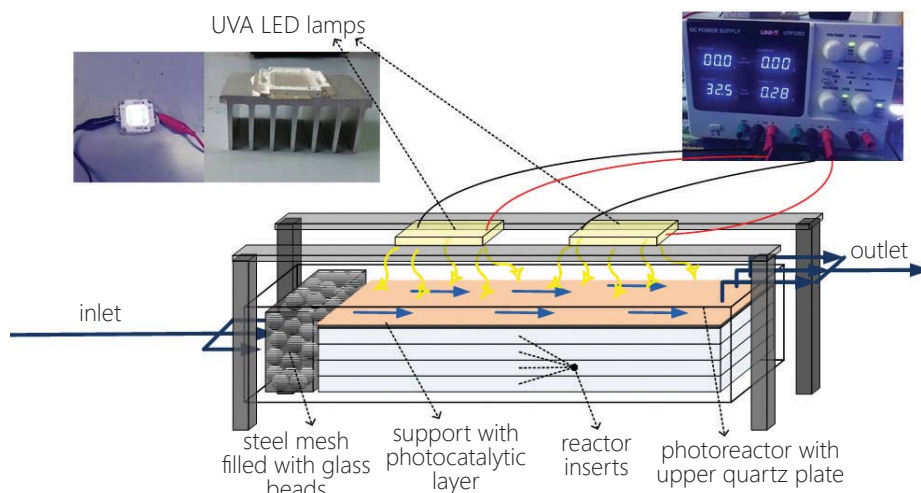


Name of the project	<b>Intensification of Photocatalytic and Catalytic Processes for Treatment of Waste Water and Waste Gases</b>
Acronym	<b>IN-PhotoCat</b>
The name of the programme & funding agency	<i>Croatian Science Foundation Research Projects (IP-2018-01)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology</i>
Partners	<ul style="list-style-type: none"> <li>• Agency for Vocational Education and Training (Croatia)</li> <li>• Xellia Pharmaceuticals (Croatia)</li> </ul>
Funding	121,242.29 €
Funding UNIZG FCET	121,242.29 €
Duration	1 <sup>st</sup> November 2018 – 31 <sup>st</sup> October 2022
Leader (UNIZG FCET)	Prof. Vesna Tomašić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. emer. Zoran Gomzi, Ph.D.</li> <li>• Assoc. Prof. Vanja Kosar, Ph.D.</li> <li>• Marina Duplančić, Ph.D.</li> <li>• Kristina Babić, mag. ing. cheming.</li> <li>• Filip Car, Ph.D.</li> <li>• Vanja Gilja, Ph.D.</li> <li>• Ivana Elizabeta Zelić, mag. ing. oecoing.</li> </ul>
Abstract	<p>Recently, we have increasingly come across achievements that stand out from the "traditional" chemical process engineering and are mostly based on the application of a new approach known as <i>Process Intensification</i> (PI).</p> <p>The aim of the project is to develop new photocatalysts and monolithic catalysts as well as innovative photocatalytic and catalytic reactors using the basic methodology of chemical engineering and the fundamental principles of process intensification. The goal is their potential application to solve the global problems related to wastewater and waste gas treatment and the production of suitable reactor prototypes.</p>
Key words	Process Intensification (PI), heterogeneous photocatalysis, monolithic reactors, neonicotinoid insecticides, aromatic volatile organic compounds
Web page	<a href="https://www.fkit.unizg.hr/IN-PhotoCat">https://www.fkit.unizg.hr/IN-PhotoCat</a>
Awards	<ul style="list-style-type: none"> <li>• Rector's Award for the academic year 2018/2019 M. Komljen, M. Koren, I. Lukanović, Removal of imidacloprid from simulated wastewater by an advanced oxidation process, UNIZG FCET (2019) (supervisor: Vesna Tomašić)</li> <li>• Rector's Award for the academic year 2021/2022 L. Bogdan, P. Hršak, Preparation, characterization and application of TiO<sub>2</sub>/ZIF-8 hybrid photocatalyst for the photodegradation of the insecticide imidacloprid, UNIZG FCET (2022) (supervisor: Marina Duplančić)</li> </ul>

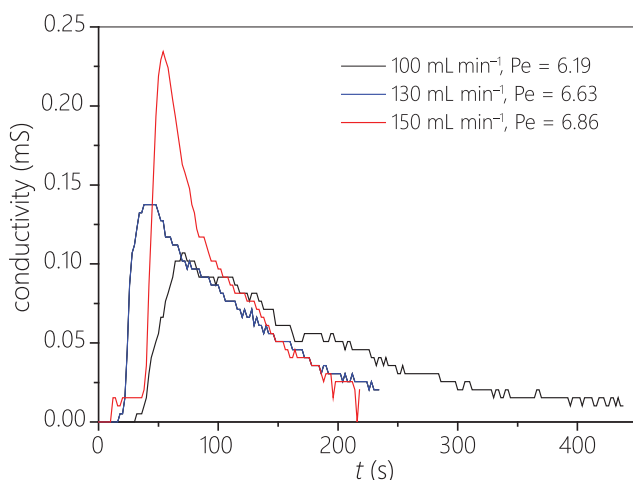
## Awards

Antonia Škarica, Development of a structured catalyst and advanced reactor design for the oxidation of aromatic compounds, UNIZG FCET (2022) (supervisor: Vesna Tomašić)

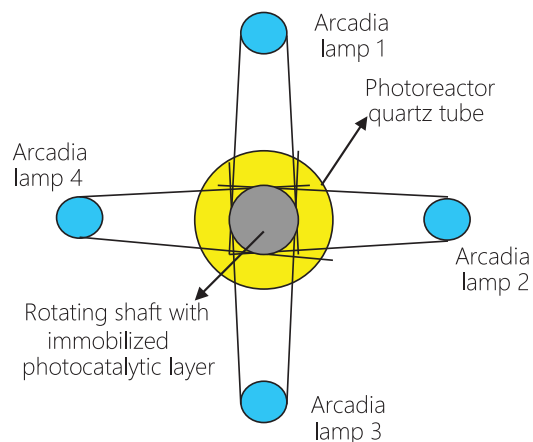
- IAAM Young Scientist Medal for oral presentation at international congress  
F. Car, V. Tomašić, D. Vrsaljko, Production of novel ceramic monolithic catalysts for catalytic oxidation of BTEX compounds using stereolithography, European Advanced Materials Congress, Genoa, Italy (2022)



**Figure 1.** The experimental setup consisting of the flat-plate photoreactor with the upper quartz plate, two UVA LED lamps connected to two passive aluminium coolers and the UVA-LED radiation source.



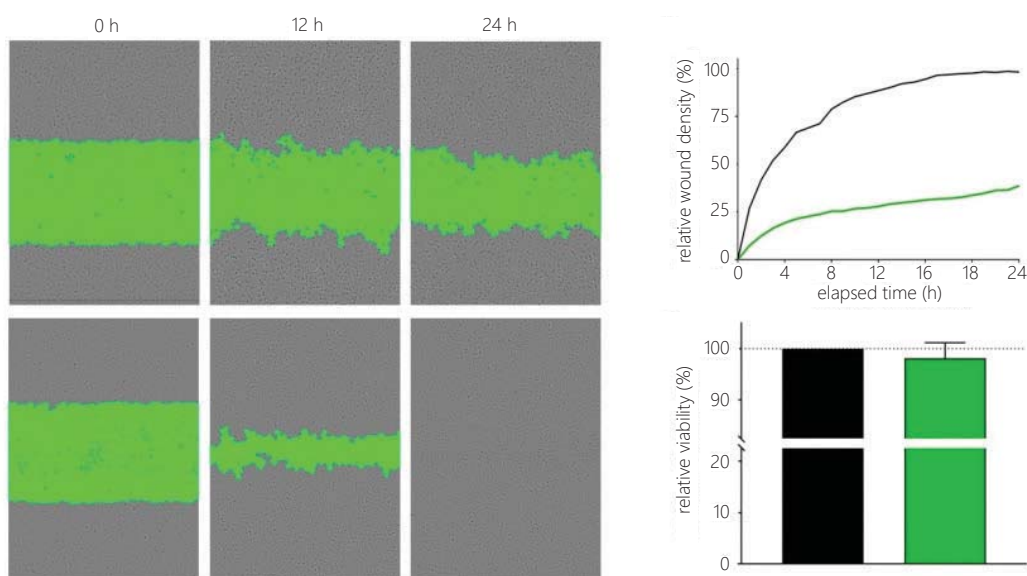
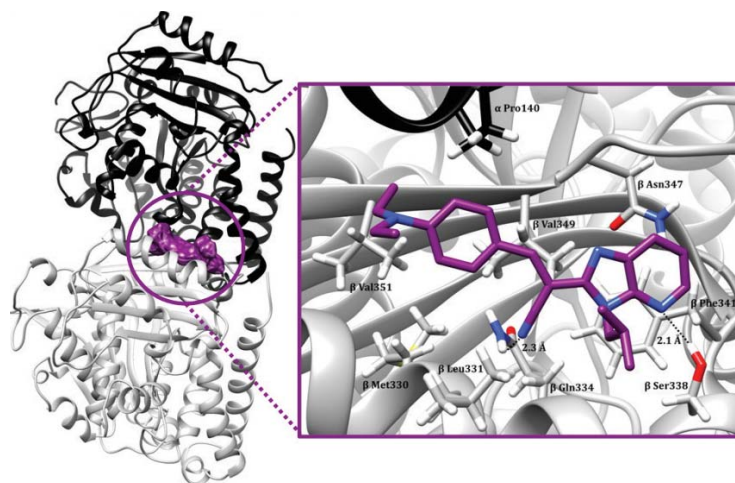
**Figure 2.** A residence time distribution (RTD) analysis performed to characterize the liquid flow pattern in the flow flat-plate photoreactor - Response to the impulse disturbance for different fluid flow rates through a rectangular flat-plate photoreactor. The axial dispersion model was used and the Peclet numbers were estimated from the experimental data as a quantitative indicator of the deviation from the ideal flow.



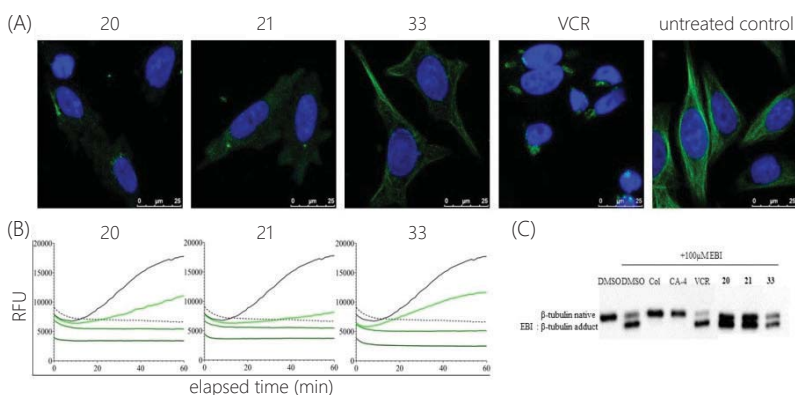
**Figure 3.** Schematic representation of the illumination of the surface of the immobilized photocatalytic layer in a rotating photoreactor.

Name of the project	<b>Exploring the Antioxidative Potential of Benzazole Scaffold in the Design of Novel Antitumor Agents</b>
Acronym	<b>AntioxPot</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Research Projects (IP-2018-01)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Zagreb Faculty of Textile Technology (Croatia)</li> <li>• Ruđer Bošković Institute (Croatia)</li> <li>• Fidelta Ltd. (Croatia)</li> <li>• Institute for Medical Research and Occupational Health (Croatia)</li> <li>• University of Zagreb Faculty of Veterinary Medicine (Croatia)</li> </ul>
Funding	131,926.47 €
Funding UNIZG FCET	131,926.47 €
Duration	1 <sup>st</sup> December 2018 – 31 <sup>st</sup> March 2023
Leader (UNIZG FCET)	Prof. Marijana Hranjec, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Maja Cindrić, Ph.D.</li> <li>• Nataša Perin, Ph.D.</li> <li>• Anja Beč, mag. appl. chem.</li> <li>• Ida Boček Pavlinac, mag. appl. chem.</li> <li>• Prof. Dragana Mutavdžić Pavlović, Ph.D.</li> <li>• Prof. Grace Karminski-Zamola, Ph.D.</li> <li>• Kristina Tolić Čop, mag. appl. chem.</li> </ul>
Abstract	<p>The scientific project is focused on the design and development of new and effective benzazole derivatives as antioxidants with antitumor activity that will be a part of an antitumor therapeutic strategy based on the inhibition of reactive oxygen compounds. The project is multidisciplinary and brings together an interdisciplinary group of researchers whose joint synergy should lead to the realization of the main goals of the project. The project consists of three main objectives, including synthesis and structural characterization of benzazole derivatives, computational studies and evaluation of biological activity.</p>
Key words	synthesis, benzazoles, computational chemistry, antioxidative activity, antitumor activity
Web page	<a href="https://www.fkit.unizg.hr/AntioxPot">https://www.fkit.unizg.hr/AntioxPot</a>

**Figure 1.** Representative structure of E-21 acrylonitrile within the allosteric site 1. Tubulin  $\alpha$ - and  $\beta$ -subunits are shown in black and gray, respectively.



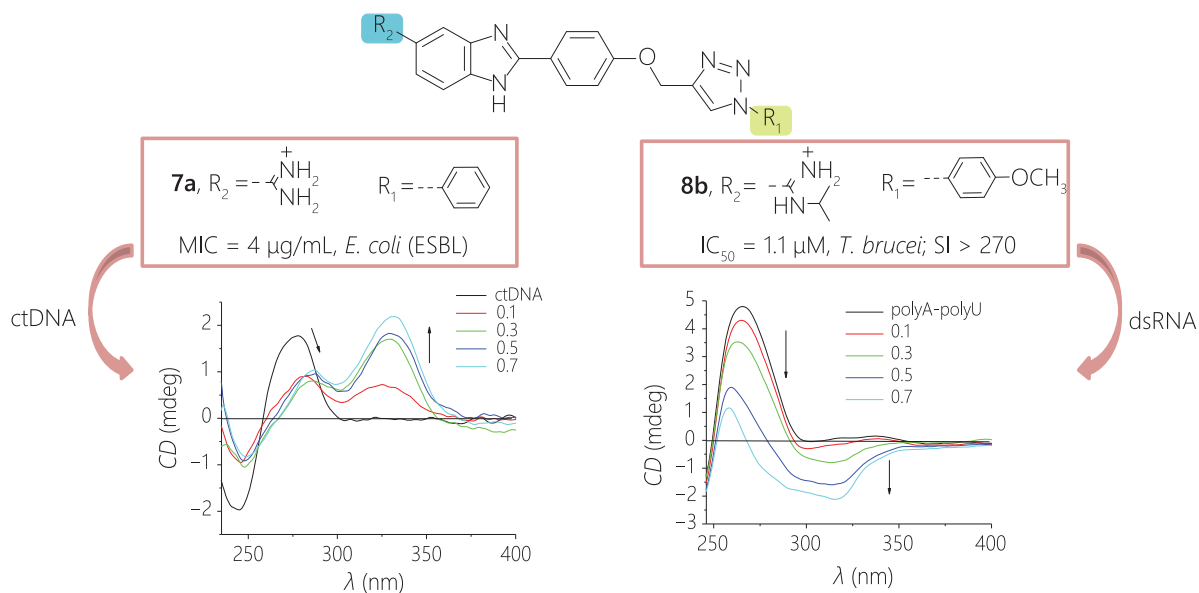
**Figure 2.** Effect of most active compounds on cancer cell migration.



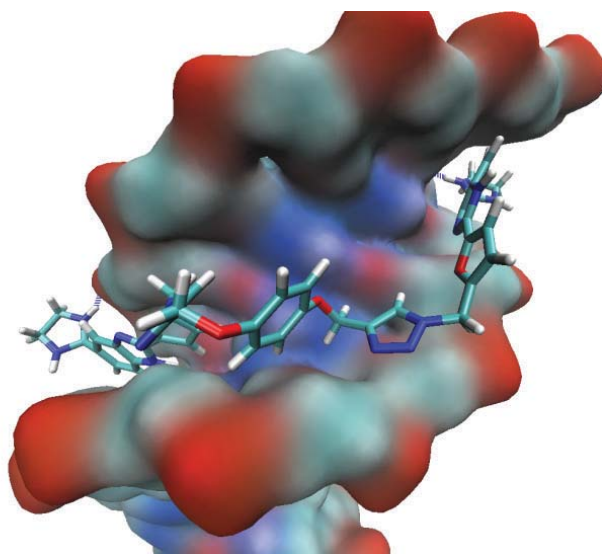
**Figure 3.** Effect of most active compounds on the cellular microtubule network. (A) HEp-2 cells were treated with 20 (5  $\mu$ M), 21 (5  $\mu$ M), 33 (100  $\mu$ M) and VCR (5  $\mu$ M) for 3 h, or left untreated. Microtubules are shown in green and the nuclei in blue. Scalebar, 25  $\mu$ m. (B) Dose dependent effect of 20, 21, and 33 on tubulin polymerization *in vitro*. Vincristine (5  $\mu$ M), dotted black line) was used as a reference drug, and DMSO as a vehicle control (solid black line).



Name of the project	<b>Novel Purine Bioisostere-Based Compounds for Their Anticancer and Antipathogenic Activity Evaluations</b>
Acronym	<b>PurBioCaPa</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Research Projects (IP-2018-01)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Rijeka, Department of Biotechnology (Croatia)</li> <li>• University of Osijek, Faculty of Medicine (Croatia)</li> <li>• London School of Hygiene &amp; Tropical Medicine (UK)</li> <li>• Fidelta Ltd. (Croatia)</li> <li>• University of Zagreb Faculty of Veterinary Medicine (Croatia)</li> </ul>
Funding	132,483.91 €
Funding UNIZG FCET	132,483.91 €
Duration	1 <sup>st</sup> December 2018 – 30 <sup>th</sup> November 2022
Leader (UNIZG FCET)	Prof. Silvana Raić-Malić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Tatjana Gazivoda Kraljević, Ph.D.</li> <li>• Andrijana Meščić Macan, Ph.D.</li> <li>• Silvija Maračić, Ph.D.</li> <li>• Ivana Sokol, mag. appl. chem.</li> <li>• Andrea Bistrović, Ph.D.</li> </ul>
Abstract	<p>In recent years, the number of treatment failures associated with the development of drug resistant cancer cells and pathogens has increased with an alarming rate.</p> <p>The research in the project is focused on the synthesis, structure optimization and biological evaluations of the new chemical entities with the aim to obtain lead compounds with selective and pronounced cytostatic and/or antipathogenic activities.</p> <p>To evaluate the benefit of sustainable synthetic method to traditional approach, batch-based syntheses of chosen reactions will be translated to non-conventional, such as mechanochemical and micro-flow processes.</p>
Key words	purine bioisosteres, benzimidazole, benzothiazol, 1,2,3-triazole, antitumor, antibacterial, antitrypanosomal activity
Web page	<a href="https://www.fkit.unizg.hr/PurBioCaPa">https://www.fkit.unizg.hr/PurBioCaPa</a>

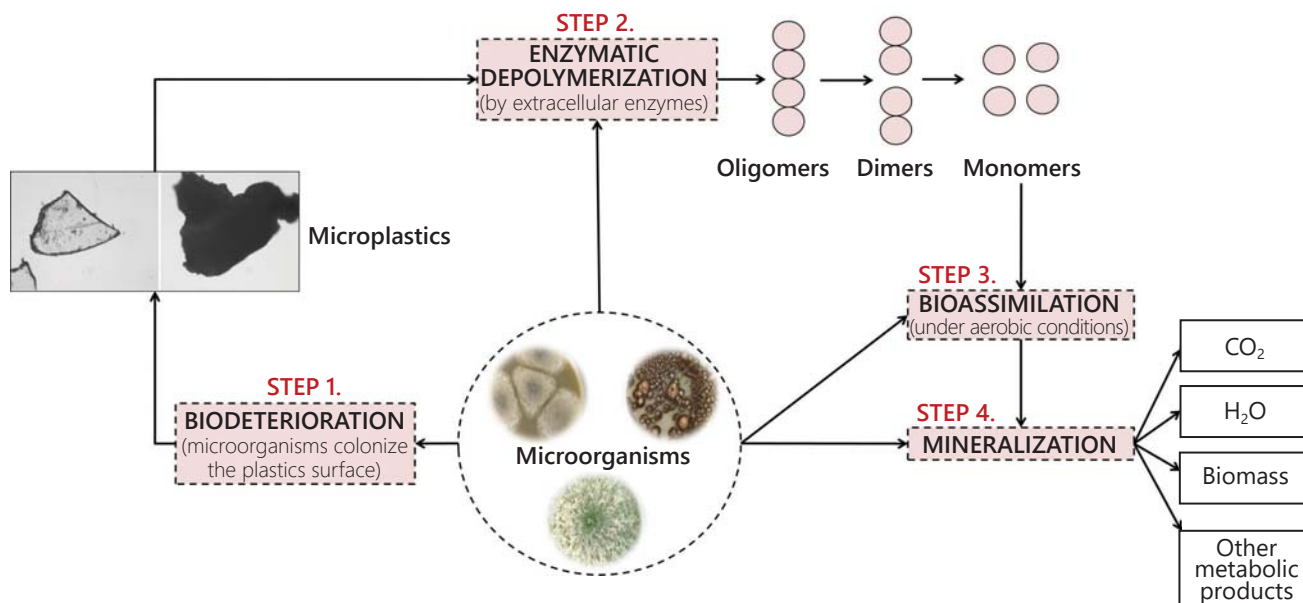


**Figure 1.** Unsubstituted amidine **7a** shows strong inhibition of Gram-negative *E. coli*, while isopropyl benzimidazole amidine **8b** is more active on *T. brucei* compared to Nifurtimox. The dominant mode of binding in the ctDNA is in the minor groove of ctDNA, while compounds bind by intercalation to ds-RNA.

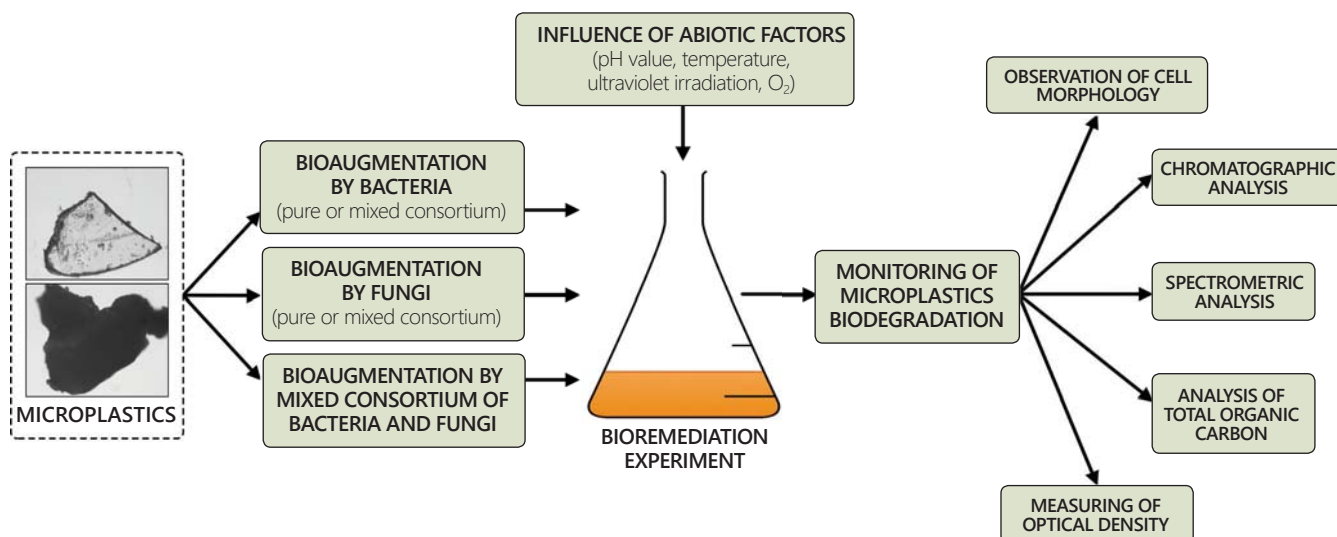


**Figure 2.** Complex of symmetrical bis-benzimidazole with 14 bp DNA d[(CTACCGATAAGCAG)<sub>2</sub>].

Name of the project	<b>Advanced Water Treatment Technologies for Microplastics Removal</b>
Acronym	<b>AdWaTMiR</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Research Projects (IP-2019-04-9661)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• Institute of Macromolecular Chemistry (Czechia)</li> <li>• Institute for Water Quality and Resource Management, University of Technology, Vienna (Austria)</li> <li>• Croatian Institute for Public Health (Croatia)</li> </ul>
Funding	118,455.11 €
Funding UNIZG FCET	118,455.11 €
Duration	15 <sup>th</sup> December 2019 – 14 <sup>th</sup> December 2023
Leader (UNIZG FCET)	Prof. Tomislav Bolanča, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. emer. Laszlo Sipos, Ph.D.</li> <li>• Prof. Danijela Ašperger, Ph.D.</li> <li>• Prof. Křešimir Košutić, Ph.D.</li> <li>• Prof. Šime Ukić, Ph.D.</li> <li>• Assoc. Prof. Dajana Kučić Grgić, Ph.D.</li> <li>• Assoc. Prof. Vesna Očelić Bulatović, Ph.D.</li> <li>• Assist. Prof. Matija Cvetnić, Ph.D.</li> <li>• Mirjana Novak Stankov, Ph.D.</li> <li>• Marinko Markić, M.Sc.</li> <li>• Martina Miloloža, mag. ing. oecoiing.</li> <li>• Kristina Bule Možar, mag. ing. oecoiing.</li> <li>• Bruna Babić Visković, mag. ing. oecoiing.</li> <li>• Silvia Morović, mag. ing. oecoiing.</li> <li>• Viktorija Martinjak, mag. ing. cheming.</li> <li>• Iva Čurić, mag. ing. cheming.</li> </ul>
Abstract	<p>Studies dealing with removal of microplastics (MP) from water are so far relatively rare and scarce. Therefore, AdWaTMiR is focused on the removal of these contaminants.</p> <p>The main goal of AdWaTMiR is to explore and develop new effective approaches for removal of MP from contaminated waters. The most effective approach will be selected by applying multiple criteria decision making methodology with two criteria included: best removal efficiency and highest cost efficiency.</p>
Key words	polluted water, microplastics, removal, advanced treatment technologies, innovative reactor
Web page	<a href="https://www.fkit.unizg.hr/AdWaTMiR">https://www.fkit.unizg.hr/AdWaTMiR</a>



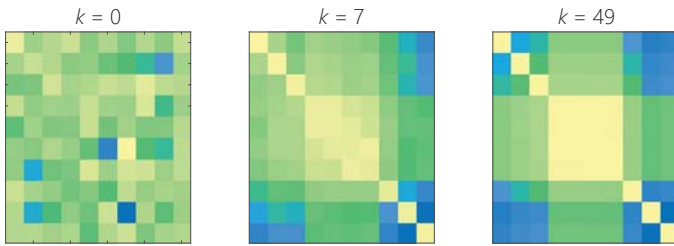
**Figure 1.** The most important steps in the biodegradation of microplastics. Biodegradation begins with the colonization of the surface of microplastics by microorganisms and the secretion of their extracellular enzymes. These enzymes play an important role in the depolymerization of the polymers. The resulting compounds with low molecular mass easily enter the cells of the microorganisms (bioassimilation), where intracellular enzymes continue the decomposition until complete mineralization.



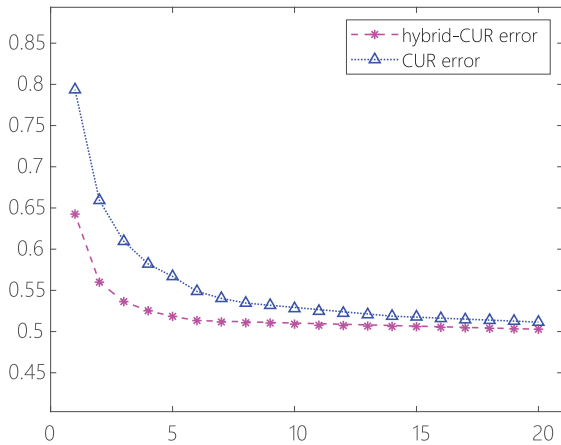
**Figure 2.** Implementation of the biodegradation process. The process begins with the bioaugmentation of microorganisms in the microplastic suspension. Biodegradation is influenced by the chemical and physical properties of the polymers as well as abiotic factors. The process is usually monitored microscopically (observation of cell morphology) and using instrumental analysis methods.

Name of the project	<b>Decompositions and Approximations of Matrices and Tensors</b>
Acronym	<b>DAMAT</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Installation Research Projects (UIP-2019-04-5200)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Zagreb Faculty of Science (Croatia)</li> <li>• University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (Croatia)</li> </ul>
Funding	133,758.05 €
Funding UNIZG FCET	133,758.05 €
Duration	1 <sup>st</sup> January 2020 – 31 <sup>st</sup> December 2024
Leader (UNIZG FCET)	Assist. Prof. Erna Begović Kovač, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Ana Perković, mag. math.</li> </ul>
Abstract	<p>The most important and the most challenging problems of the scientific computing are those involving very big amount of numerical data modelled by big matrices or multidimensional tensors. Limitations of the computer memory and the fact that we want to obtain the solution fast imply additional requirements to our problems. We can overcome these obstacles by well-created algorithms that efficiently use computer memory while keeping the relative accuracy.</p> <p>Some of the approaches in this direction are using the particular structure of the problem in question, using low-rank approximations of matrices or tensors, and using matrix or tensor decompositions. Our group works on hot topics of numerical linear algebra where many interesting questions are raised, both theoretical ones and those involving various applications.</p>
Key words	numerical linear algebra, scientific computing, factorization, approximation, eigendecomposition, structure-preserving algorithms
Web page	<a href="http://matematika.fkit.hr/erna/damat.html">http://matematika.fkit.hr/erna/damat.html</a>

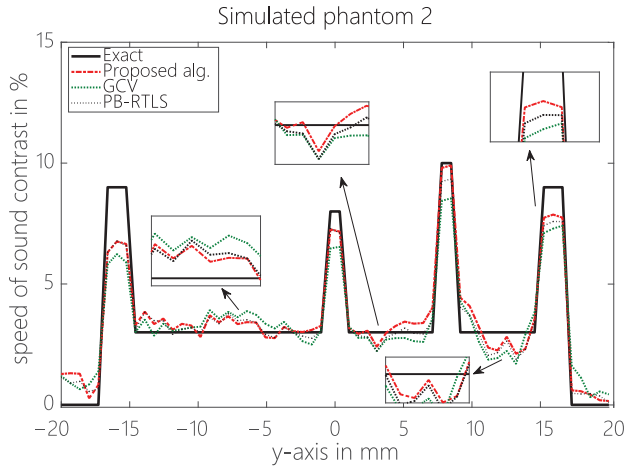




**Figure 1.** Formation of the block diagonal matrix structure during several iterations of the Eberlein eigenvalue algorithm.

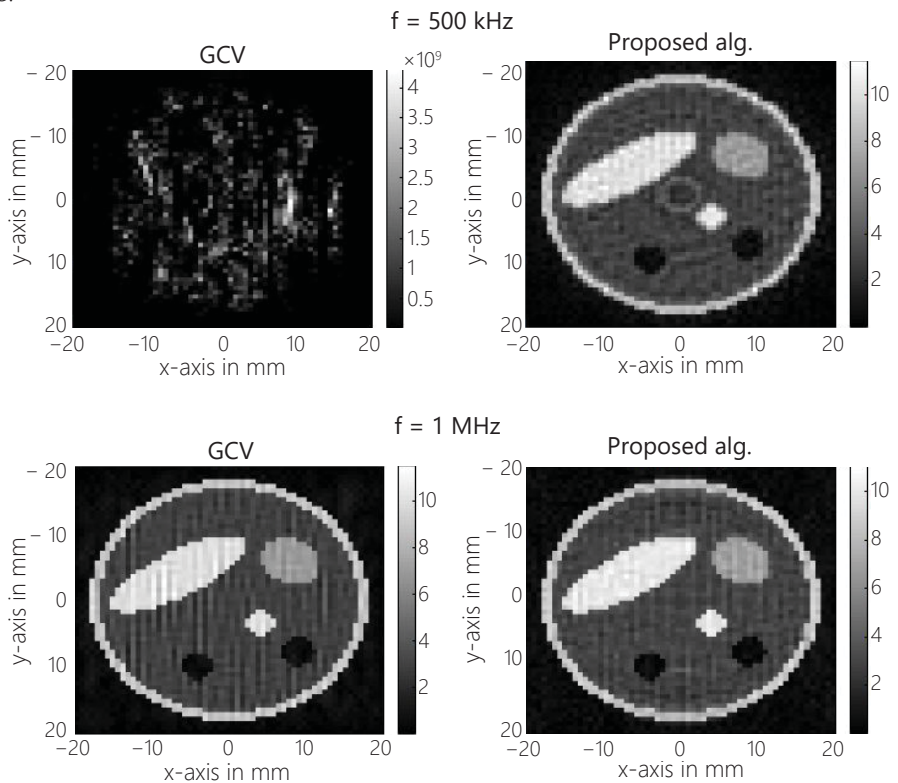


**Figure 2.** The approximation error of the new hybrid CUR tensor decomposition algorithm compared to the approximation error of the standard CUR algorithm from the literature.

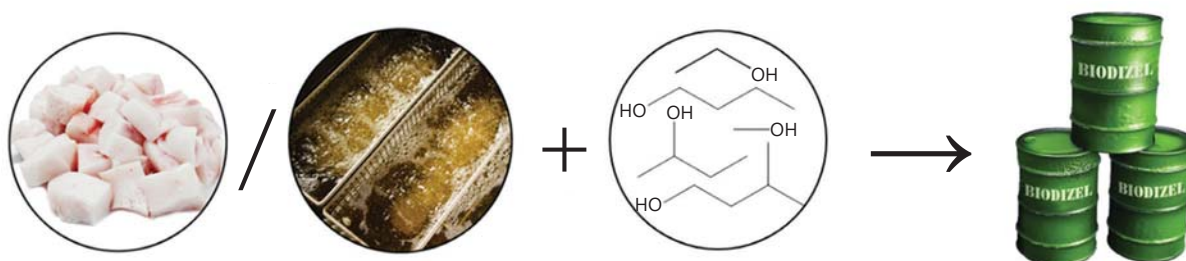


**Figure 3.** Accuracy of the new ultrasound tomography reconstruction algorithm compared to two algorithms from the literature.

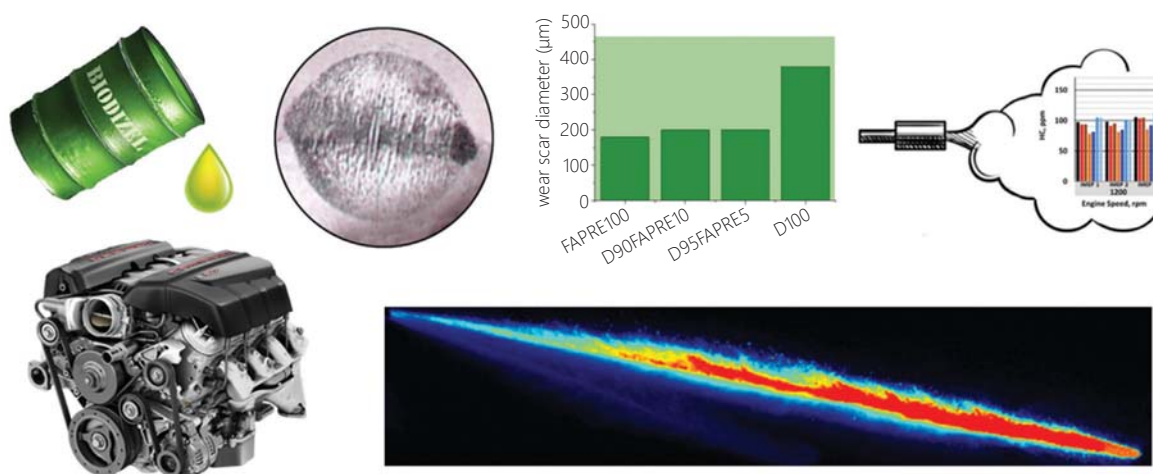
**Figure 4.** Results of the new ultrasound tomography reconstruction algorithm (right) compared to an algorithm from the literature (left).



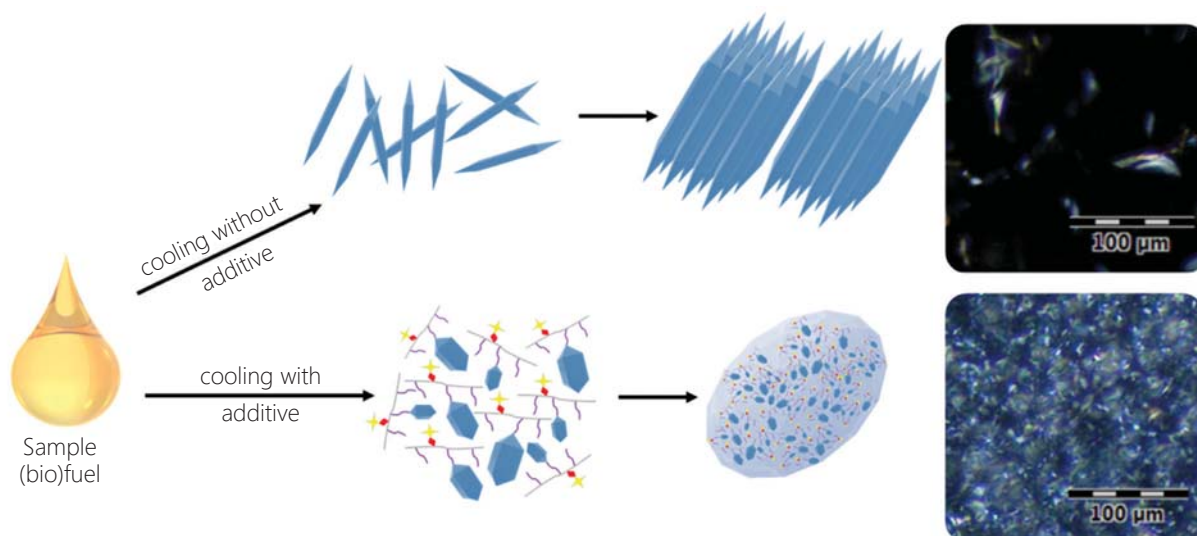
Name of the project	<b>Development of Functional Biofuels and (Bio)Additives and Characterization of Blends with Mineral Fuels</b>
Acronym	<b>FunBioFA</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Installation Research Projects (UIP-2019-04)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Zagreb Faculty of Mechanical Engineering and Naval Architecture (Croatia)</li> <li>• INA-Petroleum Industry d.d. (Croatia)</li> </ul>
Funding	172,900.66 €
Funding UNIZG FCET	172,900.66 €
Duration	4 <sup>th</sup> January 2020 – 3 <sup>rd</sup> January 2025
Leader (UNIZG FCET)	Assoc. Prof. Fabio Faraguna, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Marko Racar, Ph.D.</li> <li>• Mia Gotovuša, mag. ing. cheming.</li> <li>• Ivan Pucko, mag. ing. cheming.</li> <li>• Lucija Konjević, mag. ing. cheming.</li> </ul>
Abstract	<p>In this project, new functional biofuels, bioadditives and polymer additives are developed and new and improved methods for the purification of biochemicals by membrane processes are designed. The project investigates the application properties of two-component (mineral fuel, biofuel), three-component (mineral fuel, biofuel, alcohol) and formulated mixtures with (bio)additives according to the standards for fuels and biofuels. The analysis is followed by an investigation of the combustion properties in the engine and an analysis of the exhaust gases.</p> <p>The aim of this project is to develop a synthesis/purification process from waste raw materials (waste oil, animal fats) using chemical and process engineering knowledge that produces a high-quality biochemical substance as a product in the form of a functional biofuel or bioadditive.</p>
Key words	biofuel, bioadditive, membrane purification, engine combustion tests, exhaust gas analysis, fuel and biofuel mixtures, fuel characterization, EN 590
Web page	<a href="https://funbiofa.wordpress.com">https://funbiofa.wordpress.com</a>
Awards	<p>Gold medals:</p> <ul style="list-style-type: none"> <li>• 46<sup>th</sup> International Invention Show INOVA</li> <li>• International Exhibition INVENTCOR 3<sup>rd</sup> ed.</li> <li>• 47<sup>th</sup> International Invention Show INOVA</li> <li>• Special award from Norton University and Silver medal at 2022 Kaohsiung International Invention and Design EXPO for innovation</li> </ul>



**Figure 1.** Synthesis of new biodiesels from waste animal fat or waste oil and higher alcohols with linear or branched chain structure.



**Figure 2.** Analysis of new biodiesels and monitoring of improvements in lubricity, reduction of hydrocarbon emissions, fuel atomization and diesel engine performance.



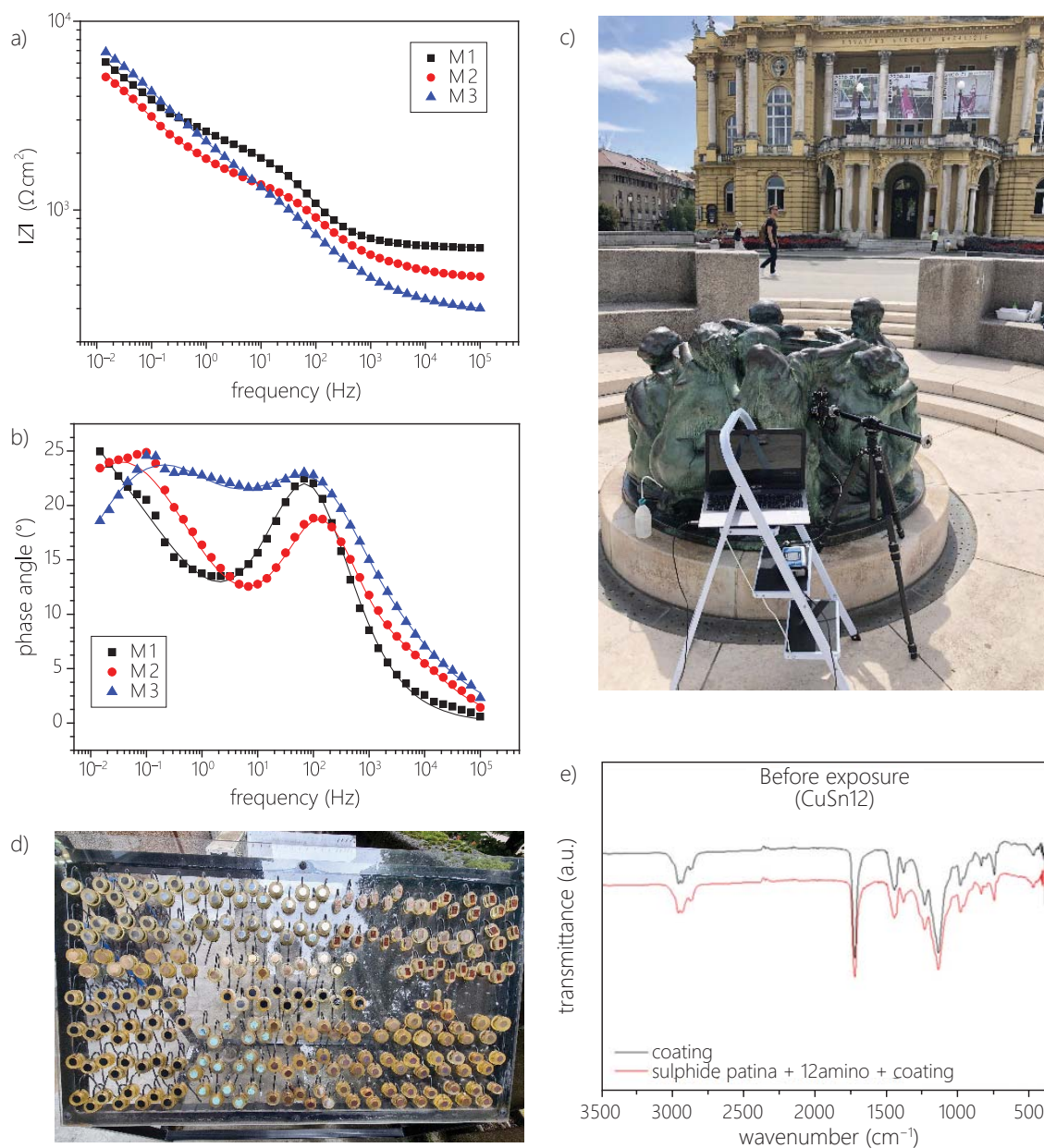
**Figure 3.** Development of polymer additives for improving the low-temperature properties of (bio)fuels: mechanism of action and monitoring of the formation of smaller and more spherical paraffin crystals with the addition of additives using polarizing microscopy.

Name of the project	<b>Development of New Solutions for Characterization and Protection of Bronze Cultural Heritage Exposed to Outdoor Environment</b>
Acronym	<b>BroCH</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Research Projects (IP-2019-04)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Zagreb Academy of Fine Arts (Croatia)</li> <li>• Ruđer Bošković Institute (Croatia)</li> <li>• Slovenian National Building &amp; Civil Engineering Institute (Slovenia)</li> <li>• City Institute for Cultural and Natural Heritage Conservation, Zagreb (Croatia)</li> <li>• Sisak City Museum (Croatia)</li> <li>• Freidrich-Alexander University Erlangen (Germany)</li> </ul>
Funding	153,892.10 €
Funding UNIZG FCET	153,892.10 €
Duration	7 <sup>th</sup> January 2020 – 6 <sup>th</sup> March 2024
Leader (UNIZG FCET)	Prof. Helena Otmačić Čurković, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Sanja Martinez, Ph.D.</li> <li>• Assoc. Prof. Ljerka Kratofil Krehula, Ph.D.</li> <li>• Dajana Mikić, mag. appl. chem.</li> <li>• Ivana Šoić, mag. appl. chem.</li> <li>• Anđela Kapitanović, mag. ing. cheming.</li> <li>• Ines Šoljić, mag. appl. chem.</li> </ul>
Abstract	<p>Bronze sculptures displayed in public areas are an important part of cultural heritage, but the corrosive city atmosphere causes their degradation.</p> <p>The goal of this project is to develop new solutions for their characterization and improve their protection procedures.</p> <p>The aims of the project are: detailed characterization of selected urban bronze sculptures for better understanding of the corrosion behavior, the development of the sensor part of the device for determining the corrosion stability of bronze by performing non-destructive electrochemical measurements, and the development of improved coating protection systems e.g. a monolayer film of organic molecules as corrosion inhibitors and adhesion promoters of organic coatings.</p>
Key words	cultural heritage, corrosion, corrosion protection, organic coatings, electrochemical techniques
Web page	<a href="https://www.fkit.unizg.hr/BroCH">https://www.fkit.unizg.hr/BroCH</a>



## Awards

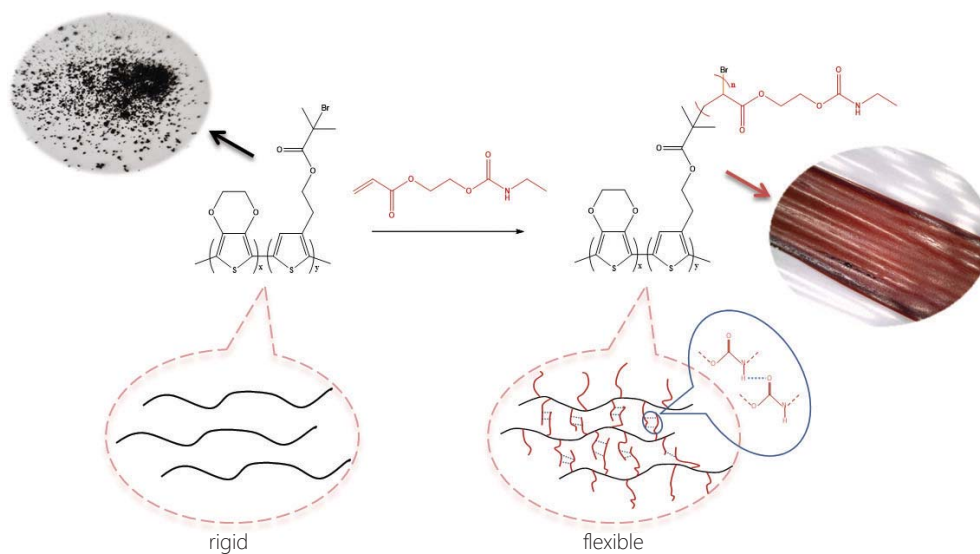
- M. Eškinja, K. Hmelina, Development of a method for creation of superhydrophobic films for the protection of bronze cultural heritage, Rector's Award, 2020/2021
- H. Bach-Rojecky, L. Volf, Investigation of environmentally friendly water-based coatings for protection of patinated bronze, Rector's Award, 2021/2022



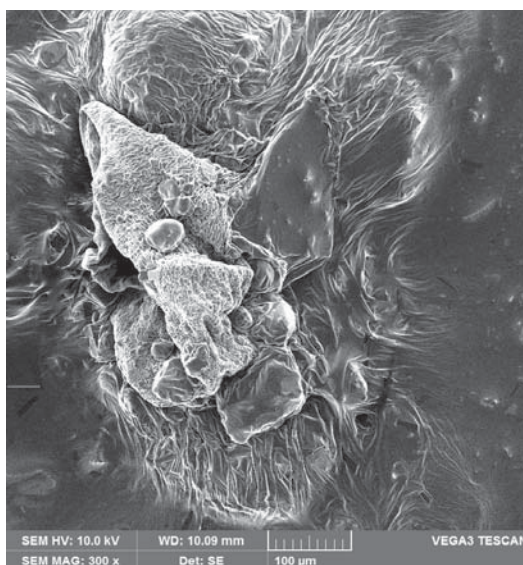
**Figure 1.** Electrochemical measurements (a and b) on bronze sculpture (c) and image of laboratory prepared patinated samples (d) with their characterization by FTIR spectroscopy (e).



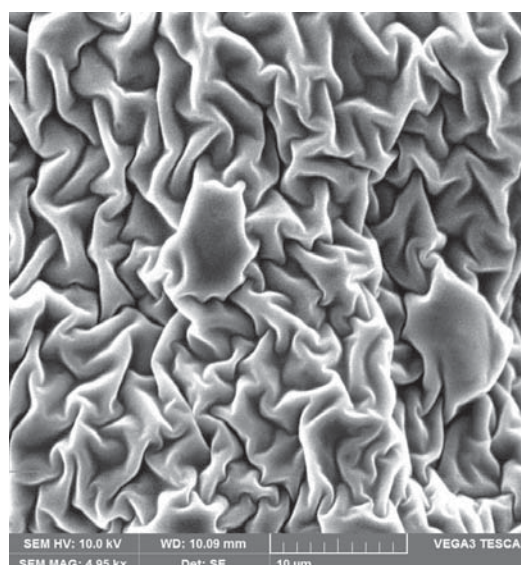
Name of the project	<b>Molecular Tailoring of Stretchable and Healable Conductive Polymers for Wearable Electronics</b>
Acronym	<b>SHaPes</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Installation Research Projects (UIP-2019-04)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Funding	261,410.84 €
Funding UNIZG FCET	261,410.84 €
Duration	1 <sup>st</sup> February 2020 – 31 <sup>st</sup> January 2025
Leader (UNIZG FCET)	Assist. Prof. Zvonimir Katančić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Roko Blažić, mag. ing. cheming.</li> <li>• Marin Božičević, mag. ing. cheming.</li> <li>• Lucija Fiket, mag. ing. cheming.</li> <li>• Denis Sačer, Ph.D.</li> <li>• Patricia Žagar, mag. ing. cheming.</li> </ul>
Abstract	<p>New frontiers in organic electronics are wearable electronics made of conductive polymer materials with high electrical and skin-like properties. Such materials have the ability to stretch and move with the human body, opening up possibilities for the development of stretchable sensors for continuous health monitoring.</p> <p>Tailoring the molecular design to produce functional materials that can stretch and heal after mechanical damage is the key. The main goal of the project is to develop intrinsically stretchable and self-healing conductive materials for stacked sensors for health monitoring.</p>
Key words	molecular tailoring, wearable electronics, self-healing, stretchable conductive polymers, atom transfer radical polymerization (ATRP)
Web page	<a href="https://www.fkit.unizg.hr/SHaPes">https://www.fkit.unizg.hr/SHaPes</a>



**Figure 1.** Change of PEDOT properties after modification with soft side branches.



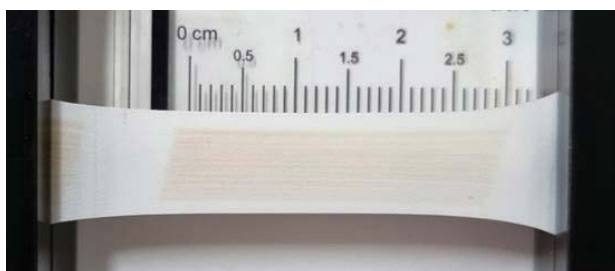
**Figure 2.** SEM image of PEDOT macroinitiator.



**Figure 3.** SEM image of PEDOT modified with soft side branches.



**Figure 4.** Bending of modified PEDOT conductive polymer.



**Figure 5.** Stretching of modified PEDOT conductive polymer.

Name of the project	<b>Phenomena on the Surface During the Preparation of Advanced Nanocomposites by Infiltration and Functionalization of Porous Materials</b>
Acronym	<b>SLIPPERY SLOPE</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Installation Research Projects (UIP-2019-04)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Funding	265,412.44 €
Funding UNIZG FCET	265,412.44 €
Duration	1 <sup>st</sup> February 2020 – 31 <sup>st</sup> January 2025
Leader (UNIZG FCET)	Assoc. Prof. Vilko Mandić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Arijeta Bafti, mag. chem.</li> <li>• Floren Radovanović-Perić, mag. ing. cheming.</li> <li>• Filip Brleković, mag. ing. cheming.</li> </ul>
Abstract	It is necessary to improve the efficiency indicators of functional materials. Lately, this vague statement accompanies the research and development of advanced materials, composites, and structured materials that aim for orderliness and functionality at the nano level. The project is focused on elucidating more complex but fundamental aspects of material surface research. Particularly attractive and complex, yet insufficiently explored, is the area of contact between porous or nanostructured materials and other materials prepared using wet chemistry methods, <i>i.e.</i> , chemical deposition, as well as physical deposition methods.
Key words	surfaces, porosity, infiltration, nanomaterials, structural analysis, small-angle X-ray diffraction, lubricious composites, gradual release
Web page	<a href="https://www.fkit.unizg.hr/SLIPPERY-SLOPE">https://www.fkit.unizg.hr/SLIPPERY-SLOPE</a>

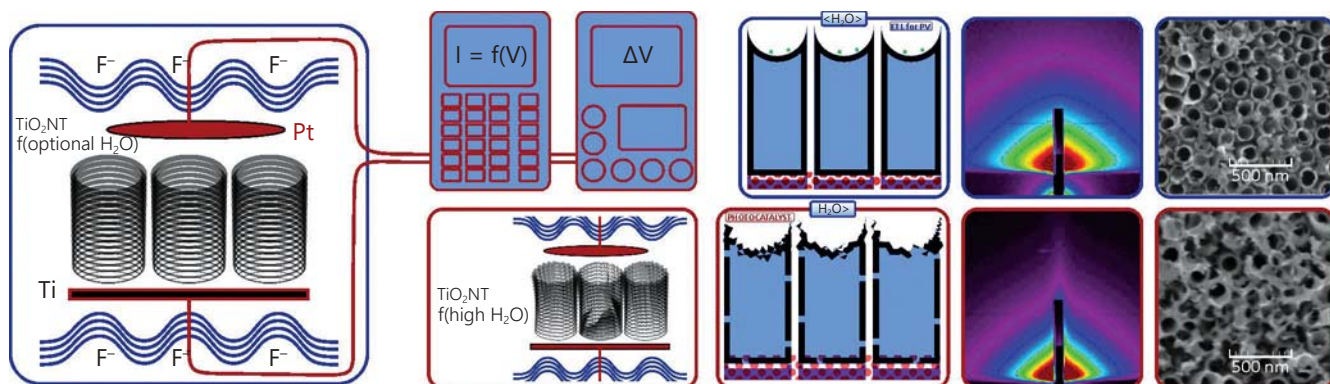


Figure 1. Scheme/Example of the self-organisation.

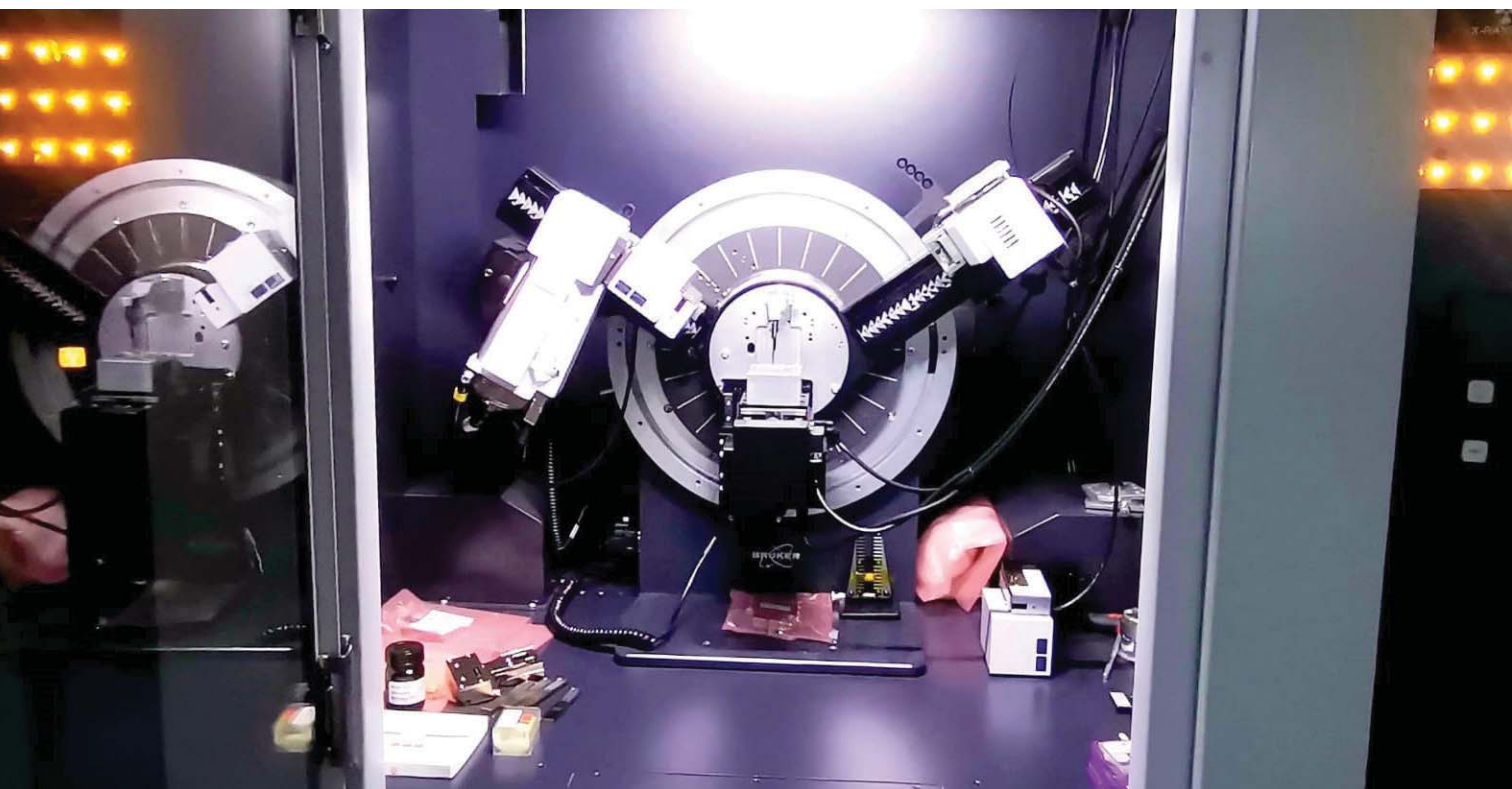
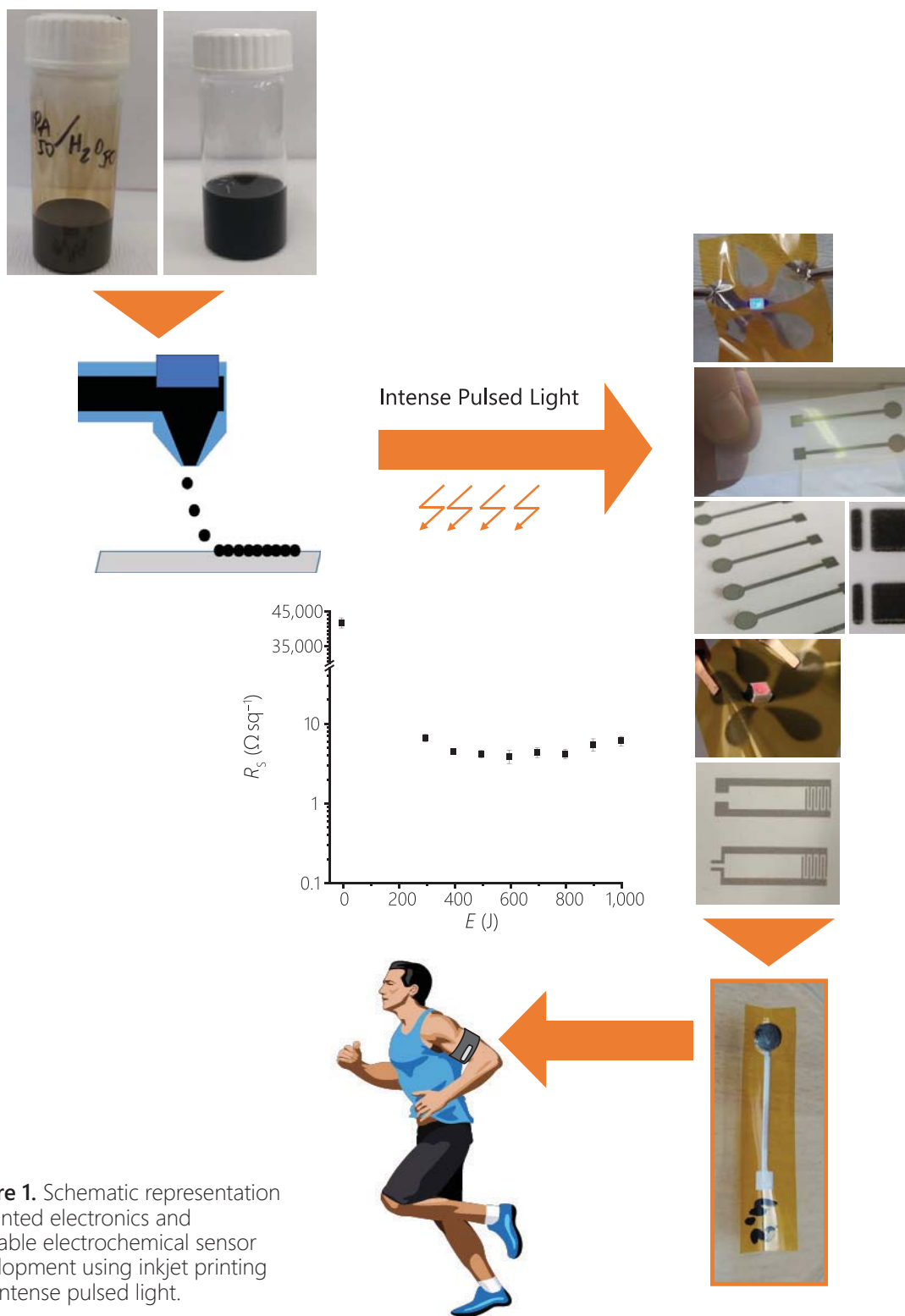


Figure 2. GID/XRR/SAXS device.



Name of the project	<b>Photonic Sintering for Inkjet Printed Electrochemical Sensors and Biosensors on Plastic Substrates</b>
Acronym	<b>PrintEChemSens</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Installation Research Projects (UIP-2020-02)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Funding	262,300.09 €
Funding UNIZG FCET	262,300.09 €
Duration	15 <sup>th</sup> December 2020 – 14 <sup>th</sup> December 2025
Leader (UNIZG FCET)	Assist. Prof. Petar Kassal, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Irena Ivanišević, Ph.D.</li> <li>• Sara Krivačić, mag. appl. chem.</li> <li>• Marko Zubak, mag. ing. cheming.</li> <li>• Ivana Čevič, mag. ing. oecoing.</li> </ul>
Abstract	<p>Widespread distribution of electrochemical (bio)sensors is needed to solve pressing global challenges in different areas, particularly healthcare and environmental protection. The main goal of the project is to use inkjet printing to develop low-cost but robust electrochemical sensors on plastic substrates for the detection of important analytes in wearable sweat sensing (electrolytes) and environmental protection (drugs and pesticides).</p> <p>The project encompasses synthesis of conductive inks based on metallic and carbon nanoparticles and inkjet printing of ion-selective electrodes and amperometric biosensors.</p>
Key words	electrochemical sensors, biosensors, inkjet sensors, printed electronics, photonic sintering, wearable sensors, microfluidics, lab-on-a-chip
Web page	<a href="https://www.fkit.unizg.hr/PrintEChemSens">https://www.fkit.unizg.hr/PrintEChemSens</a>





**Figure 1.** Schematic representation of printed electronics and wearable electrochemical sensor development using inkjet printing and intense pulsed light.

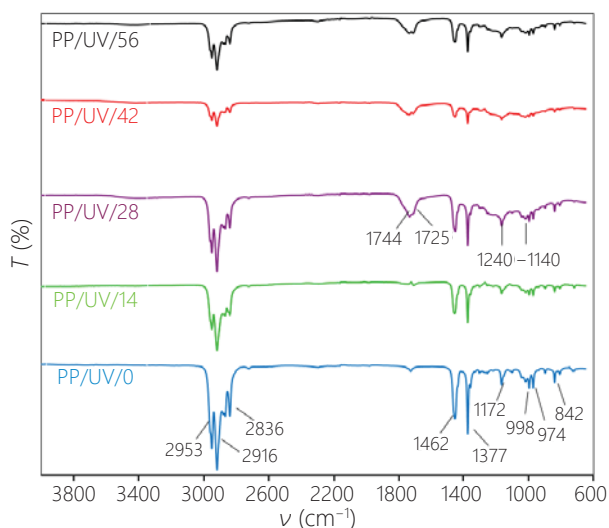
Name of the project	<b>Microplastics in Water; Fate and Behavior and Removal</b>
Acronym	<b>ReMiCRO</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Research Projects (IP-2020-02)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Cincinnati (USA)</li> <li>• The Institute of Analytical Sciences and Physico-Chemistry for Environment and Materials (France)</li> <li>• University of Pau (France)</li> <li>• North Dakota State University (USA)</li> </ul>
Funding	149,339.70 €
Funding UNIZG FCET	149,339.70 €
Duration	15 <sup>th</sup> December 2020 – 14 <sup>th</sup> December 2024
Leader (UNIZG FCET)	Prof. Ana Lončarić Božić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Zlata Hrnjak-Murgić, Ph.D.</li> <li>• Prof. Hrvoje Kušić, Ph.D.</li> <li>• Assist. Prof. Zvonimir Katančić, Ph.D.</li> <li>• Assist. Prof. Marin Kovačić, Ph.D.</li> <li>• Josipa Papac Zjačić, mag. ing. oecoling.</li> <li>• Stefani Tonković, mag. ing. oecoling.</li> <li>• Anamarija Pulitika, mag. chem.</li> </ul>
Abstract	<p>Although not much is known about the impact of microplastics (MPs) on the environment and health, there is growing concern about their long-term and widespread presence in the environment, their inability to be removed, and their transfer within the food chain.</p> <p>This project contributes to a fundamental understanding of MPs fate and behaviour in aquatic systems.</p> <p>The project applies a combined experimental and computational approach to explain the interactions and establish correlations between MPs of different types, sizes and surface properties and different co-pollutants in the water matrix that affect the fate and behaviour as well as the efficiency of the treatment process.</p>
Key words	microplastics, contaminants of emerging concern, fate and behaviour, water treatment, ferrates, DFT, QSP/AR
Web page	<a href="https://www.fkit.unizg.hr/ReMiCRO">https://www.fkit.unizg.hr/ReMiCRO</a>



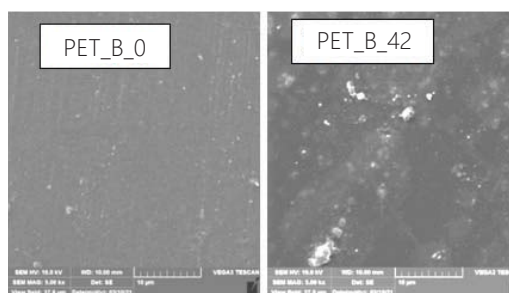
**Figure 1.** Cryogenic ball mill for the preparation of unaged and aged plastic samples.



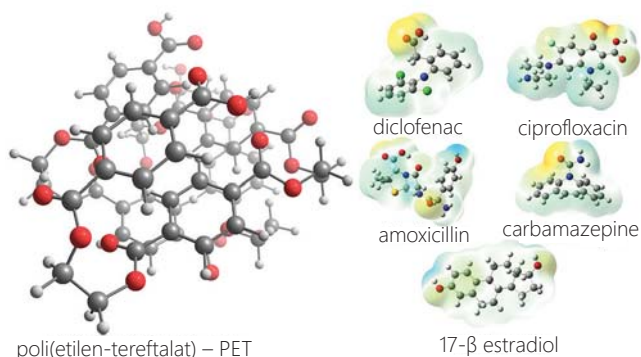
**Figure 2.** Laboratory air jet sieve for separating size fractions of MPs.



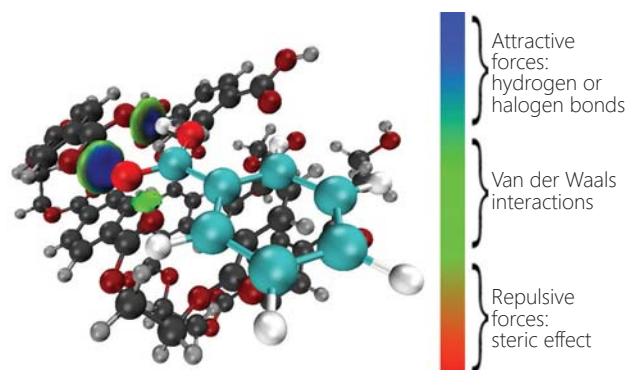
**Figure 3.** FTIR spectra of polypropylene samples (PP); pristine (0 days), aged (14, 28, 42 days).



**Figure 4.** SEM micrographs of poly(ethylene terephthalate) samples (PET); pristine (0 days), aged (42 days).



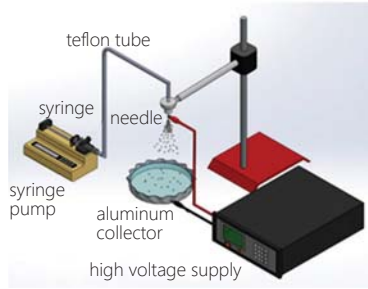
**Figure 5.** Structures of PET and pharmaceuticals optimized by the density functional theory (DFT) method.



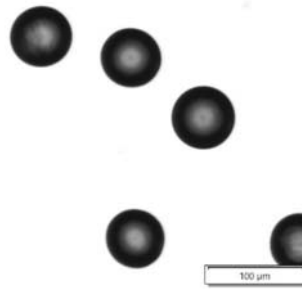
**Figure 6.** Analysis of weak interactions between PET and benzoic acid using the independent gradient model (IGM).

Name of the project	<b>Smart Drug Delivery Systems in Bone Tumour Treatment</b>
Acronym	<b>SmartCar</b>
The name of the programme and funding agency	<i>Croatian Science Foundation Installation Research Projects (UIP-2020-02)</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	University of Zagreb Faculty of Mechanical Engineering and Naval Architecture (Croatia)
Funding	243,767.47 €
Funding UNIZG FCET	243,767.47 €
Duration	1 <sup>st</sup> April 2021 – 31 <sup>st</sup> March 2026
Leader (UNIZG FCET)	Assist. Prof. Anamarija Rogina, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Andrea Lončarević, mag. ing. cheming.</li> <li>• Leonard Bauer, Ph.D.</li> <li>• Antonia Ressler, Ph.D.</li> <li>• Luka Dornjak, mag. chem.</li> </ul>
Abstract	<p>The extensive development of materials as potential drug delivery systems has emerged from the need for less invasive treatment of malignant diseases. The new strategy for improved treatment is targeted delivery of lower drug dosage without affecting the whole body.</p> <p>This project proposes the development of smart antitumor drug carriers, while the investigation focuses on</p> <ol style="list-style-type: none"> <li>1) smart drug delivery systems as microspheres suitable for injection;</li> <li>2) highly porous scaffolds as drug and therapeutic carriers for tissue regeneration;</li> <li>3) materials modification by calcium phosphates to enhance the antitumor efficiency;</li> <li>4) <i>in vitro</i> biological validation of prepared materials on healthy and tumour cells.</li> </ol>
Key words	drug delivery carriers, hydrogel, therapeutic ions, antitumor activity
Web page	<a href="https://www.fkit.unizg.hr/SmartCar">https://www.fkit.unizg.hr/SmartCar</a>

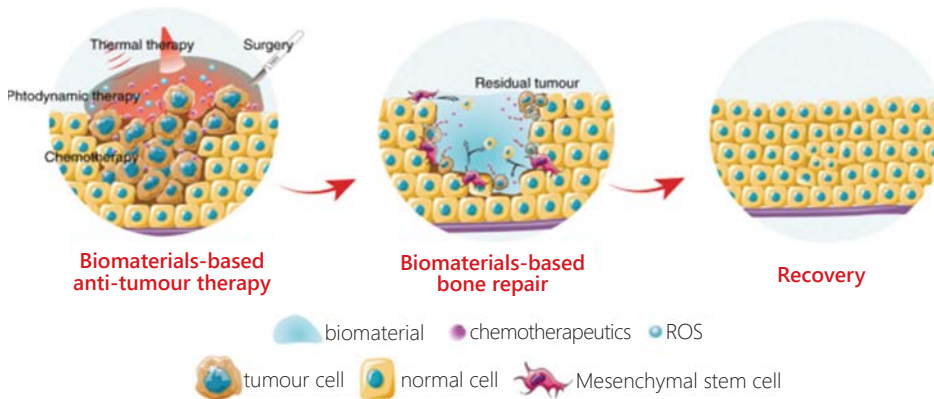
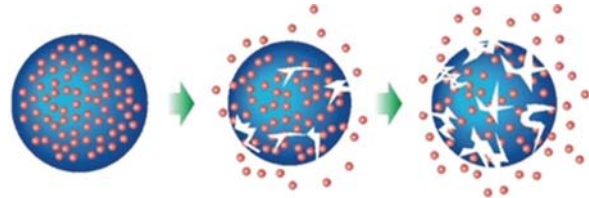
**Figure 1.**  
A schematic illustration of the electrospaying process for the preparation of drug microcarriers.



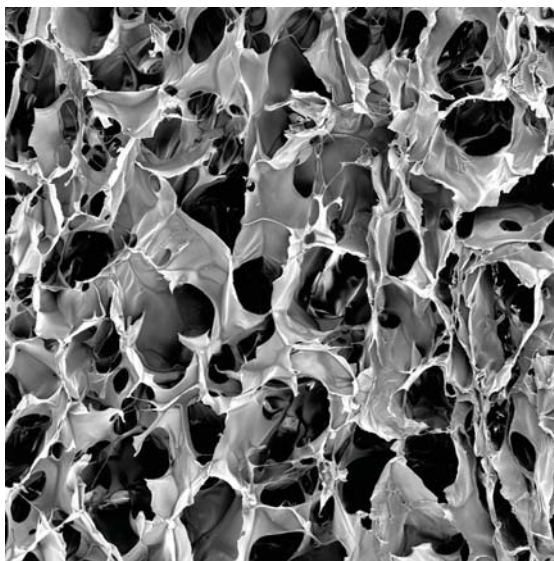
**Figure 2.**  
Electrosprayed biodegradable microspheres.



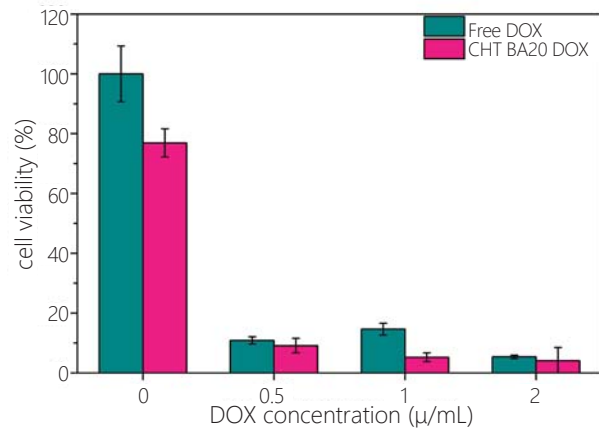
**Figure 3.** Drug release from microspheres induced by dissolution and degradation.



**Figure 4.** A schematic illustration of the treatment of bone defect after tumour resection by applying a biodegradable scaffold.



**Figure 5.** Highly porous biodegradable scaffold for bone regeneration and drug delivery.

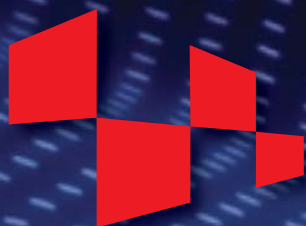


**Figure 6.** The viability of osteosarcoma cells after treatment with DOX-loaded biodegradable scaffold.





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# European Social Fund and Croatian Science Foundation PROJECTS





Name of the project	<b>Photovoltaic-Geopolymer Facade: the Role of Water and Oxygen in the Advanced Assembly of Composite Material Films</b>
Acronym	<b>PV-WALL</b>
The name of the programme and funding agency	<i>Programme Research Projects, Croatian Science Foundation and European Research Fund</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• Technical University of Darmstadt (Germany)</li> <li>• Ruđer Bošković Institute (Croatia)</li> </ul>
Funding	291,921.83 €
Funding UNIZG FCET	291,921.83 €
Duration	1 <sup>st</sup> October 2019 – 31 <sup>st</sup> May 2023
Leader (UNIZG FCET)	Assoc. Prof. Vilko Mandić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Stanislav Kurajica, Ph.D.</li> <li>• Prof. Juraj Šipušić, Ph.D.</li> <li>• Assist. Prof. Dragana Vuk, Ph.D.</li> <li>• Ivana Panžić, Ph.D.</li> <li>• Marko Rukavina, mag. appl. chem.</li> <li>• Filip Brleković, mag. ing. cheming.</li> </ul>
Abstract	<p>The project aims to use geopolymer paste in a conductive and/or transparent configuration, similar to transparent conductive oxide materials, to explore the possibility of applying such materials in solar cells. Another goal is to expand existing knowledge on connecting nanostructured transparent conductive layers and charge transport layers.</p> <p>The objective is to enable a better understanding of the stability of these layers for the preparation of various elements of solar cells, such as various heterojunctions, hybrid organic multi-phase heterojunctions, photoactive perovskites, and similar structures.</p>
Key words	photovoltaic-geopolymer composite, smart facade, transparent conductive oxide, charge transport materials, energy harvesting management.
Web page	<a href="http://www.fkit.unizg.hr/PV-WALL">www.fkit.unizg.hr/PV-WALL</a>

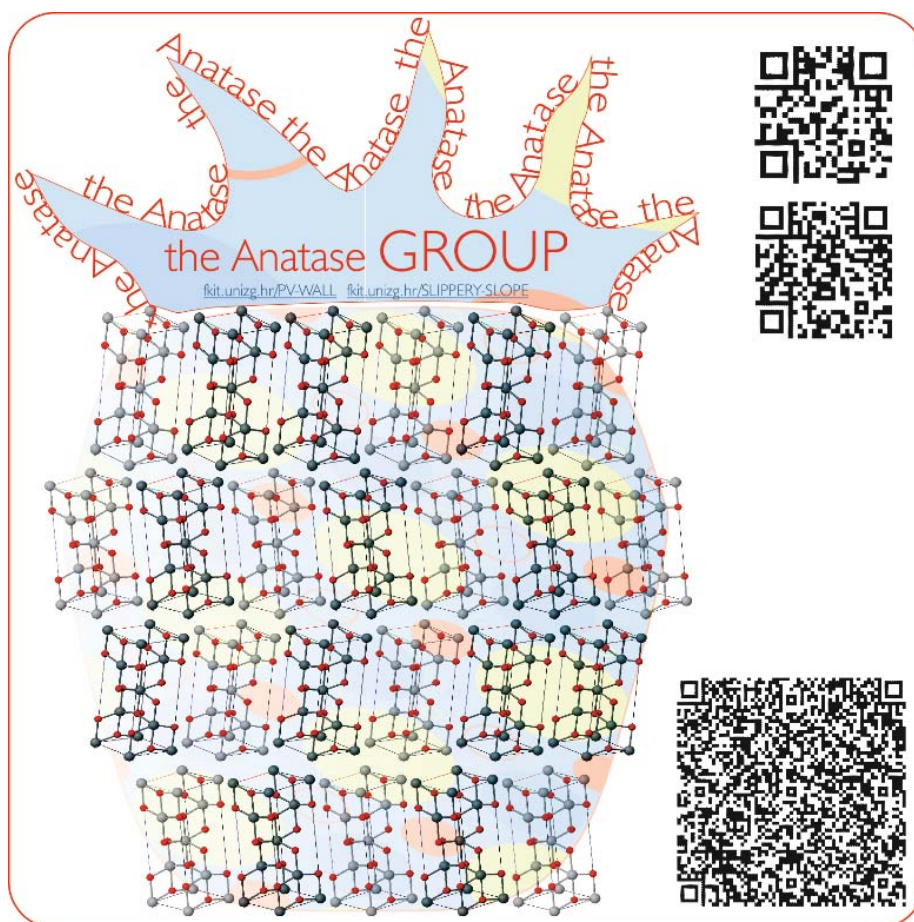


Figure 1. Logo of the Assoc. Prof. Vilko Mandić's research group.

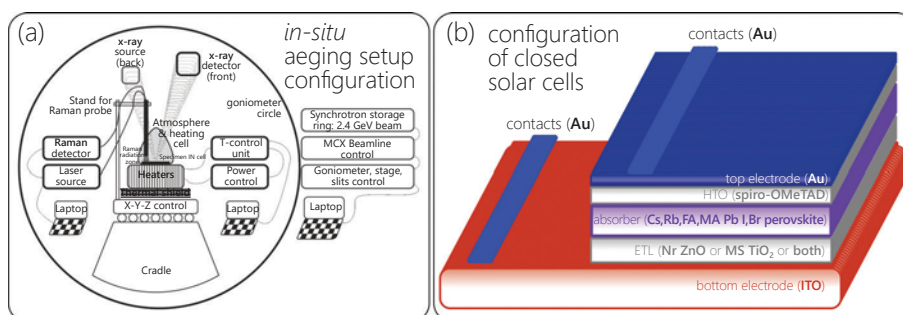


Figure 2. a) Scheme of the synchrotron *in-situ* characterisation; b) an example of the perovskite solar cell configuration.





**EUROPEAN STRUCTURAL  
AND INVESTMENT FUNDS**

**European Structural  
and Investment Funds  
PROJECTS**





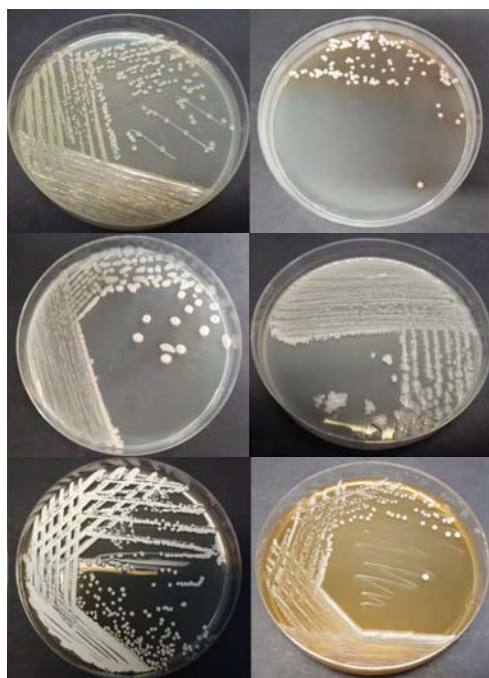


Name of the project	<b>Development of Tehnix Plant for Bioreactor Composting of Biodegradable Municipal Waste</b>
Code	<b>KK.01.2.1.01.0076</b>
The name of the programme and funding agency	<i>European Structural and Investment funds, Strengthening the economy by applying research and innovation, Call reference number KK.01.2.1.01</i>
Coordinator	<i>Tehnix d.o.o. (Croatia)</i>
Partner	University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)
Funding	2,721,016.84 €
Funding UNIZG FCET	73,787.00 €
Duration	1 <sup>st</sup> March 2018 – 28 <sup>th</sup> February 2021
Leader (UNIZG FCET)	Prof. Bruno Zelić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Marija Vuković Domanovac, Ph.D.</li> <li>• Assist. Prof. Anita Šalić, Ph.D.</li> <li>• Assist. Prof. Martina Sudar, Ph.D.</li> <li>• Assoc. Prof. Dajana Kučić Grgić, Ph.D.</li> <li>• Monika Šabić Runjavec, Ph.D.</li> <li>• Tea Sokač, mag. ing. oecoing.</li> </ul>
Abstract	<p>The objectives of the project were to increase competitiveness, modernize and diversify the Croatian economy and strengthen the research and innovation capacity of Tehnix.</p> <p>The specific objective of the project was to develop the composting process for biodegradable municipal waste, using different composting processes: a composting process without bioaugmentation and a process with bioaugmentation, <i>i.e.</i>, with the addition of microorganisms isolated during the composting process itself.</p> <p>By creating a mathematical model of the composting process and based on the results of the process simulation, it was possible to optimize the process conditions.</p>
Key words	biodegradable municipal waste, bioreactor composting
Web page	<a href="https://tehnix.hr/zavrsetak-projekta-razvoj-tehnix-pogona-za-bioreaktorsko-kompostiranje-biorazgradivog-komunalnog-otpada">https://tehnix.hr/zavrsetak-projekta-razvoj-tehnix-pogona-za-bioreaktorsko-kompostiranje-biorazgradivog-komunalnog-otpada</a>

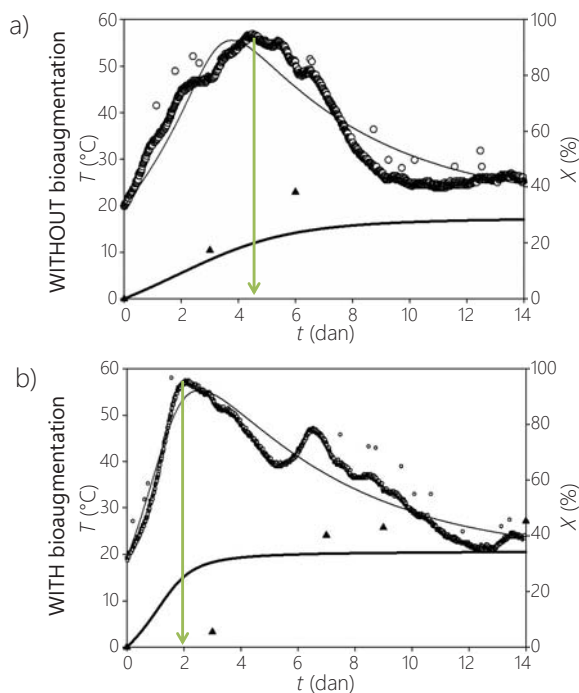


**Figure 1.** a) Laboratory bioreactor for composting biowaste and b) schematic representation of the laboratory system for composting biowaste.

**Figure 2.** Biowaste a) before and b) after composting.



**Figure 3.** Microorganisms isolated from the compost material during the composting process.



**Figure 4.** Comparison of the composting process without and with bioaugmentation using the example of the change in a) temperature and b) conversion (symbols – experimental results; lines – simulation of the mathematical model).

Name of the project	<b>Master Study Program in English „Chemical and Environmental Technology“</b>
Acronym   Code	<b>CET   UP.03.1.1.02.0001</b>
The name of the programme and funding agency	<i>European Structural and Investment Funds: Internationalization of Higher Education</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partner	University of Split Faculty of Chemical Technology (Croatia)
Funding	238,870.26 €
Funding UNIZG FCET	119,435.00 €
Duration	12 <sup>th</sup> October 2018 – 12 <sup>th</sup> October 2021
Leader (UNIZG FCET)	Prof. Hrvoje Kušić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Tatjana Gazivoda Kraljević, Ph.D.</li> <li>• Prof. Tomislav Bolanča, Ph.D.</li> <li>• Prof. Ante Jukić, Ph.D.</li> <li>• Prof. Marko Rogošić, Ph.D.</li> <li>• Prof. Ivana Steinberg, Ph.D.</li> <li>• Prof. Zvezdana Findrik Blažević, Ph.D.</li> </ul>
Abstract	<p>There are no graduate level programs in English, in Republic of Croatia, for educating experts for work in chemical and related industries, with knowledge in the field of environmental engineering, based on principles of sustainability, circular economy, and current climate challenges.</p> <p>The aim of the project is development of master study program on English based on the learning outcomes and in line with the labor market needs focusing on the education of undergraduate students from Croatia and abroad, who will acquire knowledge, skills and competence for working in an international environment.</p>
Key words	new study, English language, master study
Web page	<a href="https://www.fkit.unizg.hr/en/curricula/graduate_study_CET">https://www.fkit.unizg.hr/en/curricula/graduate_study_CET</a>



International Graduate Study  
**CHEMICAL AND  
ENVIRONMENTAL TECHNOLOGY**



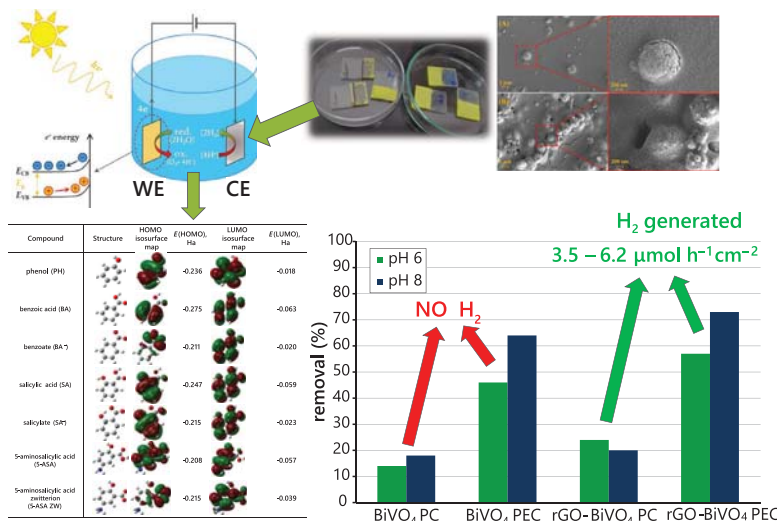
University of Zagreb  
Faculty of Chemical Engineering and Technology  
University of Split  
Faculty of Chemistry and Technology



Project was financed by European Union from European social fund.

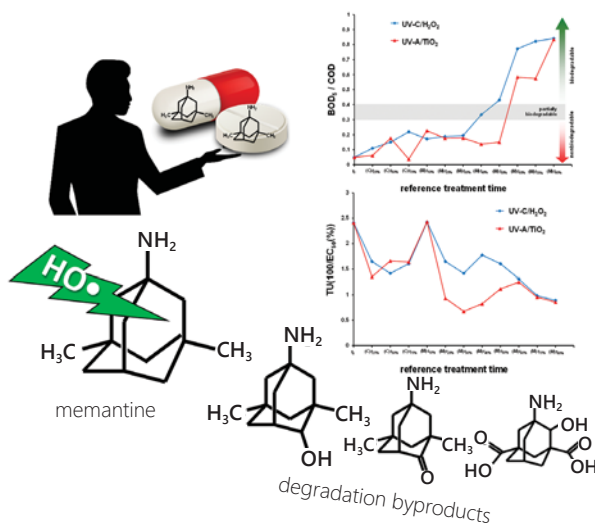


Name of the project	<b>Water Purification and Energy Conversion using Novel Composite Materials and Solar Irradiation</b>
Code	<b>KK.01.1.1.04.0001</b>
The name of the programme and funding agency	<i>European Structural and Investment Funds: Investments in Research and Innovation</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partner	Karlovac University for Applied Sciences (Croatia)
Funding	960,318.07 €
Funding UNIZG FCET	386,180.00 €
Duration	1 <sup>st</sup> December 2019 – 19 <sup>th</sup> May 2023
Leader (UNIZG FCET)	Prof. Hrvoje Kušić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Ana Lončarić Božić, Ph.D.</li> <li>• Prof. Tomislav Bolanča, Ph.D.</li> <li>• Prof. Marijana Kraljić Roković, Ph.D.</li> <li>• Assist. Prof. Matija Cvetnić, Ph.D.</li> <li>• Josipa Papac, mag. ing. oecoing.</li> </ul>
Abstract	<p>The aim of the project is development, application and evaluation of innovative system for water purification and hydrogen evolution employing novel composite materials and solar irradiation.</p> <p>The need for clean water and energy along with the waste valorization was considered by developing innovative system. In that purpose, a novel composite materials, based on semiconductors and graphene-oxide obtained from biomass pyrolysis, active under solar irradiation were developed. Design of reactor system enables efficient hydrogen separation generated during water purification.</p> <p>The project contributes to strengthening of development capacities for the industry enabling also transfer of knowledge and technology.</p>
Key words	novel composite materials, innovative system for water purification and energy conversion, hydrogen separation, semiconducting materials, graphene-oxide
Web page	<a href="https://www.fkit.unizg.hr/PVDEKM">https://www.fkit.unizg.hr/PVDEKM</a>

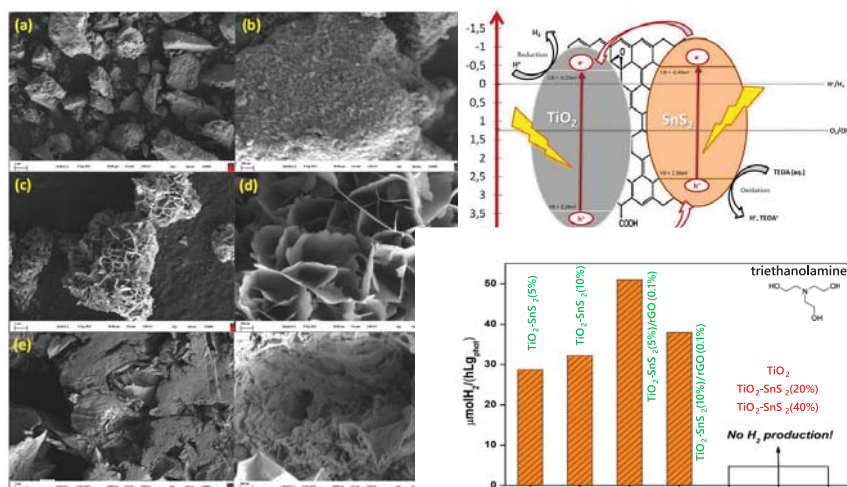


**Figure 1.** Photocatalytic and photo-electrochemical degradation of aromatics along with hydrogen evolution by RGO/BiVO<sub>4</sub> photocatalyst under solar irradiation.

**Figure 2.** Degradation of pharmaceutical memantine by advanced oxidation/reduction processes and correlation of formed intermediates with changes in the toxicity.



**Figure 3.** Photocatalytic water splitting aiming at hydrogen evolution employing TiO<sub>2</sub>/SnS<sub>2</sub>/RGO under solar irradiation.



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EUROPEAN STRUCTURAL  
AND INVESTMENT FUNDS

Name of the project	<b>Bioconversion of Lignocellulosic Material into High-Value Animal Feed</b>
Acronym   Code	<b>Bio4Feed   KK.01.1.1.04.0107</b>
The name of the programme and funding agency	<i>Operational programme Competitiveness and Cohesion, Investment in Science and Innovations</i>
Coordinator	<i>Josip Juraj Strossmayer University of Osijek Faculty of Food Technology Osijek (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</li> <li>• Josip Juraj Strossmayer University of Osijek Faculty of Agrobiotechnical Sciences Osijek (Croatia)</li> </ul>
Funding	1,142,045.83 €
Funding UNIZG FCET	3,554.00 €
Duration	20 <sup>th</sup> December 2019 – 19 <sup>th</sup> December 2022
Leader (UNIZG FCET)	Prof. Bruno Zelić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Assist. Prof. Anita Šalić, Ph.D.</li> </ul>
Abstract	<p>The purpose of the project is the valorization of lignocellulosic materials (waste and/or byproducts originating from the food industry and agriculture) with the aim of producing high-value, nutritionally enriched animal feed. As part of this project, the bioconversion of selected lignocellulosic materials (hay, haylage, corn stalks, fresh beet noodles, corn silage, barley and malt meal, etc.) with different types of white rot fungi will be carried out. The goal of bioconversion is the removal and decomposition of lignin by the action of certain lignolytic and hydrolytic enzymes resulting in the release of useful phenolic compounds, which in the lignocellulosic material are bound in complexes with fibers, proteins and polysaccharides, increasing the digestibility of processed lignocellulosic materials, increasing the amount of protein and improving the amino acid protein composition. The material, processed in the proposed way, represents a nutritionally improved feed for animals.</p>
Key words	quadriplex model, lignocellulosic materials, high-value animal feed
Web page	<a href="http://www.ptfos.unios.hr/Bio4Feed">http://www.ptfos.unios.hr/Bio4Feed</a>

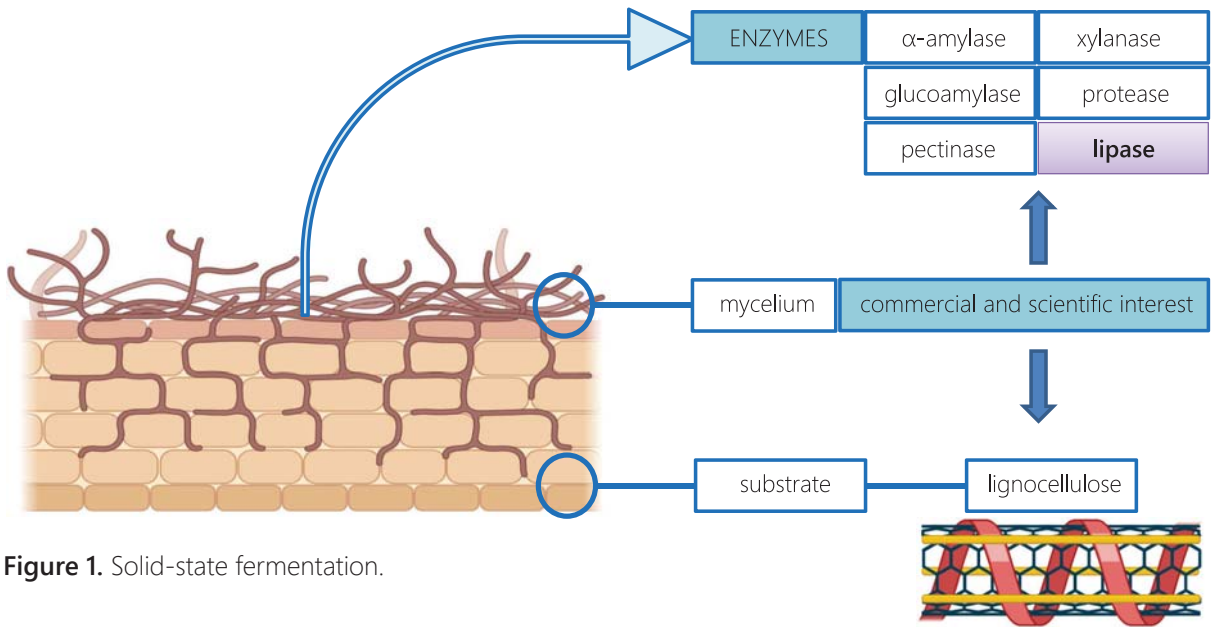


Figure 1. Solid-state fermentation.

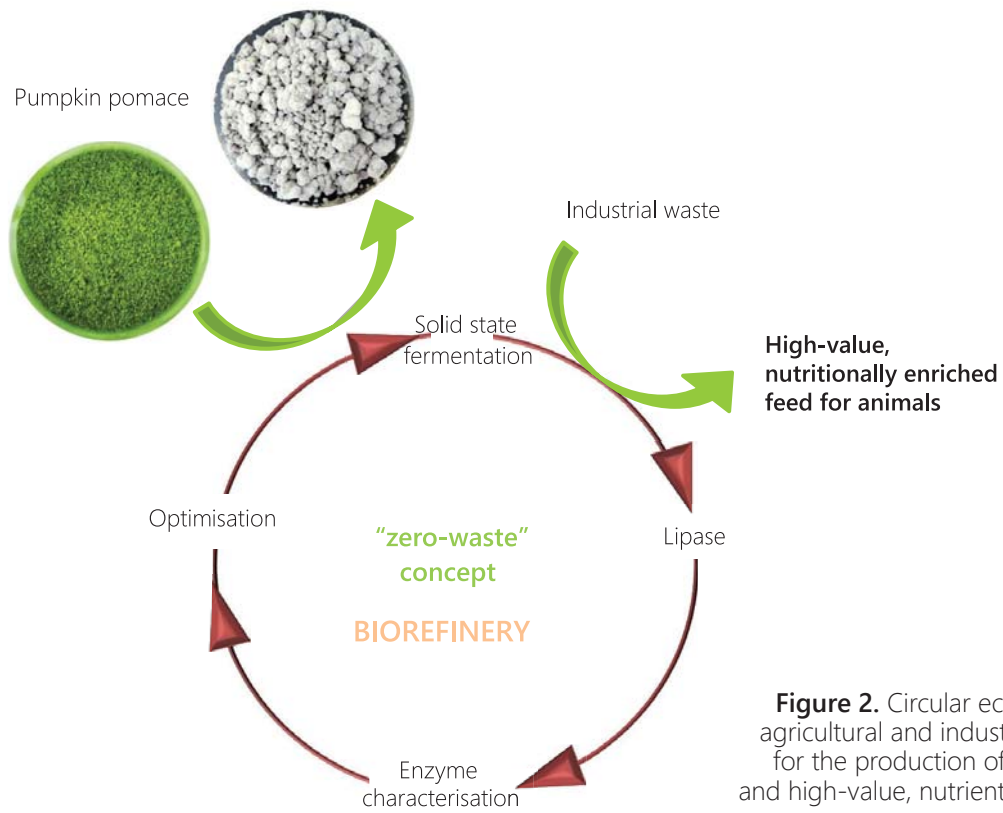


Figure 2. Circular economy of agricultural and industrial waste for the production of enzymes and high-value, nutrient-enriched animal feed.

Name of the project	<b>Development of Innovative Primers from Waste Emulsion</b>
Code	<b>KK.01.2.1.02.0190</b>
The name of the programme and funding agency	<i>Operational Program Competitiveness and Cohesion 2014–2020 Increasing the development of new products and services resulting from research and development activities</i>
Coordinator	<i>Rijekatank d.o.o. (Croatia)</i>
Partner	University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)
Funding	1,509,732.28 €
Funding UNIZG FCET	173,074.00 €
Duration	1 <sup>st</sup> March 2020 – 1 <sup>st</sup> March 2023
Leader (UNIZG FCET)	Prof. Ante Jukić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Assoc. Prof. Fabio Faraguna, Ph.D.</li> <li>• Prof. Elvira Vidović, Ph.D.</li> <li>• Roko Blažić, mag. ing. cheming.</li> <li>• Prof. Mirela Leskovac, Ph.D.</li> <li>• Prof. Sanja Lučić Blagojević, Ph.D.</li> <li>• Marko Babić, mag. appl. chem.</li> <li>• Petra Ačkar, mag. ing. cheming.</li> </ul>
Abstract	<p>The company Rijekatank provides cleaning services during maintenance of facilities for the processing, transportation and storage of liquid hydrocarbons such as crude oil and its derivatives. Based on the research, the company concluded that waste emulsion could be used as a substitute for bitumen emulsion, a suitable "primer" for road construction. Additionally, properties of the waste emulsion can be significantly improved by adding polymers. This will reduce waste disposal costs as well as harmful impact on the environment. The general goal of the project is to carry out research regarding waste emulsion utilization and new product development, thereby increasing income and becoming a leader in the national production of innovative emulsions. The specific goal is to establish a pilot plant for the use and treatment of waste emulsion for production of the road construction primer for global market, based on the performed research.</p>
Key words	waste emulsion, innovative primer, environmentally sustainable and circular products, ecodesign
Web page	<a href="https://www.fkit.unizg.hr/RIPiOE">https://www.fkit.unizg.hr/RIPiOE</a> <a href="https://rijekatank.hr/razvoj-inovativnih-primera-iz-otpadne-emulzije">https://rijekatank.hr/razvoj-inovativnih-primera-iz-otpadne-emulzije</a>





Figure 1. Use of bitumen primer in road construction.

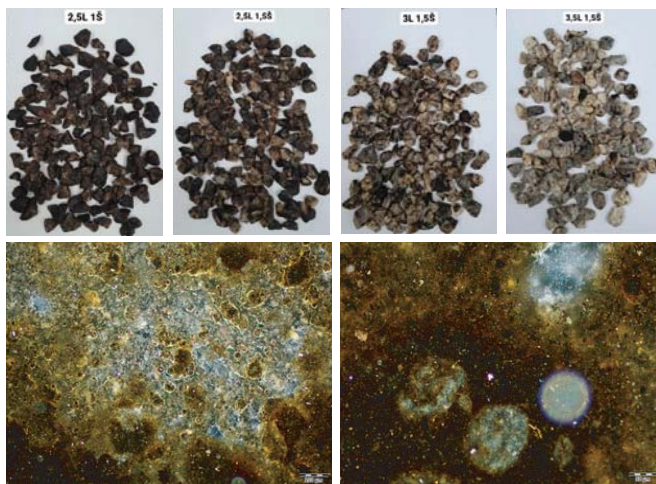


Figure 2. Adhesion of emulsion on mineral aggregate and microphotographs of emulsion stability.

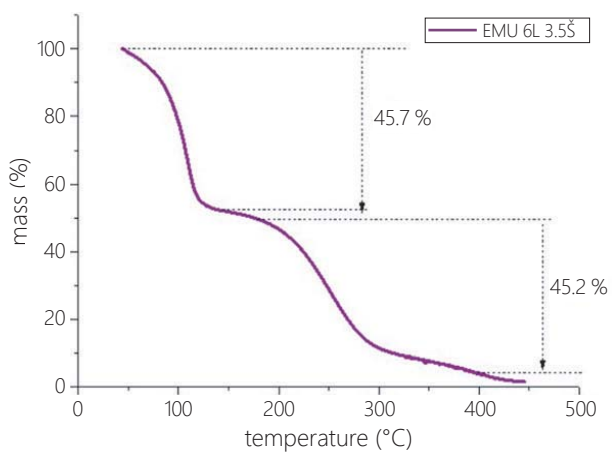
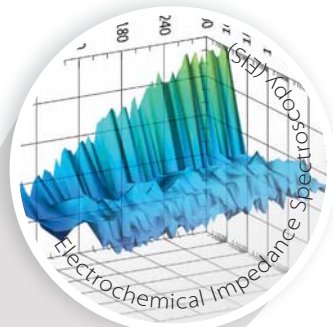
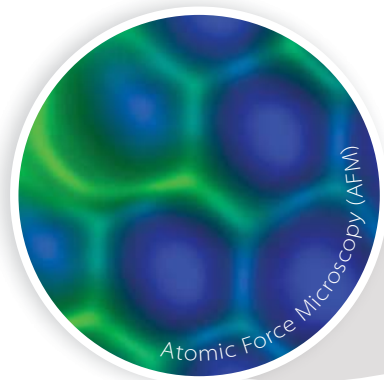


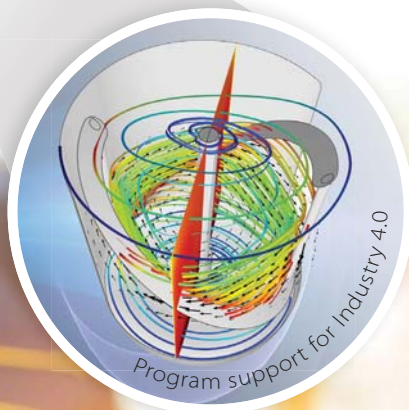
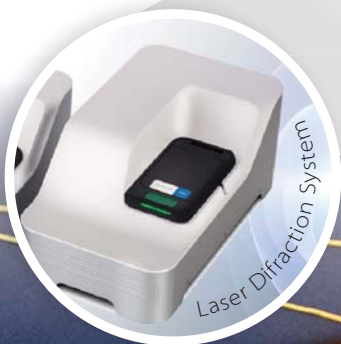
Figure 3. Thermal stability of emulsion.

Name of the project	<b>CeSaR at Faculty of Chemical Engineering and Technology</b>	
Acronym   Code	<b>CeSaR   UP.03.1.1.04.0026</b>	
The name of the programme and funding agency	<i>European Social Fund: Development, improvement and implementation of professional practice in higher education</i>	
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>	
Funding	488,869.81 €	
Funding UNIZG FCET	488,869.81 €	
Duration	9 <sup>th</sup> March 2020 – 9 <sup>th</sup> March 2023	
Leader (UNIZG FCET)	Prof. Ante Jukić, Ph.D.	
Co-workers (UNIZG FCET)	<p>Expert working group</p> <ul style="list-style-type: none"> <li>• Ante Jukić</li> <li>• Tatjana Gazivoda Kraljević</li> <li>• Hrvoje Kušić</li> <li>• Tomislav Bolanča</li> <li>• Šime Ukić</li> <li>• Marko Rogošić</li> <li>• Vesna Gabelica Marković (Robertina Keranović)</li> <li>• Kristina Sušac (Karla Plenča)</li> </ul> <p>Administrative personnel:</p> <ul style="list-style-type: none"> <li>• Nataša Štefok</li> <li>• Tihana Popović</li> <li>• Stela Markotić (Anita Nikolić Bukvić)</li> <li>• Igor Horaček</li> <li>• Višnja Pavić</li> <li>• Petra Kurajica</li> </ul>	<p>Training grounds</p> <ol style="list-style-type: none"> <li>1. <ul style="list-style-type: none"> <li>• Nenad Bolf (leader)</li> <li>• Hrvoje Dorić (Srečko Herceg)</li> <li>• Nikola Rimac</li> </ul> </li> <li>2. <ul style="list-style-type: none"> <li>• Fabio Faraguna (leader)</li> <li>• Marin Kovačić</li> <li>• Marko Racar (Roko Blažić)</li> </ul> </li> <li>3. <ul style="list-style-type: none"> <li>• Marijana Kraljić Roković (leader)</li> <li>• Jozefina Katić</li> <li>• Vedran Petrić (Ivana Šoić)</li> </ul> </li> <li>4. <ul style="list-style-type: none"> <li>• Stanislav Kurajica (leader)</li> <li>• Vilko Mandić</li> <li>• Katarina Mužina (Floren Radovanović-Perić)</li> </ul> </li> </ol>
Abstract	<p>The aim of the project is to improve the practical and soft skills of students, and to strengthen cooperation between the Faculty of Chemical Engineering and Technology with employers by establishing a Consulting and Development of the Student's Career Centre (CeSaR).</p> <p>Through the scope of the project, a new course Professional Practice at graduate studies was introduced and new training laboratories with modern equipment for undergraduate and graduate studies were established.</p>	
Key words	Consulting and Development of the Student's Career Centre, professional practice, training laboratories, modern equipment	
Web page	<a href="https://www.cesar-fkit.eu">https://www.cesar-fkit.eu</a>	



# CeSaR

Training grounds for students



## CeSaR

Consulting and Development of the Student's Career Centre



Project was financed by European Union from European social fund.

Name of the project	<b>Development of Submerged Aggregate for Low-Head Small Hydropower Plants</b>
Code	<b>KK.011.1.02.0017</b>
The name of the programme and funding agency	<i>Operational Program Competitiveness and Cohesion 2014–2020 Increasing the development of new products and services resulting from research and development activities</i>
Coordinator	<i>Končar – Generators and Motors Inc. (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</li> <li>• University of Zagreb Faculty of Electrical Engineering and Computing (Croatia)</li> <li>• Inpirio d.o.o. (Croatia)</li> </ul>
Funding	4,892,171.14 €
Funding UNIZG FCET	215,213.00 €
Duration	1 <sup>st</sup> August 2020 – 31 <sup>st</sup> July 2023
Leader (UNIZG FCET)	Prof. Ante Jukić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Assoc. Prof. Fabio Faraguna, Ph.D.</li> <li>• Prof. Elvira Vidović, Ph.D.</li> <li>• Prof. Vladimir Dananić, Ph.D.</li> <li>• Prof. Zoran Mandić, Ph.D. / Assist. Prof. Jozefina Katić, Ph.D.</li> <li>• Marko Racar, Ph.D. / Rafael Anelić, mag. ing. cheming.</li> <li>• Kristina Šušac, mag. ing. cheming.</li> <li>• Andrea Špoljarić, mag. ing. cheming.</li> <li>• Marko Jagetić, technical associate</li> </ul>
Abstract	In the scope of the project a new high-tech solutions in the use of hydropower for electricity production were developed and applied – nanostructured insulating materials (increased thermal conductivity with preserved breaking voltage and volume resistivity), environmentally friendly permanent magnets, green lubricants, measuring coils in the detection of malfunctions and permanent remote monitoring. These integrated advanced technologies do not exist on the global market.
Key words	small hydropower plants, nanotechnology, advanced solutions, integration
Web page	<a href="https://www.fkit.unizg.hr/RPAmHnpv">https://www.fkit.unizg.hr/RPAmHnpv</a>



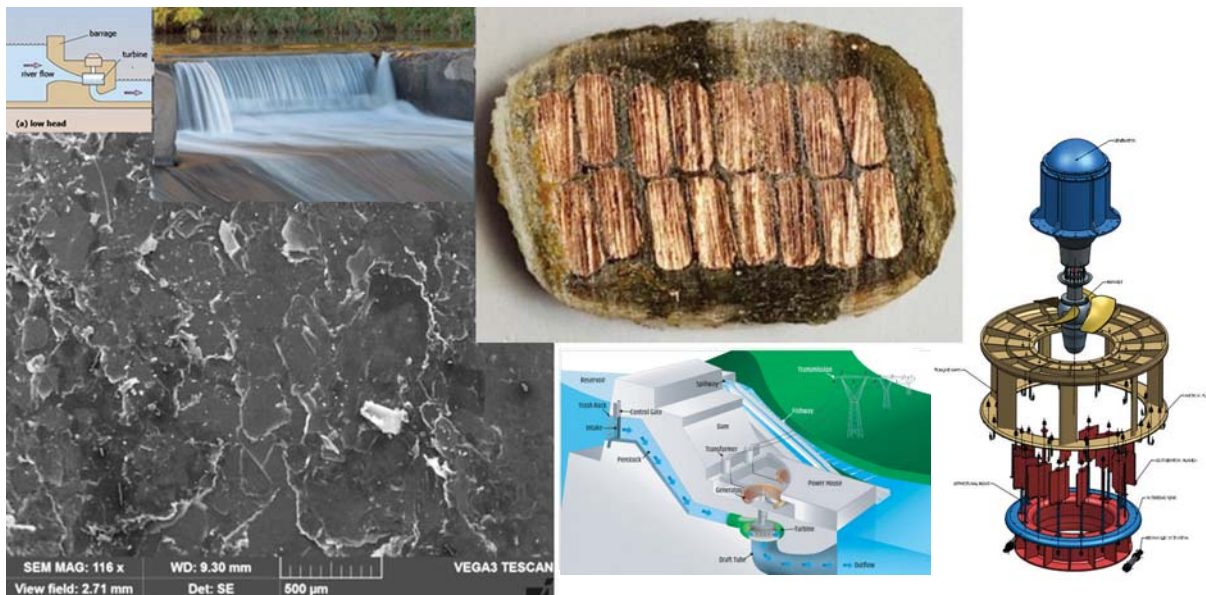


Figure 1. Nanostructured electrical insulation in electricity production.

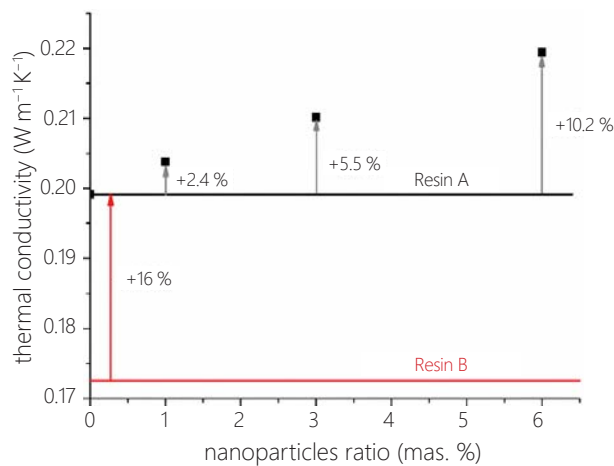


Figure 2. Thermal conductivity of nanocomposite material.

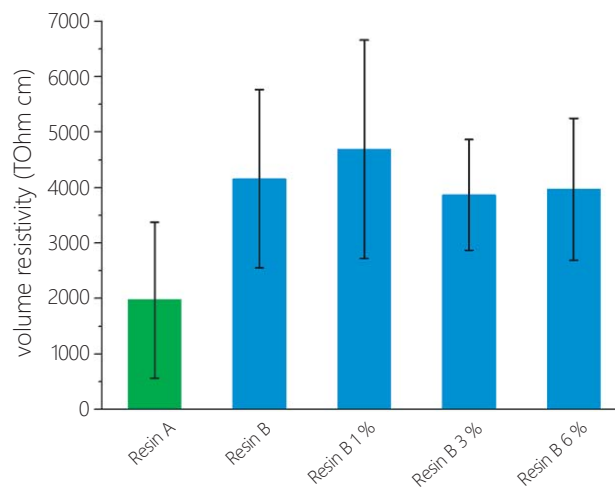


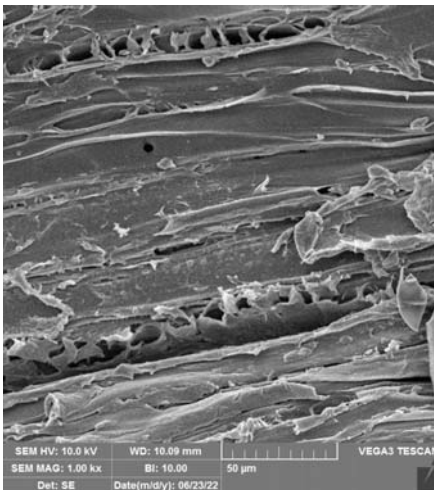
Figure 3. Electrical volume resistivity of nanocomposite material.



Name of the project	<b>Acoustic Incombustible Panel</b>
Code	<b>KK.011.1.02.0299</b>
The name of the programme and funding agency	<i>Operational Program Competitiveness and Cohesion 2014–2020 Increasing the development of new products and services resulting from research and development activities</i>
Coordinator	<i>Fragmat H d.o.o. (Croatia)</i>
Partner	University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)
Funding	1,336,334.96 €
Funding UNIZG FCET	147,526.00 €
Duration	1 <sup>st</sup> October 2020 – 30 <sup>th</sup> September 2023
Leader (UNIZG FCET)	Prof. Juraj Šipušić, Ph.D.   Prof. Jelena Macan, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Jelena Macan, Ph.D.</li> <li>• Filip Brleković, mag. ing. cheming.</li> <li>• Matej Ercegović, mag. ing. cheming.</li> </ul>
Abstract	<p>“Acoustic incombustible panel” is an advanced and innovative technological solution based on wood, a fire-retardant additive and cement binder, which fulfils key demands concerning thermal and acoustic isolation as well as incombustibility. A new product belonging to the A2 class of incombustibility will find a wide application in construction and interior design.</p> <p>The result of this project will be a technological advancement compared to the current commercially available products for isolation, both considering its primary purpose (thermal and acoustic isolation) as well as safety and environmental factors.</p>
Key words	climate change, thermal and acoustic isolation, incombustibility, wood-cement composite
Web page	<a href="https://www.fkit.unizg.hr/ANP">https://www.fkit.unizg.hr/ANP</a> <a href="https://www.fragmat.hr/akusticna-negoriva-ploca">https://www.fragmat.hr/akusticna-negoriva-ploca</a>



**Figure 1.**  
Wood-cement composite panel.



**Figure 2.** SEM micrograph of wood wool used as the reinforcement in the acoustic incombustible panel.



**Figure 3.** Laboratory test of the fire-retardant additive for wood wool.

Name of the project	<b>Development of a Technical Solution for Energy Savings Using Visible Light-Transmitting or Semi-Transmitting and Infrared-Reflective Thin Layers</b>
Code	<b>KK.011.1.02.0316</b>
The name of the programme and funding agency	<i>Operational Program Competitiveness and Cohesion 2014–2020: Increasing the development of new products and services resulting from research and development activities</i>
Coordinator	<i>ITRS d.o.o. Integrirana tehničko energetska rješenja (Croatia)</i>
Partner	University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)
Funding	1,556,108.27 €
Funding UNIZG FCET	562,637.00 €
Duration	1 <sup>st</sup> September 2020 – 30 <sup>th</sup> September 2023
Leader (UNIZG FCET)	Assoc. Prof. Vilko Mandić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Stanislav Kurajica, Ph.D.</li> <li>• Prof. Juraj Šipušić, Ph.D.</li> <li>• Assoc. Prof. Fabio Faraguna, Ph.D.</li> <li>• Assist. Prof. Zvonimir Katančić, Ph.D.</li> <li>• Ivana Panžić, Ph.D.</li> <li>• Arijeta Bafti, mag. chem.</li> <li>• Floren Radovanović-Perić, mag. ing. cheming.</li> </ul>
Abstract	<p>This project aims to explore the possibilities of preparing a multifunctional, energy-efficient solar panel. The energy efficiency of the panel is based on the property of selective transmission and reflection of different parts of the electromagnetic spectrum, all to achieve the functionality of a thermal mirror.</p> <p>The goal is to design a multifunctional system in which the plastic substrate would be coated with an advanced multilayer coating of nanometre dimensions to achieve the desired properties.</p> <p>The objective is to test a production setup that requires integrating well-known technological processes with the most advanced methods of control and material application at the nanoscale, which still require extensive scientific research.</p> <p>The aim is to examine the feasibility of the proposed configuration and define acceptable technical, safety, and economically viable process conditions.</p>
Key words	solar panel, energy, nanotechnology, ablation
Web page	<a href="https://www.fkit.unizg.hr/RTRueVIS-ICrts">https://www.fkit.unizg.hr/RTRueVIS-ICrts</a>



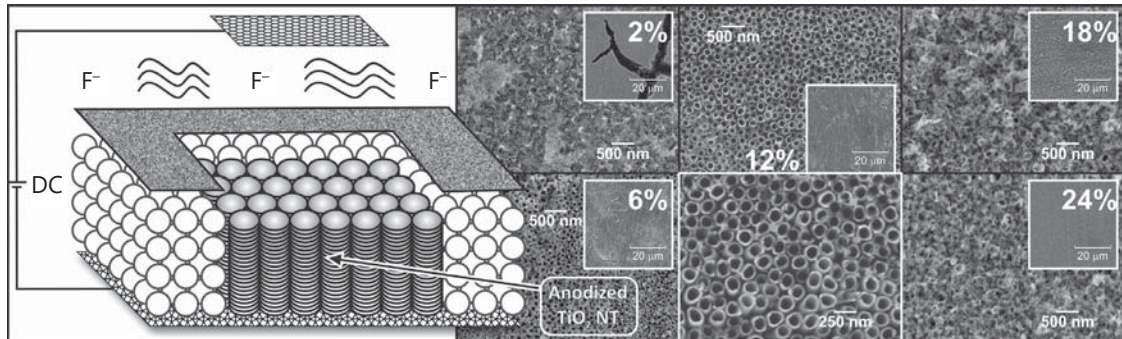


Figure 1. Scheme for one option of the nanostructuring.



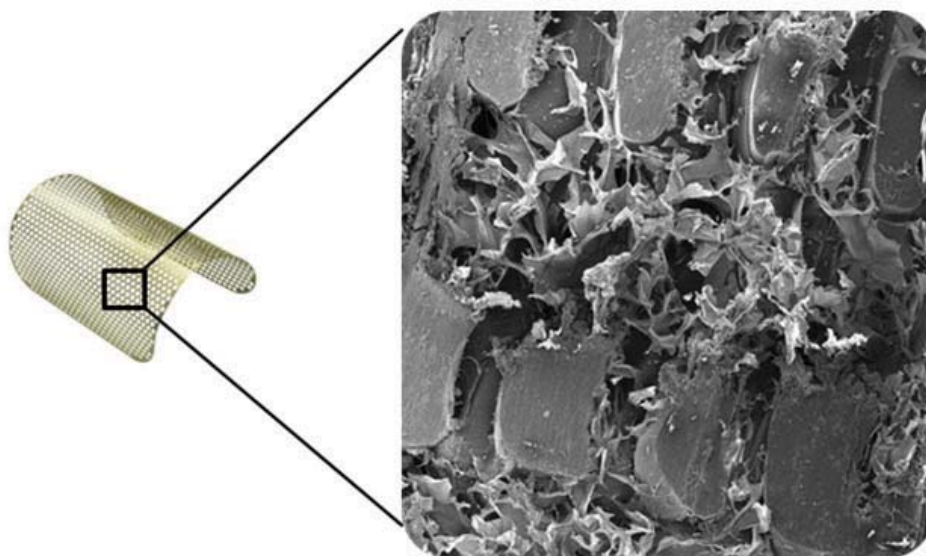
Figure 2. Thin film laboratory.

Name of the project	<b>Biodegradable 3D Printed Structures for Bone Augmentation</b>
Acronym   Code	<b>BIDEAS   KK.01.1.1.07.0014</b>
The name of the programme and funding agency	<i>Operational Programme Competitiveness and Cohesion 2014–2020 Increasing the development of new products and services resulting from research and development activities</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• Topomatika d.o.o. (Croatia)</li> <li>• IZIT d.o.o. (Croatia)</li> </ul>
Funding	963,577.79 €
Funding UNIZG FCET	734,201.00 €
Duration	15 <sup>th</sup> December 2020 – 15 <sup>th</sup> December 2023
Leader (UNIZG FCET)	Prof. Hrvoje Ivanković, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Assist. Prof. Anamarija Rogina, Ph.D.</li> <li>• Prof. Hrvoje Kušić, Ph.D.</li> <li>• Prof. Marica Ivanković, Ph.D.</li> <li>• Dajana Milovac Lerga, Ph.D.</li> </ul>
Abstract	<p>The aim of the BIDEAS project is the development of production technologies of biodegradable 3D structures as materials for bone augmentation, <i>i.e.</i>, as a support for dental implants. The concept will be confirmed by an innovative biodegradable 3D support for bone tissue augmentation in maxillofacial and periodontal surgery. The novelty of the proposed solution is also evident through the personalization of the implant.</p>
Key words	maxillofacial and periodontal surgery, implants, biodegradable 3D structures, augmentation, 3D structures
Web page	<a href="https://www.fkit.unizg.hr/BIDEAS">https://www.fkit.unizg.hr/BIDEAS</a> <a href="https://topomatika.hr/projekt-bideas-biorazgradive-3d-tiskane-strukture-za-augumentaciju-kosti">https://topomatika.hr/projekt-bideas-biorazgradive-3d-tiskane-strukture-za-augumentaciju-kosti</a>





**Figure 1.** A schematic illustration of an individualized implant production – a biodegradable 3D printed mesh according to CT scans of the patient's jaw.



**Figure 2.** The highly porous structure of biodegradable mesh prepared by 3D printing and impregnated by the hydrogel.

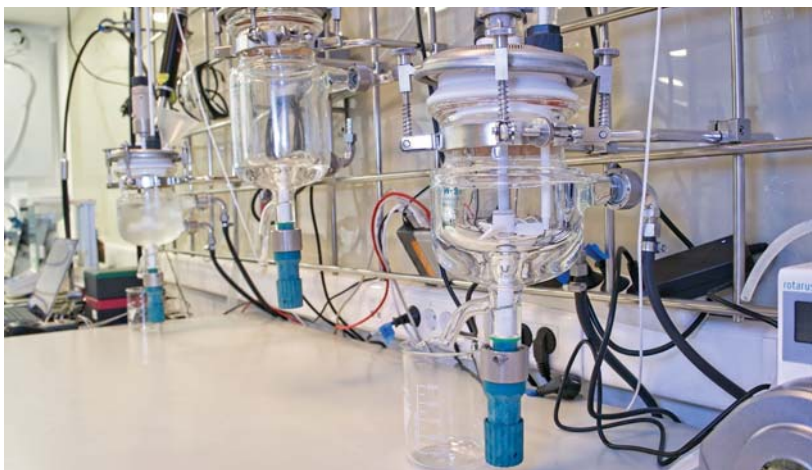
Name of the project	<b>Crystallization Advanced Process Control</b>
Acronym   Code	<b>CRYST APC   KK.01.1.1.07.0017.</b>
The name of the programme and funding agency	<i>Operational Programme Competitiveness and Cohesion 2014–2020 Increasing the development of new products and services resulting from research and development activities</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partner	MKP, Ltd. (Croatia)
Funding	1,033,296.00 €
Funding UNIZG FCET	935,077.00 €
Duration	15 <sup>th</sup> December 2020 – 15 <sup>th</sup> December 2023
Leader (UNIZG FCET)	Prof. Nenad Bolf, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Tomislav Bolanča, Ph.D.</li> <li>• Prof. Zvezdana Findrik Blažević, Ph.D.</li> <li>• Prof. Vesna Tomašić, Ph.D.</li> <li>• Prof. Jasna Prlić Kardum, Ph.D.</li> <li>• Prof. Marko Rogošić, Ph.D.</li> <li>• Assoc. Prof. Igor Dejanović, Ph.D.</li> <li>• Assist. Prof. Željka Ujević Andrijić, Ph.D.</li> <li>• Srečko Herceg, mag. ing. mech., Ph.D.</li> <li>• Nikola Rimac, mag. ing. oecoing.</li> <li>• Josip Sacher, mag. ing. cheming.</li> <li>• Matea Gavran, mag. ing. oecoing.</li> <li>• Iva Zokić, mag. ing. oecoing.</li> </ul>
Abstract	<p>In this project, a system for the advanced control of the crystallisation process of active pharmaceutical ingredients (APIs) was developed. A team of experts and researchers was formed and a laboratory was set up with state-of-the-art spectrometric measurement equipment and a system for the development of advanced process control (APC).</p> <p>Through the application of process analytical technology (PAT), models and algorithms are developed to control the process, supported by a software application to integrate equipment and processes into a unique system.</p> <p>The result of the project is an expert research team and a system for continuous monitoring and optimal control of the crystallisation and other processes using PAT for real-time control.</p> <p>The modular design of the system extends its application to a broad spectrum of the chemical, pharmaceutical and food industries – from research to technology transfer on an industrial scale.</p>
Key words	process analytical technology, advanced process control, crystallization, automated laboratory system, spectroscopy, Industry 4.0
Web page	<a href="https://crystapc.fkit.hr">https://crystapc.fkit.hr</a>



**Figure 1.** Laboratory for advanced control of the crystallization process.



**Figure 2.** Process control system interface.



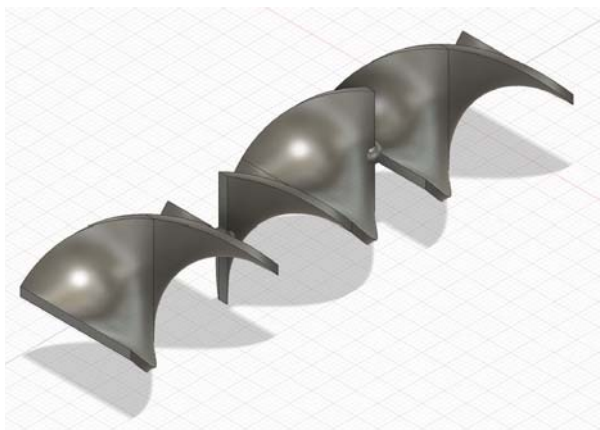
**Figure 3.** Batch crystallizers with PAT probes.

Name of the project	<b>Waste &amp; Sun for Photocatalytic Degradation of Micropollutants in Water</b>
Acronym   Code	<b>OS-MI   KK.01.1.1.04.0006</b>
The name of the programme and funding agency	<i>Operational Program Competitiveness and Cohesion 2014– 2020 European Structural and Investment Funds, Investing in Science and Innovation</i>
Coordinator	<i>University of Zagreb Faculty of Geotechnical Engineering (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</li> <li>• Ruđer Bošković Institute (Croatia)</li> <li>• University of Zagreb Faculty of Metallurgy (Croatia)</li> </ul>
Funding	1,130,596.88 €
Funding UNIZG FCET	90,000.00 €
Duration	20 <sup>th</sup> December 2019 – 1 <sup>st</sup> October 2023
Leader (UNIZG FCET)	Prof. Domagoj Vrsaljko, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Domagoj Vrsaljko, Ph.D.</li> <li>• Prof. Vesna Tomašić, Ph.D.</li> <li>• Prof. Jelena Macan, Ph.D.</li> <li>• Prof. Dragana Mutavdžić Pavlović, Ph.D.</li> <li>• Prof. Tatjana Gazivoda Kraljević, Ph.D.</li> <li>• Assoc. Prof. Vanja Kosar, Ph.D.</li> <li>• Assoc. Prof. Igor Dejanović, Ph.D.</li> <li>• Marija Lukić, mag. ing. cheming.</li> <li>• Goran Lukač, mag. ing. cheming.</li> <li>• Ivan Karlo Cingesar, mag. ing. oecoing.</li> <li>• Marijan-Pere Marković, mag. ing. cheming.</li> </ul>
Abstract	<p>The project is focused on the development of a technical solution for solar photocatalysis, as the 4<sup>th</sup> stage of water purification with the aim of maximally reducing the risk to the environment. The intensification of the solar photocatalysis process includes the development of ready-made photocatalytic forms from TiO<sub>2</sub>/CNT nanocomposites and the application of additive technologies. Based on the principles of the circular economy, the technology for the production of CNT as a new product from waste will be developed.</p> <p>An integral approach to environmental engineering completes the solution to the problem of micropollutants present in surface waters and effluents from treatment plants.</p>
Key words	photocatalysis, 3D printing, micropollutants
Web page	<a href="https://os-mi.eu">https://os-mi.eu</a>



## Awards

- Silver medal, EUROINVENT 2023 / The 15<sup>th</sup> edition of European Exhibition of Creativity and Innovation, awards: International Jury (2023)
- Excellence Award, EUROINVENT 2023 / The 15<sup>th</sup> edition of European Exhibition of Creativity and Innovation, awards: National Research and Development Institute for Non-ferrous and Rare Metals – IMNR (2023)
- Gold medal and diploma, EUROINVENT 2023 / The 15<sup>th</sup> edition of European Exhibition of Creativity and Innovation, dodjeljuje: University Politehnica of Bucharest (2023)
- Special award, EUROINVENT 2023 / The 15<sup>th</sup> edition of European Exhibition of Creativity and Innovation, awards: HIUF (2023)
- Best International Innovation Award, E-NNOVATE 2023 International Innovation & Invention Show, awards: International Jury (2023)
- Gold award, E-NNOVATE 2023 International Innovation & Invention Show, awards: International Jury (2023).



**Figure 1.** CAD model of a static mixer for chemical reaction intensification.



**Figure 2.** 3D printed model of a static mixer for chemical reaction intensification.



**Figure 3.** 3D printed model of a static mixer for chemical reaction intensification. This static mixer is made of nanocomposite based on PETG, TiO<sub>2</sub> and CNT.





Name of the project	<b>Virtulab – Integrated Laboratory for Primary and Secondary Raw Materials</b>
Acronym   Code	<b>Virtulab   KK.01.1.1.02.0022</b>
The name of the programme and funding agency	<i>European Structural and Investment Funds; European Regional Development Fund (ERDF); Operational Programme Competitiveness and Cohesion (OPCC) 2014–2020; Investment in organizational reform and infrastructure in the research, development and innovation sector</i>
Coordinator	<i>University of Zagreb Faculty of Mining, Geology and Petroleum Engineering (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</li> <li>• University of Zagreb Faculty of Geotechnical Engineering (Croatia)</li> <li>• University of Zagreb Faculty of Metallurgy (Croatia)</li> <li>• University of Zagreb Faculty of Food Technology and Biotechnology (Croatia)</li> </ul>
Funding	1,881,461.83 €
Funding UNIZG FCET	92,340.85 €
Duration	November 2018 – July 2021
Leader (UNIZG FCET)	Prof. Marko Rogošić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Hrvoje Ivanković, Ph.D.</li> <li>• Prof. Stanislav Kurajica, Ph.D.</li> <li>• Prof. Marica Ivanković, Ph.D.</li> <li>• Prof. Jelena Macan, Ph.D.</li> <li>• Prof. Zlata Hrnjak-Murgjić, Ph.D.</li> <li>• Prof. Sanja Lučić Blagojević, Ph.D.</li> <li>• Prof. Mirela Leskovac, Ph.D.</li> <li>• Prof. Emi Govorčin Bajsić, Ph.D.</li> <li>• Kristina Zagajski Kučan, Ph.D.</li> <li>• Filip Brleković, mag. ing. cheming.</li> <li>• Katarina Mužina, mag. ing. cheming.</li> <li>• Antonia Ressler, Ph.D.</li> <li>• Leonard Bauer, Ph.D.</li> <li>• Assist. Prof. Anamarija Rogina, Ph.D.</li> <li>• Assist. Prof. Vilko Mandić, Ph.D.</li> <li>• Ivana Katarina Ivković, mag. ing. cheming.</li> <li>• Assoc. Prof. Ljerka Kratofil Krehula, Ph.D.</li> <li>• Assist. Prof. Zvonimir Katančić, Ph.D.</li> <li>• Prof. Juraj Šipušić, Ph.D.</li> </ul>

## Abstract

The goal of the Virtulab project is to improve the scientific, research and teaching capacities of the five Faculties of the University of Zagreb in the sector of primary and secondary raw materials and to reach European and world standards of practical application of knowledge in the economy.

Virtulab gathers research capacities that meet the needs of prospecting research of primary and secondary raw materials, exploitation, refining, production processes, recycling and finding substitute raw materials.

The project contributes to:

- 1) strengthening the quality of scientific research by introducing modern and increasing the availability of existing instrumentation,
- 2) increasing productivity, *i.e.* the number of scientific research works and the number of applications for competitive scientific and innovative projects,
- 3) improving the quality of teaching while strengthening the competencies of students and thus their competitiveness and employability on the labour market and
- 4) transfer of knowledge and innovation to the economy.

The implementation of the project will improve the availability and utilization of primary and secondary raw materials in the long term, positively affect the environment and the economy, and reduce the import dependence of the Republic of Croatia and the European Union in the sector of non-energy mineral raw materials.

## Key words

Virtulab, primary and secondary raw material, non-energy sector, capacity strengthening

## Web page

<https://www.rgn.unizg.hr/hr/virtulab>



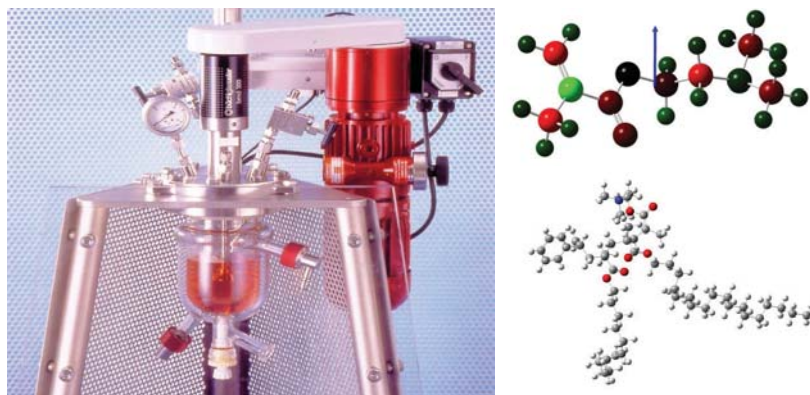
**Figure 1.** Receiving the high-temperature calorimeter at the Faculty of Chemical Engineering and Technology.



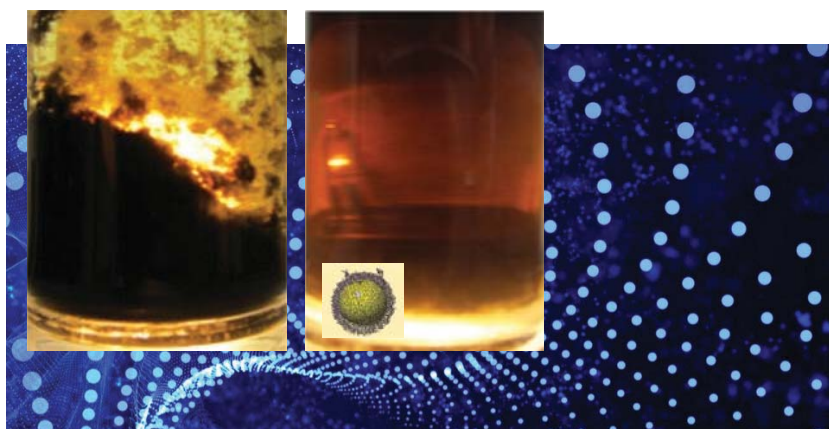
**Figure 2.** Differential scanning calorimeter with two furnaces and a total working range of  $-150$  to  $1600$  °C, model HDSX-PT 1600, Linseis GmbH, Germany, installed in one of the laboratories of the Department for Inorganic Chemical Technology and Nonmetals.



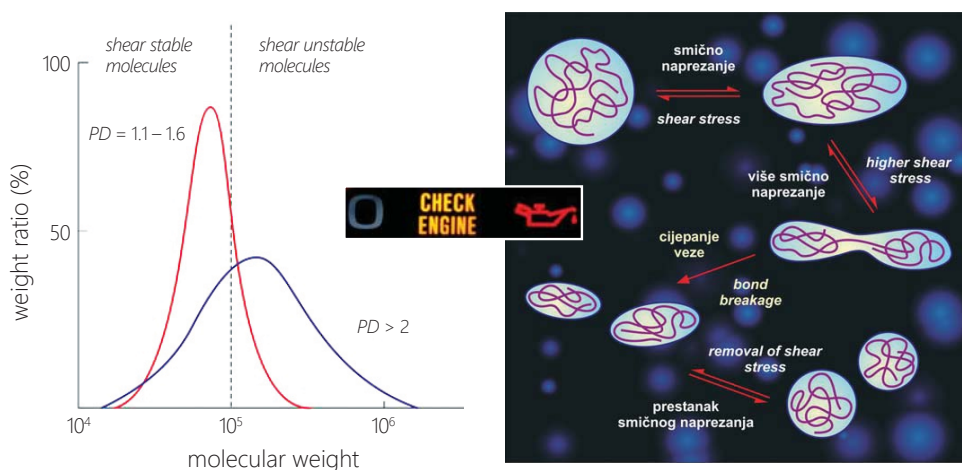
Name of the project	<b>New Polymer Additives for Lubricating Oils and Oil Nanofluids</b>
Acronym   Code	<b>NanoFlu   KK.01.1.1.07.0015</b>
The name of the programme and funding agency	<i>Operational Program Competitiveness and Cohesion 2014–2020 Increasing the development of new products and services resulting from research and development activities</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partner	INA Maziva d.o.o. (Croatia)
Funding	962,836.70 €
Funding UNIZG FCET	782,927.92 €
Duration	15 <sup>th</sup> December 2020 – 15 <sup>th</sup> December 2023
Leader (UNIZG FCET)	Prof. Ante Jukić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Assoc. Prof. Fabio Faraguna, Ph.D.</li> <li>• Prof. Elvira Vidović, Ph.D.</li> <li>• Prof. Sandra Babić, Ph.D.</li> <li>• Prof. Sanja Lučić Blagojević, Ph.D.</li> <li>• Prof. Mirela Leskovic, Ph.D.</li> <li>• Lucija Šekoranja, mag. ing. cheming.</li> <li>• Mihovil Medić, mag. ing. cheming. / Roko Blažić, mag. ing. cheming.</li> </ul>
Abstract	<p>High-performance multifunctional polymer additives and surfactants based on alkyl and functional methacrylates (PAMA) for lubricant oils and oil nanofluids, tailored to types and compositions of base oils and target applications, were developed.</p> <p>Optimizing the composition and structural properties of the polymer additive (molar mass distribution) the maximum effect on the increase of viscosity, thermal stability, dispersity and index viscosity together with the required shear stability as well as outstanding long-term stability of oil nanodispersions (with carbon nanotubes, graphene or metal oxide nanoparticles) were obtained.</p>
Key words	alkyl methacrylates (PAMA), multifunctional polymer additives for lubricating oils, nanofluid dispersion stability
Web page	<a href="http://www.nanoflu.fkit.unizg.hr">www.nanoflu.fkit.unizg.hr</a>



**Figure 1.** Synthesis of multifunctional copolymer additives of tailored composition and structure.



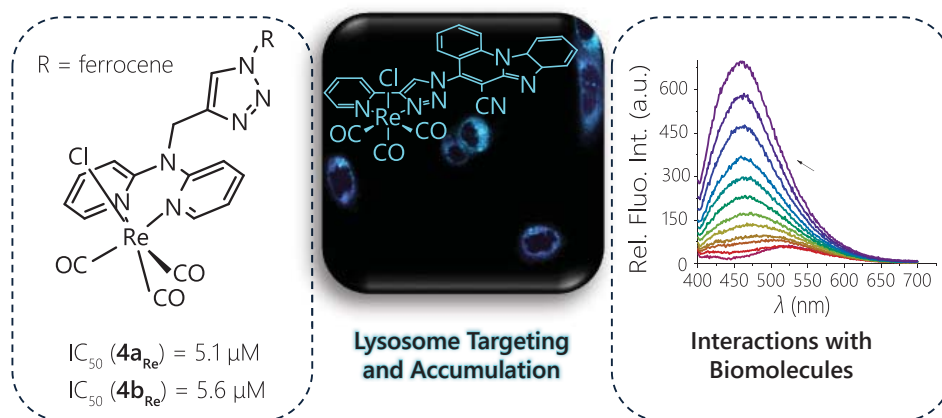
**Figure 2.** Oil nanofluid without (left) and with added polymer surfactants (right) that improves stability of nanodispersion.



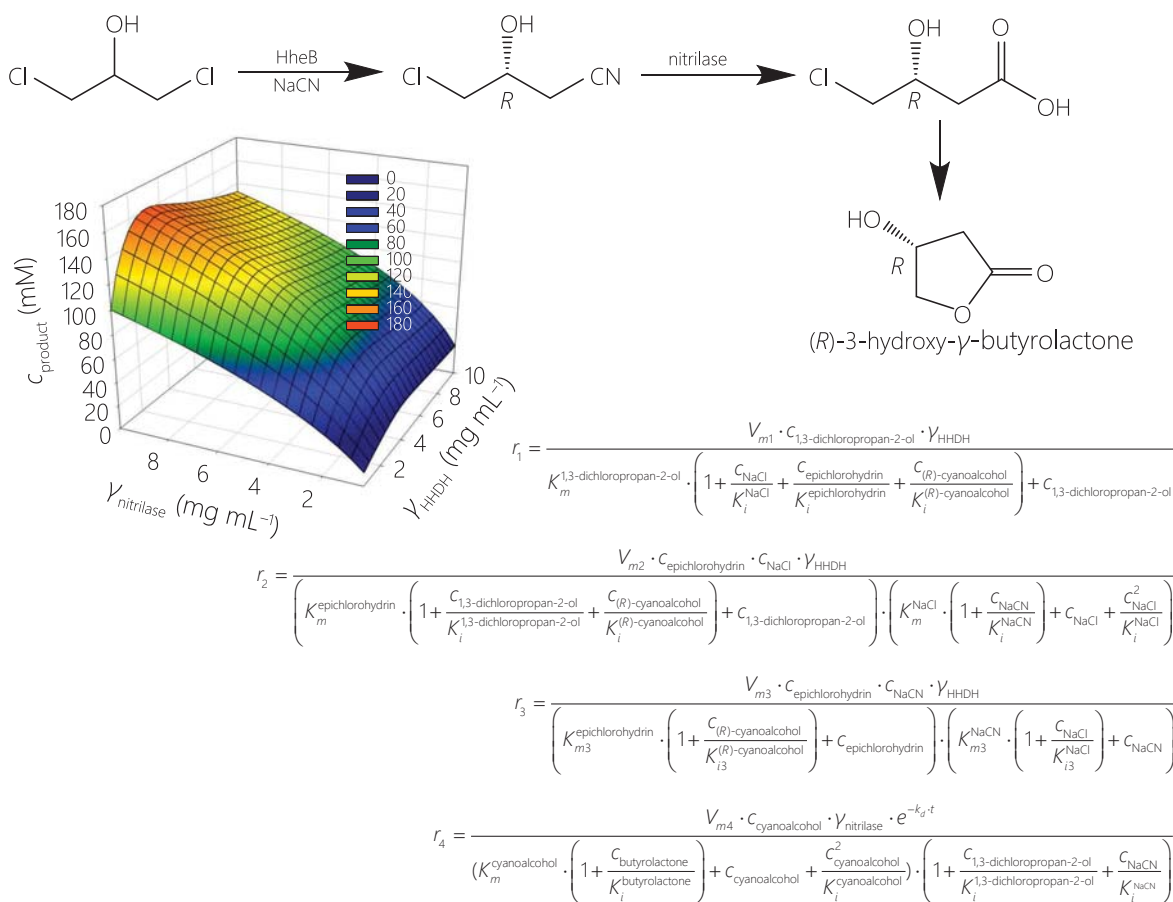
**Figure 3.** Polymer additives for lubricating oils with increased shear stability and prolonged life-time.

Name of the project	<b>Innovative Solutions in Catalytic Production Processes for the Needs of Pharmaceutical Industry</b>
Acronym   Code	<b>Catpharma   KK.01.1.1.04</b>
The name of the programme and funding agency	<i>European Regional Development Fund, Operational Program Competitiveness and Cohesion 2014–2020, European Structural and Investment Funds, Investment in Science and Innovation</i>
Coordinator	<i>Ruđer Bošković Institute, Zagreb (Croatia)</i>
Partner	University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)
Funding	816,975.55 €
Funding UNIZG FCET	200,000.00 €
Duration	21 <sup>st</sup> December 2019 – 20 <sup>th</sup> April 2023
Leader (UNIZG FCET)	Prof. Silvana Raić-Malić, Ph.D. Prof. Zvezdana Findrik Blažević, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Ivana Čevid, mag. ing. oecoing.</li> <li>• Silvio Jakopec, Ph.D.</li> </ul>
Abstract	Chemical and pharmaceutical industries are key drivers of the Croatian economy. Basic restrictions of their development are the application of old procedures and significant lagging in innovations. By gathering a multidisciplinary and successful team in the field of synthesis, spectroscopy and computer modelling, CAT PHARMA offers a platform for the development of innovative, efficient, and economic catalytic reactions in the preparation of industrially important compounds. In this sustainable transfer of knowledge, we answer to the problems of this sector and help in the approach to new markets by introducing modern, fast and cheap technologies.
Key words	(bio)catalysis, monometal and heterobimetal complexes, antitumor activity
Web page	<a href="https://catpharma.irb.hr">https://catpharma.irb.hr</a>



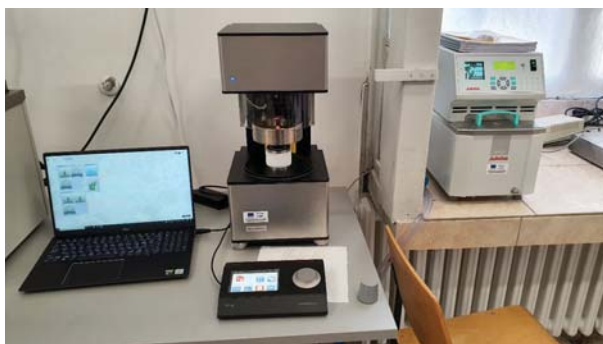


**Figure 1.** Heterobimetallic Re(I) ferrocene dipyridylamine complexes showed antiproliferative effects comparable to cisplatin on colon cancer cells (CT26 and HT29), whereas the Re(I) benzimidazo[1,2-a]quinoline complex interacted with ds-DNA/RNA.



**Figure 2.** Biocatalytic cascade reaction investigated within the project by applying chemical engineering methodology; process optimization by application of enzyme reaction engineering.

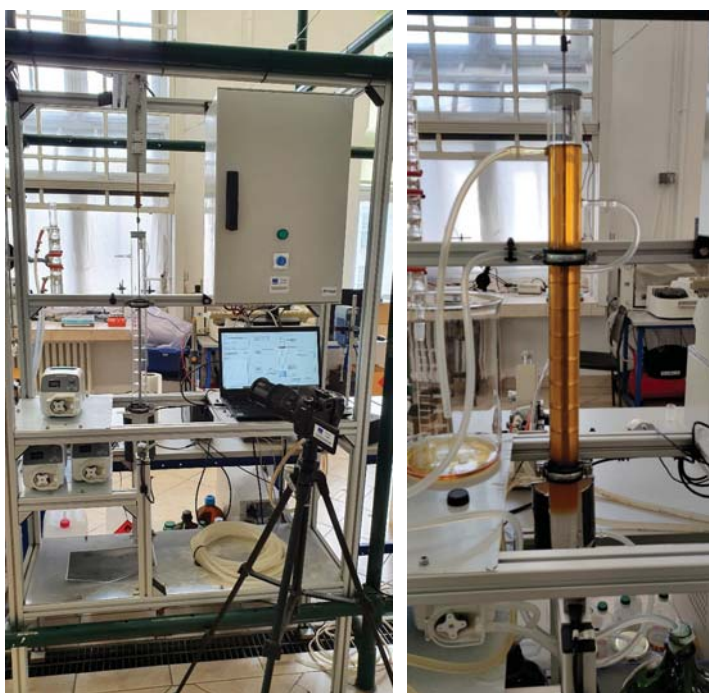
Name of the project	<b>The Development of a System for Testing Multiphase Flows and Combustion to Increase Research Activities in the Scientific and Business Sectors</b>
Acronym   Code	<b>RESIN   KK.01.1.1.04.0070</b>
The name of the programme and funding agency	<i>The European Regional Development Fund, Operational Program Competitiveness and Cohesion 2014–2020, European Structural and Investment Funds, Investment in Science and Innovation</i>
Coordinator	<i>University of Zagreb Faculty of Mechanical Engineering and Naval Architecture (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Zagreb Faculty of Electrical Engineering and Computing (Croatia)</li> <li>• University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</li> <li>• University of Zagreb Faculty of Metallurgy (Croatia)</li> <li>• Faculty of Mechanical Engineering in Slavonski Brod (Croatia)</li> </ul>
Funding	697,944.00 €
Funding UNIZG FCET	59,416.45 €
Duration	2020 – 2023
Leader (UNIZG FCET)	Prof. Aleksandra Sander, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Ana Petračić, Ph.D.</li> </ul>
Abstract	<p>A promising approach for medium-term emission reduction involves enhancing existing technologies while simultaneously increasing the use of biofuels.</p> <p>The RESIN project explores the potential of non-conventional raw materials for biodiesel production and their impact on the performance of engines and other industrial combustion systems. Research groups are being established to investigate multiphase flows, sprays, combustion, and emission formation.</p> <p>Advanced computational tools and mathematical models are being developed, alongside the creation of a system for continuous biodiesel purification.</p>
Key words	image analysis, biodiesel, spray modeling, multiphase flow
Web page	<a href="https://cfhd.hr/resin">https://cfhd.hr/resin</a>



**Figure 1.** Equipment for measuring the physical properties of fuels: surface tension of the tested liquids, interfacial energy between two liquids, and density of the tested liquid at a precisely defined temperature.

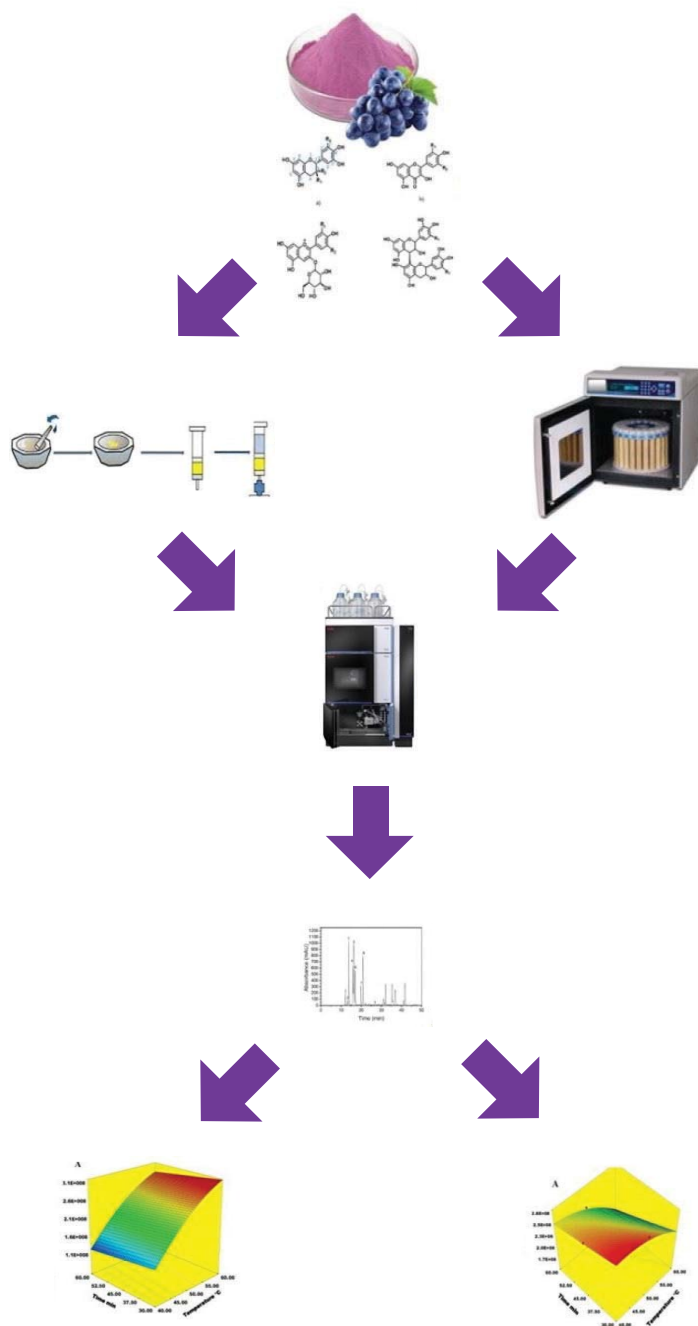


**Figure 2.** The solvent preparation system: vacuum pump is connected to a rotary evaporator. It's used to prepare deep eutectic solvents for purifying raw materials and crude biodiesel.



**Figure 3.** The system for continuous purification of raw materials from free fatty acids and biodiesel from glycerol and glycerides via extraction with deep eutectic solvents. It is comprised of an electrical cabinet, control computer with column management software, cameras for level control and capturing droplet distribution during extraction, motors, columns, trays, pumps, and connecting hoses.

Name of the project	<b>A New Beginning for the Old Croatian Grape Varieties</b>
Acronym	<b>CroVitiRestart</b>
The name of the programme and funding agency	<i>European Fund for Regional Development, Operational Program Competitiveness and Cohesion 2014–2020, European Structural and Investment Funds, Investment in Science and Innovation</i>
Coordinator	<i>University of Zagreb Faculty of Agriculture (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Zagreb Faculty of Food and Biotechnology (Croatia)</li> <li>• University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</li> </ul>
Funding	947,143.58 €
Funding UNIZG FCET	10,622.28 €
Duration	20 <sup>th</sup> December 2019 – 20 <sup>th</sup> December 2022
Leader (UNIZG FCET)	Prof. Danijela Ašperger, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Dario Dabić, Ph.D.</li> <li>• Bruna Babić Visković, mag. ing. oceoing.</li> </ul>
Abstract	<p>Viticulture and wine production represents an extremely important economic branch in the Republic of Croatia, which directly or through related activities (trade, production of viticulture equipment, catering and tourism) is of great importance for economic development.</p> <p>The implementation of the proposed project will improve the quality of growing autochthonous grape varieties in the Republic of Croatia through:</p> <ol style="list-style-type: none"> <li>(1) the application of modern vine-selection procedures with the aim of obtaining a high-quality genetic base of varieties for modern viticulture production;</li> <li>(2) definition of modern oenological procedures – wine production technology suitable for individual autochthonous varieties;</li> <li>(3) determination of the potential of autochthonous varieties for the production of cognac and</li> <li>(4) determination of the composition and content of polyphenols in pomace (by-product) of different autochthonous varieties and the development of an innovative extraction procedure for obtaining polyphenols.</li> </ol>
Key words	autochthonous grape varieties, polyphenolic compounds, analytical methods of determination
Web page	<a href="https://www.agr.unizg.hr/hr/project/714/Novi+po%C4%8Detak+za+stare+hrvatske+sorte+vinove+loze">https://www.agr.unizg.hr/hr/project/714/Novi+po%C4%8Detak+za+stare+hrvatske+sorte+vinove+loze</a>



**Figure 1.** Schematic review of the polyphenolic compounds determination in grape skin.



Name of the project	<b>STEM School in Nature</b>
The name of the programme and funding agency	<i>„Strengthening the capacity of civil society organizations to popularize STEM“ (UP.04.2.1.10) within the Operational Programme Efficient Human Resources 2014–2020, European Social Fund (ESF)</i>
Coordinator	City Red Cross Society Zagreb (CRCSZ) (Croatia)
Partner	University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)
Funding	304,925.75 €
Funding UNIZG FCET	105,000.00 €
Duration	12 <sup>th</sup> May 2021 – 12 <sup>th</sup> May 2023
Leader (UNIZG FCET)	Prof. Tatjana Gazivoda Kraljević, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Tomislav Bolanča, Ph.D.</li> <li>• Prof. Marijana Hranjec, Ph.D.</li> <li>• Prof. Ante Jukić, Ph.D.</li> <li>• Prof. Hrvoje Kušić, Ph.D.</li> <li>• Ivana Sokol, mag. appl. chem.</li> <li>• Ida Boček Pavlinac, Ph.D.</li> <li>• Anja Rakas, mag. ing. oecoling.</li> <li>• Anja Beč, Ph.D.</li> <li>• Petra Kovačec, mag. appl. chem.</li> <li>• Marina Galić, mag. ing. cheming.</li> </ul>
Abstract	<p>The activities carried out within the project popularized science and the STEM field among children and the general population. Understanding natural sciences and technology is a key factor in preparing young people for future life in a modern society in which natural sciences and technology play an increasingly important role, and their understanding contributes significantly to the private, social and cultural life of all people.</p> <p>The STEM was popularized among children and young people through activities and educational content in the newly established laboratory at the Red Cross House on Sljeme and workshops at FCET and science fairs as well.</p> <p>Within the framework of the project, two three-day professional conferences Climate Neutral Technologies and Green Chemistry – Possibilities and Challenges were organized at FCET, where experts and university professors mainly from FCET held lectures.</p>
Key words	STEM, popularization of science
Web page	<a href="https://stem-skola-u-prirodi.com">https://stem-skola-u-prirodi.com</a>



**Figure 1.** STEM workshop for children at UNIZG FCET.



**Figure 2.** Workshop for CRCSZ employees as part of the *Training for Trainers* activity.

**Figure 3.** Deputy Director of CRCSZ Ivica Golubić at the opening of the conference *Climate Neutral Technologies*



Name of the project	<b>Formula for Science</b>
The name of the programme and funding agency	<i>„Strengthening the capacity of civil society organizations to popularize STEM“ (UP.04.2.1.10) within the Operational Programme Efficient Human Resources 2014–2020, European Social Fund (ESF)</i>
Coordinator	<i>POZOR! – Projects and Education for Sustainable Development</i>
Partners	<ul style="list-style-type: none"> <li>• University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</li> <li>• The Association of Pupil's Dormitories of the Republic of Croatia and the "Our Children" Society of the Town of Gospić (Croatia)</li> </ul>
Funding	309,608.40 €
Funding UNIZG FCET	143,006.60 €
Duration	28 <sup>th</sup> December 2020 – 28 <sup>th</sup> December 2022
Leader (UNIZG FCET)	Prof. Jasna Prlić Kardum, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Aleksandra Sander, Ph.D.</li> <li>• Prof. Gordana Matijašić, Ph.D.</li> <li>• Assoc. Prof. Krunoslav Žižek, Ph.D.</li> <li>• Ana Petračić, Ph.D.</li> <li>• Iva Zokić, mag. ing. oecoing.</li> <li>• Teodora Prebeg, mag. ing. cheming.</li> <li>• Katarina Sokač, mag. ing. cheming.</li> </ul>
Abstract	<p>The project's goal was to increase civil society's capacity to promote a scientific worldview and critical thinking among primary and secondary school students in the Lika-Senj and Virovitica-Podravina counties, as well as the City of Zagreb, by developing and implementing innovative programs to popularize chemistry as a STEM field.</p> <p>The project offered training to volunteers, who thereafter included students in activities and seminars during the second phase. As a result, the degree of participation of children and young people in STEM fields grows.</p>
Key words	STEM, popularization of science
Web page	<a href="https://formula-za-znanost.eu">https://formula-za-znanost.eu</a>





Figure 1. Photographs from the project's workshops.



Project was financed by European Union from European social fund.





REPUBLIC OF CROATIA  
Ministry of Science  
and Education

# Ministry of Science and Education PROJECTS

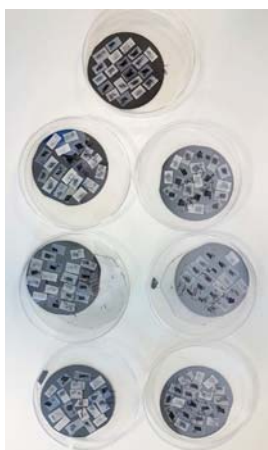




Name of the project	<b>Novel Catalysts for Solar Driven Water Treatment; Quantum-Chemical and Experimental Approach</b>
Acronym	<b>CatSol</b>
The name of the programme and funding agency	<i>Competitive project funding, Ministry of Science and Education of the Republic of Croatia</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partner	University of Pau (France)
Funding	4,904.68 €
Funding UNIZG FCET	4,904.68 €
Duration	1 <sup>st</sup> January 2017 – 31 <sup>st</sup> December 2018
Leader (UNIZG FCET)	Prof. Hrvoje Kušić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Ana Lončarić Božić, Ph.D.</li> <li>• Assist. Prof. Marin Kovačić, Ph.D.</li> <li>• Daria Juretić Perišić, Ph.D.</li> </ul>
Abstract	<p>Solving problems associated with water pollution is one of main priorities of environment protection aiming at preserving humans health and ecosystems. The fast-growing field of nanomaterials research and development resulted variety of nanoparticles with commercial uses, including water purification as well. Photocatalytic water treatment based on nanomaterials application provides a synergy of advanced oxidation processes and nanoparticles with generation of secondary waste. Main aim of the project is at development of TiO<sub>2</sub> nanocomposites with transition metals and other semiconducting materials employing combined experimental and computational approaches.</p>
Key words	photocatalytic water purification, hydrogen evolution, semiconductors, solar irradiation

Name of the project	<b>Plasma Technology for the Development of Polymeric Materials for Catalytic Microreactors</b>
The name of the programme and funding agency	<i>Competitive project funding, Ministry of Science and Education of the Republic of Croatia</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partner	IRCP Paris Tech (France)
Funding	5,022.36 €
Funding UNIZG FCET	5,022.36 €
Duration	1 <sup>st</sup> January 2017 – 31 <sup>st</sup> December 2018
Leader (UNIZG FCET)	Prof. Domagoj Vrsaljko, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Ivana Grčić, Ph.D.</li> <li>• Zana Hajdari, Ph.D.</li> <li>• Vedrana Lovinčić, Ph.D.</li> <li>• Prof. Krunoslav Žižek, Ph.D.</li> <li>• Assoc. Prof. Igor Dejanović, Ph.D.</li> </ul>
Abstract	<p>In recent years, special interest of numerous researches has been directed towards the use of semiconductor materials as catalysts and photocatalysts for the removal of organic and inorganic pollutants from the aqueous medium. Microreactors have received more and more attention in recent years due to their specific properties. The general goal of the project is the development of advanced materials that will be used for the production of microreactor systems for wastewater treatment and thus meet the requirements of sustainable development and environmental protection.</p>
Key words	plasma technology, polymer materials, microreactors

**Figure 1.** Samples on silicon wafers, prepared for etching processing before placement in the etching apparatus.

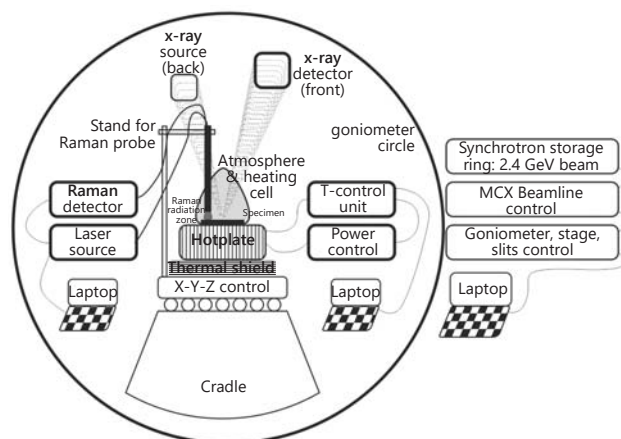


**Figure 2.** Samples on the carrier, prepared for processing and placed in the Hybrid Plasmionique reactor.

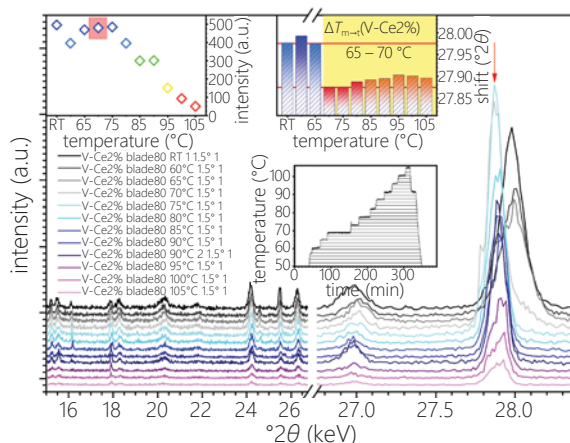
Name of the project	<b>Development of Novel Catalysts for Simultaneous Water Purification and Energy Conversion under Solar Irradiation</b>
The name of the programme and funding agency	<i>Competitive project funding, Ministry of Science and Education of the Republic of Croatia</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partner	University of Ljubljana, Faculty of Chemistry and Chemical Technology (Slovenia)
Funding	1,968.94 €
Funding UNIZG FCET	1,968.94 €
Duration	1 <sup>st</sup> January 2018 – 31 <sup>st</sup> December 2019
Leader (UNIZG FCET)	Prof. Hrvoje Kušić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Ana Lončarić Božić, Ph.D.</li> <li>• Assist. Prof. Marin Kovačić, Ph.D.</li> <li>• Daria Juretić Perišić, Ph.D.</li> </ul>
Abstract	<p>The access to clean water and green energy sources are necessary for economic development and progress of society. Inter-correlation of energy and water is well known, however, technologies are not adequately integrated. Photocatalytic degradation of organics and photo-electrochemical water splitting involves generation of electron/hole pairs induced by emitted irradiation of sufficient energy. The project will focus on development of novel photocatalytic materials of nano-sizes, active under solar irradiation for simultaneous water purification and hydrogen generation.</p>
Key words	photocatalytic water purification, hydrogen evolution, semiconductors, solar irradiation



Name of the project	<b>Comparison of Cerium Oxide-Doped Catalysts Prepared Using Advanced Chemical and Physical Deposition Methods</b>
The name of the programme and funding agency	<i>Competitive project funding, Ministry of Science and Education of the Republic of Croatia</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partner	Hangzhou Dianzi University (China)
Funding	15,926.74 €
Funding UNIZG FCET	7,963.37 €
Duration	1 <sup>st</sup> January 2020 – 31 <sup>st</sup> December 2023
Leader (UNIZG FCET)	Assoc. Prof. Vilko Mandić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Ivana Panžić, Ph.D.</li> <li>• Arijeta Bafti, mag. chem.</li> <li>• Floren Radovanović-Perić, mag. ing. cheming.</li> </ul>
Abstract	The goal is to prepare materials based on cerium oxide, as well as similar semiconductor materials, and to dope them. The objective is to compare the preparation processes using advanced methods of chemical and physical deposition. The ultimate aim is to apply and compare the prepared functional materials, such as catalysts.
Key words	semiconductors, chemical and physical methods of deposition, catalysts



**Figure 1.** Scheme of the synchrotron *in-situ* characterisation.



**Figure 2.** An example for thermochromic phase transformation.

Name of the project	<b>Cooperation Research on Ecological Restoration and Monitoring Technologies after Unexpected Disturbances of World Natural Heritage Sites</b>
The name of the programme and funding agency	<i>Competitive project funding, Ministry of Science and Education of the Republic of Croatia</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partner	Chengdu Institute of Biology, Chinese Academy of Science (China)
Funding	7,963.37 €
Funding UNIZG FCET	1,990.84 €
Duration	1 <sup>st</sup> January 2020 – 31 <sup>st</sup> December 2023
Leader (UNIZG FCET)	Prof. Bruno Zelić, Ph.D.
Abstract	<p>The main purpose of the protection of the world's natural heritage sites is to restore and maintain ecological integrity in sites of Outstanding Universal Values (OUV).</p> <p>On August 8<sup>th</sup>, 2017, a magnitude 7.0 earthquake occurred in Jiuzhaigou. The affected forest area was 195 km<sup>2</sup>, the giant panda habitat area was 126 km<sup>2</sup>, and the water area was 520 ha.</p> <p>The landscape aesthetic value, biodiversity and ecosystem service functions were affected. The OUV of Jiuzhaigou Heritage Site has the risk of reducing and losing. The Jiuzhaigou earthquake is the largest natural disturbance factor in Jiuzhaigou, and the natural ecosystem is seriously damaged. It is urgent to carry out research on ecological restoration and monitoring technology.</p> <p>The restoration of damaged natural ecosystems can lay an important foundation for the scientific reconstruction and green development of the Jiuzhaigou disaster.</p> <p>From the perspective of restoring landscape aesthetic value and their ecological function, Project collects and screens up today international scientific knowledge in the field of Ecological Restoration and Monitoring Technologies with special attention on the influence of Unexpected Nature Disturbances in unique travertine landscape.</p>
Key words	ecological restoration, unexpected natural disturbances, monitoring technologies, world natural heritage sites

Name of the project	<b>Stabilization of Halohydrin Dehalogenases for Use in Unconventional Media</b>
The name of the programme and funding agency	<i>Competitive project funding, Ministry of Science and Education of the Republic of Croatia</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partner	University of Maribor, Faculty of Chemistry and Chemical Technology (Slovenia)
Funding	1,974.40 €
Funding UNIZG FCET	1,974.40 €
Duration	1 <sup>st</sup> January 2020 – 31 <sup>st</sup> December 2022
Leader (UNIZG FCET)	Prof. Zvezdana Findrik Blažević, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"><li>• Assist. Prof. Martina Sudar, Ph.D.</li><li>• Nevena Milčić, Ph.D.</li></ul>
Abstract	Halohydrin dehalogenases are a relatively new and unexplored group of enzymes that catalyze the reactions of formation and conversion of epoxides, and the products are industrially interesting and optically pure epoxides and $\beta$ -haloalcohols. Since the substrates are poorly soluble and hydrolytically unstable, the option of synthesis in non-conventional media offers numerous advantages. Considering the nature of enzymes, it is necessary to investigate immobilization methods, so that biocatalysts have greater operational stability in non-aqueous media, as well as provide the possibility of multiple use.
Key words	halohydrin dehalogenase, biocatalysis, nonconventional media, stabilization, immobilization

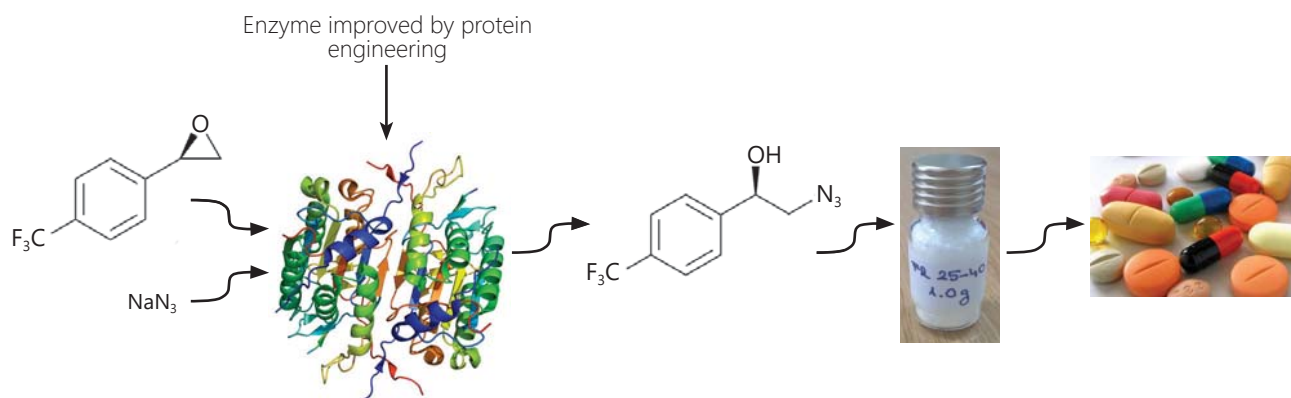


**Figure 1.** *E. coli* cells containing halohydrin dehalogenase immobilized in calcium alginate.



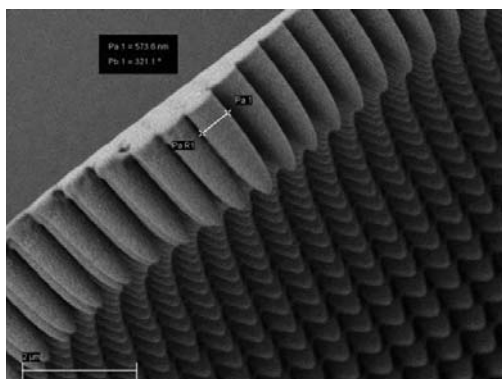
**Figure 2.** Reactor tank containing rotating layer of immobilized biocatalyst.

Name of the project	<b>Enzyme Engineering and Process Engineering in the Synthesis of Fragrances from Renewable Sources</b>
Acronym	<b>BioFragrance</b>
The name of the programme and funding agency	<i>Competitive project funding, Ministry of Science and Education of the Republic of Croatia</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partner	Technical University Graz, Institute of Molecular Biotechnology (Austria)
Funding	6,750.00 €
Funding UNIZG FCET	6,750.00 €
Duration	1 <sup>st</sup> January 2022 – 31 <sup>st</sup> December 2023
Leader (UNIZG FCET)	Prof. Zvezdana Findrik Blažević, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Assist. Prof. Martina Sudar, Ph.D.</li> <li>• Nevena Milčić, Ph.D.</li> </ul>
Abstract	<p>The development of sustainable processes for valorization of side-products and other waste products remains a challenge in the area of catalysis. Biotechnological processes provide the possibility of producing specific products in high yields with low energy consumption and minimum waste generation.</p> <p>Biocatalytic processes investigated in the laboratory often provide favorable opportunities in accordance with the principles of green chemistry, but also show limitations in terms of their economic potential, therefore it is important to investigate the processes in detail from the point of view of process engineering.</p> <p>The goal of this project is to develop an efficient process for the synthesis of high-value products from renewable sources by combining enzyme and process engineering.</p>
Key words	enzymes, biocatalysis, protein engineering, process engineering, biotechnological processes

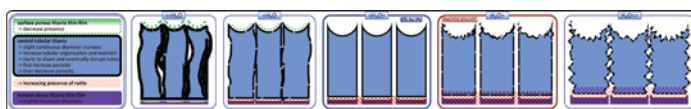


**Figure 1.** Biocatalytic synthesis of chiral building block for the application in pharmaceutical industry.

Name of the project	<b>Development of Nanostructured Composites of Metal-Oxide Films and Polymeric Nanopatterns Prepared by High-Resolution 3D Printing and Deposition Using Spark Ablation for the Preparation of Films with Optically Selective Properties</b>
The name of the programme and funding agency	<i>Competitive project funding, Ministry of Science and Education of the Republic of Croatia</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partner	Montanuniversität Leoben (Austria)
Funding	13,935.89 €
Funding UNIZG FCET	6,967.95 €
Duration	1 <sup>st</sup> January 2022 – 31 <sup>st</sup> December 2023
Leader (UNIZG FCET)	Assoc. Prof. Vilko Mandić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Ivana Panžić, Ph.D.</li> <li>• Arijeta Bafti, mag. chem.</li> <li>• Floren Radovanović-Perić, mag. ing. cheming.</li> </ul>
Abstract	<p>The project's aim is the development of nanostructured composites of metal-oxide films and polymeric nanopatterns prepared by high-resolution 3D printing and deposition using spark ablation for the preparation of films with optically selective properties.</p> <p>The project will observe applications and test various configurations of materials that can be prepared through the integration of the mentioned techniques.</p>
Key words	nanomaterials, spark ablation, deposition, 3D printing, nanotechnology, FIB



**Figure 1.** 3D printed nanosubstrate.



**Figure 2.** Optimisation of the photovoltaic vs. photocatalytic efficiency.





Horizon 2020

**HORIZON 2020**  
PROJECTS

5

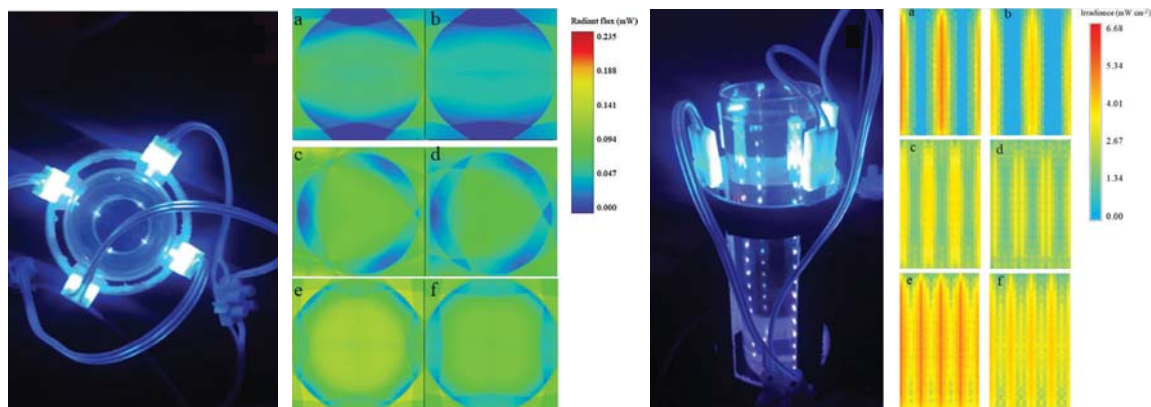


Name of the project	<b>Joint Ph.D. Laboratory for New Materials and Inventive Water Treatment Technologies. Harnessing Resources Effectively through Innovation</b>
Acronym	<b>NOWELTIES</b>
The name of the programme and funding agency	<i>Horizon 2020 (H2020), Marie Skłodowska-Curie action (MSCA), Innovative Training Networks (ITN)</i>
Coordinator	<i>Catalan Institute for Water Research (Spain)</i>
Partners	<ul style="list-style-type: none"> <li>• Universidad de Santiago de Compostela (Spain)</li> <li>• Rheinisch-Westfälische Technische Hochschule Aachen (Germany)</li> <li>• Technische Universität München (Germany)</li> <li>• University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</li> <li>• University of Zagreb Faculty of Mechanical Engineering and Naval Architecture (Croatia)</li> <li>• Faculty of Technology and Metallurgy, University of Belgrade (Serbia)</li> <li>• Institute of Physics (Serbia)</li> <li>• Università degli Studi di Ferrara (Italy)</li> </ul>
Funding	3,422,141.64 €
Funding UNIZG FCET	453,294.16 €
Duration	1 <sup>st</sup> February 2019 – 31 <sup>st</sup> January 2023
Leader (UNIZG FCET)	Prof. Sandra Babić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Hrvoje Kušić, Ph.D.</li> <li>• Prof. Dragana Mutavdžić Pavlović, Ph.D.</li> <li>• Danilo Bertagna Silva, Ph.D.</li> <li>• Francis de la Rosa, mag. chem.</li> </ul>
Abstract	<p>Increasing demands on water quality standards result in the development of new, sustainable technologies for water treatment, the application of new materials or the improvement of the integration of existing technologies. However, the integration of research and innovation within the water sector needs to be supported by education of a new generation of interdisciplinary trained wastewater professionals able to face future challenges and implement wastewater-related directives in practice. The primary objective of NOWELTIES is to organize a platform (European Joint Doctorate, EJD) that will provide cutting edge training opportunities for the education of tomorrow's water treatment experts. The results of the project will be inventive water treatment technologies (advanced biological treatments, innovative oxidation processes, hybrid systems) that allow control of organic pollution and improve water recovery.</p>

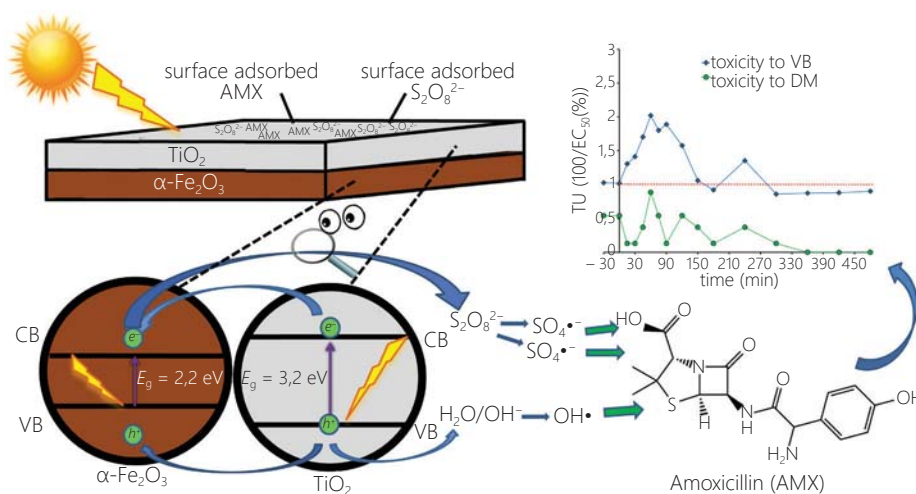
Key words

water treatment, water recovery, organic pollutants, advanced biological water treatment processes, advanced oxidation processes

Web page

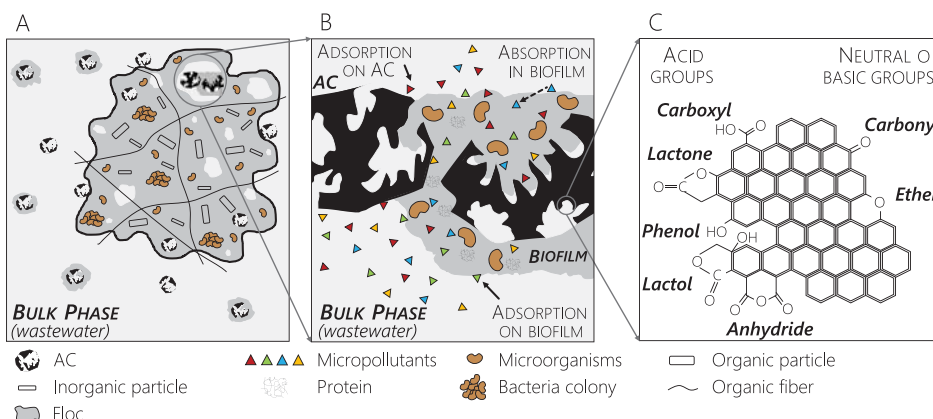
<https://nowelties.eu>

**Figure 1.** UV-LED photoreactor with simulated radiant flux profile on photoreactor's middle cross section and simulated irradiance profile on photoreactor's side wall.



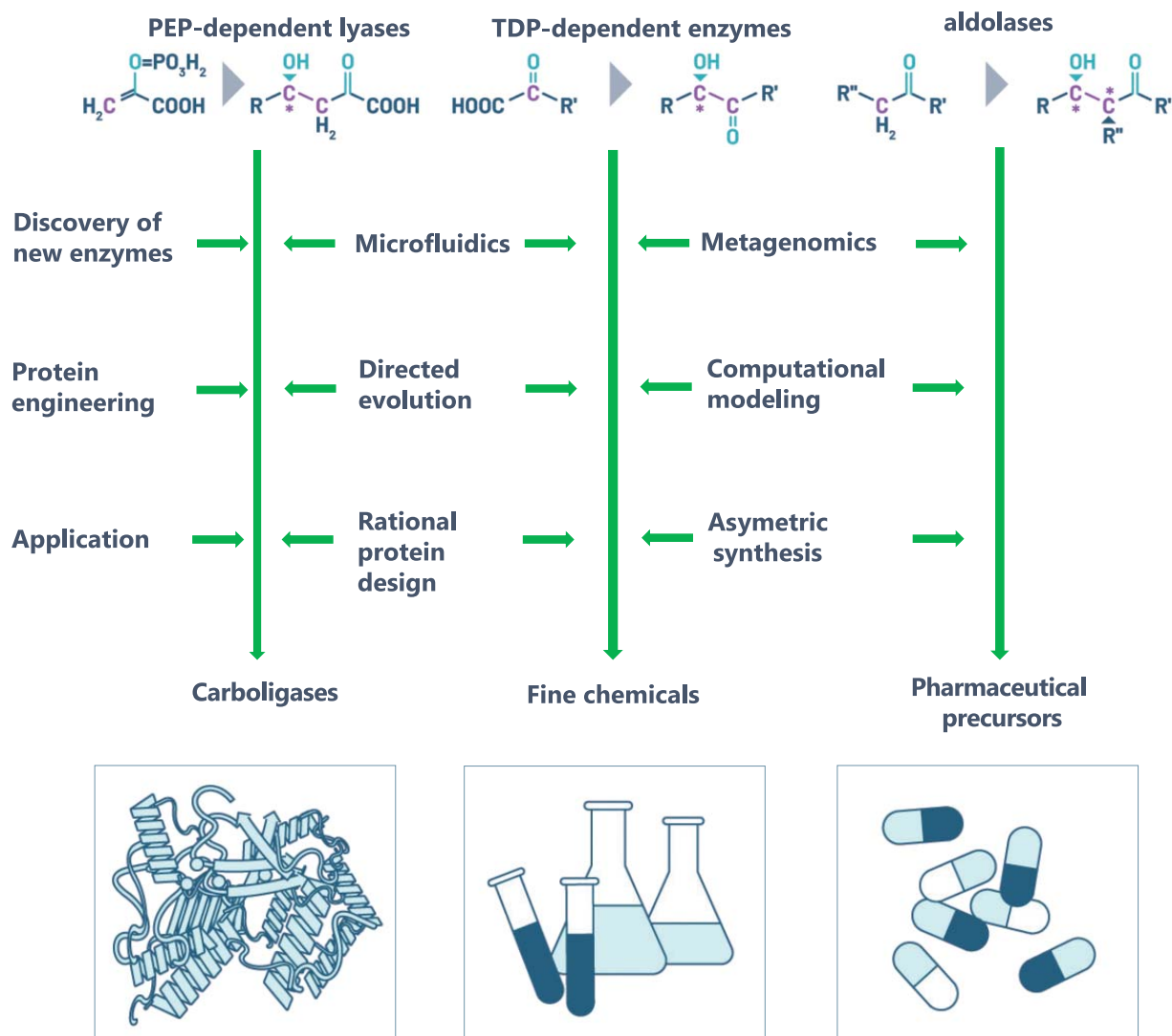
**Figure 2.** Solar light activation of persulfate by  $\text{TiO}_2/\text{Fe}_2\text{O}_3$  layered composite films for degradation of amoxicillin, correlation of degradation mechanism and changes in toxicity.

**Figure 3.** Schematic representation of a sludge floc in the presence of AC (A); OMP removal mechanisms in an AC particle incorporated in the sludge floc (B); main functional groups on the surface of AC (C). (AC = activated carbon; OMP = organic micropollutants).



Name of the project	<b>C–C Bond Formation Using Top Performing Enzymes</b>
Acronym	<b>C–C Top</b>
The name of the programme and funding agency	<i>Horizon 2020 (H2020-EU.1.3.-Excellent Science) Marie Skłodowska-Curie Actions, Innovative Training Networks (ITN)</i>
Coordinator	<i>Technische Universität Darmstadt (Germany)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</li> <li>• Prozomix Ltd. (UK)</li> <li>• Universidad Autonoma de Madrid (Spain)</li> <li>• Albert-Ludwigs-Universität Freiburg (Germany)</li> <li>• University College London (UK)</li> <li>• Georg-August-Universität Göttingen Stiftung Öffentlichen Rechts (Germany)</li> <li>• Université Clermont Auvergne (France)</li> <li>• Johnson Matthey PLC (UK)</li> <li>• BASF SE (Germany)</li> <li>• Rijksuniversiteit Groningen (Netherlands)</li> <li>• Agencia Estatal Consejo Superior de Investigaciones Científicas (Spain)</li> </ul>
Funding	3,971,466.72 €
Funding UNIZG FCET	237,367.08 €
Duration	1 <sup>st</sup> March 2021 – 28 <sup>th</sup> February 2025
Leader (UNIZG FCET)	Prof. Zvezdana Findrik Blažević, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Mehmet Mervan Çakar, mag. chem.</li> <li>• Assist. Prof. Martina Sudar, Ph.D.</li> </ul>
Abstract	Carbon can form almost an unlimited number of compounds thanks to the many ways in which it can bond to other atoms. The C–C bond leads to a variety of molecules including long chains, branched chains and ring structures. Compared to chemical catalysis, enzymatic C–C bond formation using carboligases can offer a significantly larger range of molecules in a more environmentally friendly manner and with greater control. This project works on state-of-the-art enzyme technology aimed at C–C bond formation with numerous applications in industrial biotechnology.
Key words	carbon-carbon bond, enzymes, carboligases, biocatalysis, industrial biotechnology
Web page	<a href="https://cc-top-itn.eu">https://cc-top-itn.eu</a>





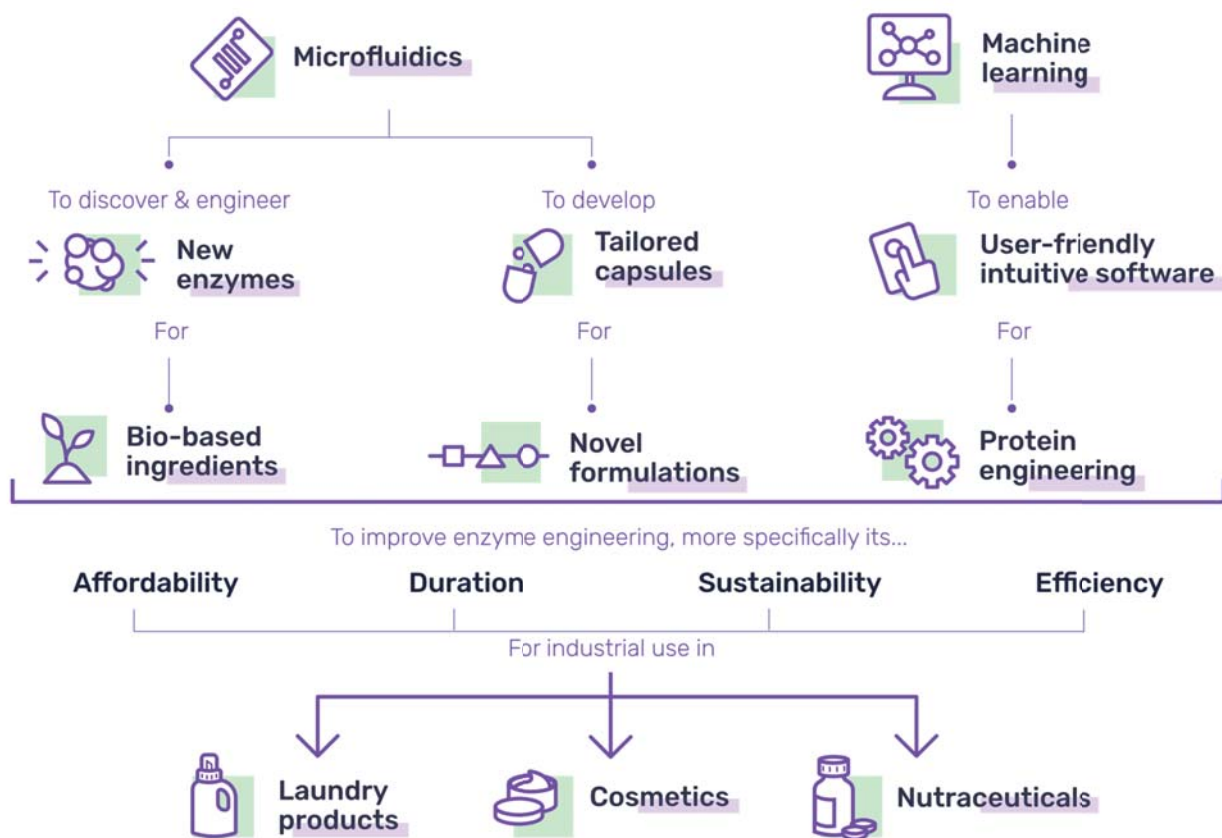
**Figure 1.** Schematic representation of goals and methodology used in C-C Top project.

Name of the project	<b>Rapid Discovery and Development of Enzymes for Novel and Greener Consumer Products</b>
Acronym	<b>RADICALZ</b>
The name of the programme and funding agency	<i>Horizon 2020 (H2020-FNR-2020-2), European Commission</i>
Coordinator	<i>Universidad Autonoma de Madrid (Spain)</i>
Partners	<ul style="list-style-type: none"> <li>• Ecole Polytechnique Federale de Lausanne (Switzerland)</li> <li>• University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</li> <li>• Sustainable Momentum SL (Spain)</li> <li>• Scienseed SL (Spain)</li> <li>• University of Exeter (UK)</li> <li>• Institut National des Sciences Appliquees de Toulouse (France)</li> <li>• Institut National de Recherche Pour L'agriculture, L'alimentation et L'environnement (France)</li> <li>• Bio-Product BV (Netherlands)</li> <li>• Biotechnology Research and Information Network AG (Germany)</li> <li>• Biocatalysts Limited (UK)</li> <li>• Universitaet Greifswald (Germany)</li> <li>• AnalytiCon Discovery GmbH (Germany)</li> <li>• Christian Hansen (Denmark)</li> </ul>
Funding	6,004,308.75 €
Funding UNIZG FCET	487,095.00 €
Duration	1 <sup>st</sup> June 2021 – 31 <sup>st</sup> May 2025
Leader (UNIZG FCET)	Prof. Zvezdana Findrik Blažević, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Ana Vrsalović Presečki, Ph.D.</li> <li>• Assist. Prof. Martina Sudar, Ph.D.</li> <li>• Lorena Mateša, mag. ing. cheming.</li> <li>• Emerik Leaković, mag. appl. chem.</li> </ul>
Abstract	<p>Global climate change poses a great risk to health and life, therefore there is a strong need to turn to green technologies. The solution could be in the application of enzymes in industrial processes with the aim of replacing existing technologies based on fossil fuels, which would bring the EU closer to achieving the goals of sustainable development. The current low success rate in enzyme discovery and engineering applications is delaying this transition.</p> <p>The RADICALZ project funded by the EU commission develops faster and more adaptable cost-effective tools for enzyme research, design and development. The results of this project are expected to accelerate the transition to a more sustainable chemical bioeconomy.</p>

Key words

biocatalysis, enzymes, green technologies, protein engineering, circular bioeconomy

Web page

<https://radicalz.eu>

**Figure 1.** The approach and the methodology for the development of new product in project RadicalZ.

Name of the project	<b>Techno-Past Techno-Future; European Researchers' Night</b>
Acronym	<b>TPTF_ERN</b>
The name of the programme and funding agency	<i>Horizon 2020 EU's Research and Innovation Funding Programme 2014–2020, Contract Number 818748</i>
Koordinator	<i>Ministry of Science and Education of Republic of Croatia</i>
Partners	<ul style="list-style-type: none"> <li>• Institute for Social Research in Zagreb (Croatia)</li> <li>• Ruđer Bošković Institute (Croatia)</li> <li>• Old Church Slavonic Institute (Croatia)</li> <li>• Institute for Adriatic Crops and Karst Reclamation (Croatia)</li> <li>• Mediterranean Institute for Life Sciences (Croatia)</li> <li>• British Council (Croatia)</li> <li>• University of Zagreb (Croatia)</li> <li>• University of Split (Croatia)</li> <li>• University of Zadar (Croatia)</li> <li>• University of Dubrovnik (Croatia)</li> <li>• University of Pula (Croatia)</li> <li>• University of Rijeka (Croatia)</li> <li>• University of Osijek (Croatia)</li> <li>• State Intellectual Property Office (Croatia)</li> <li>• Catholic University of Croatia (Croatia)</li> <li>• University North (Croatia)</li> <li>• Croatian Science Foundation (Croatia)</li> </ul>
Funding UNIZG FCET	4,000.00 €
Duration	1 <sup>st</sup> August 2018 – 31 <sup>st</sup> October 2019
Leader (UNIZG FCET)	Prof. Tatjana Gazivoda Kraljević, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Marijana Hranjec, Ph.D.</li> <li>• Assoc. Prof. Sijetlana Krištafor, Ph.D.</li> <li>• Prof. Sandra Babić, Ph.D.</li> <li>• Prof. Danijela Ašperger, Ph.D.</li> <li>• Prof. Dragana Mutavdžić Pavlović, Ph.D.</li> <li>• Assoc. Prof. Fabio Faraguna, Ph.D.</li> <li>• higher lecturer Lidija Furač, Ph.D.</li> <li>• Martina Biošić, Ph.D.</li> <li>• Ana Ratković, mag. appl. chem.</li> <li>• Ivana Sokol, magg. appl. chem.</li> <li>• Sena Jorgić, mag. appl. chem.</li> <li>• Nataša Perin, Ph.D.</li> <li>• Kristina Bobanović, mag. appl. chem.</li> <li>• Irena Ivanišević, dipl. ing.</li> <li>• Marija Sigurnjak, mag. ing. cheming</li> <li>• Kristina Tolić, mag. appl. chem.</li> <li>• Dario Dabić, mag. chem.</li> <li>• Roko Blažić, mag. ing. cheming.</li> <li>• Ivo Androšević, tech. assoc.</li> <li>• Tea Regvar, tech. assoc.</li> <li>• Silva Gluckselig, higher tech. assoc.</li> </ul>

	<ul style="list-style-type: none"> <li>• Lili Plenković, tech. assoc.</li> <li>• Slavica Kos, tech. assoc.</li> <li>• Tanja Ivančić, tech. assoc.</li> <li>• Marko Jagetić, tech. assoc.</li> <li>• UNIZG FCET students</li> </ul>
Abstract	<p><i>European Researchers' Night</i> is a long-standing initiative of the European Commission in the area of science, with an emphasis on the popularization of science, raising public awareness about the importance of "science in and for society", the importance of scientific and research work, and the European and national scientific policies. The European Researchers' Night is traditionally held every year across Europe on the last Friday in September. The University of Zagreb, as one of the partners, carried out activities in 2018 and 2019 on the European Square in Zagreb, and FCET participated in 2018 by holding the workshops <i>Funny chemistry</i>, <i>Kitchen chemistry</i>, and in 2019 the workshops <i>Chemistry – from alchemists to today</i>, <i>Chemists create the future</i> and <i>Chemistry quiz</i>.</p>
Key words	popularization of science
Web page	<a href="https://www.idi.hr/en/projects/competitive-research-projects/h2020-msca-night-project-european-researchers-night---techno-past-techno-future">https://www.idi.hr/en/projects/competitive-research-projects/h2020-msca-night-project-european-researchers-night---techno-past-techno-future</a>



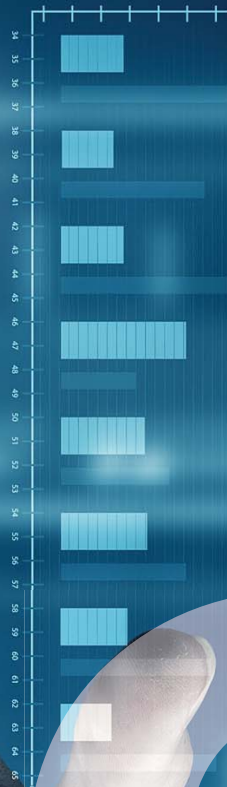
**Figure 1.** a) Lecture of Ines Vujasinović, Ph.D. at FCET as part of the *European Researchers' Night* of 2018;  
 b) *Funny Chemistry* workshop on stage at the European Square 2018;  
 c) *Kitchen Chemistry* workshop at the European Square 2018;  
 d) Workshop *Chemistry – from alchemists to today* at the European Square 2019;  
 e) *Chemistry Quiz* at the European Square 2019.





NATO  
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OTAN

# NATO Science for Peace and Security PROJECTS





Name of the project	<b>High Energy Calcium – Oxygen Batteries</b>
Acronym	<b>CaO-Bat</b>
The name of the programme and funding agency	<i>NATO Science for Peace and Security</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• Solvionic Ltd. (France)</li> <li>• Chalmers University of Technology (Sweden)</li> <li>• University of Belgrade, Institute of Chemistry, Technology and Metallurgy (Serbia)</li> </ul>
Funding	349,500.00 €
Funding UNIZG FCET	173,900.00 €
Duration	1 <sup>st</sup> September 2022 – 1 <sup>st</sup> September 2025
Leader (UNIZG FCET)	Prof. Zoran Mandić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Marijana Kraljić Roković, Ph.D.</li> <li>• Assoc. Prof. Vladimir Dananić, Ph.D.</li> <li>• Grgur Mihalinec, mag. app. chem.</li> </ul>
Abstract	<p>In the context of increasing awareness of the need to develop new and advanced battery technologies that would eliminate the shortcomings of existing lithium-ion batteries (LIBs), the main goal of this project is to provide sufficient knowledge for the efficient future development of rechargeable Ca-O<sub>2</sub> batteries with high energy density. The project relies on the knowledge and experience that exist in the partners' institutions, and the project is also supported by the French company Solvionic, Ltd., a leading company for the development of electrolytes for batteries. The successful development of the Ca-O<sub>2</sub> battery would enable solving many different practical challenges, such as increasing the driving range of electric vehicles and cheaper stationary energy storage systems. Research on the project is interdisciplinary and includes chemistry, chemical engineering and materials engineering.</p>
Key words	Ca-O <sub>2</sub> batteries, rechargeable batteries, next generation battery technology
Web page	<a href="https://ca-bat.net/index.php">https://ca-bat.net/index.php</a>



**Figure 1.** Grgur Mihalinec during the assembly of a battery cell in the glove box.



**Figure 2.** Ca-O<sub>2</sub> cell as a expected result of the project.

Ca-O<sub>2</sub>





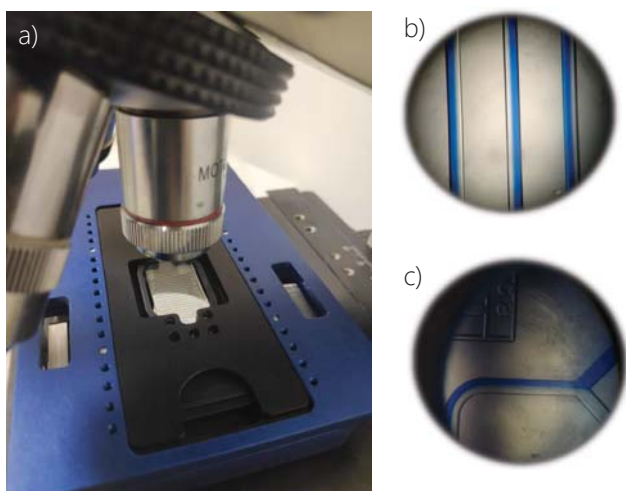


UNESCO  
PROJECTS



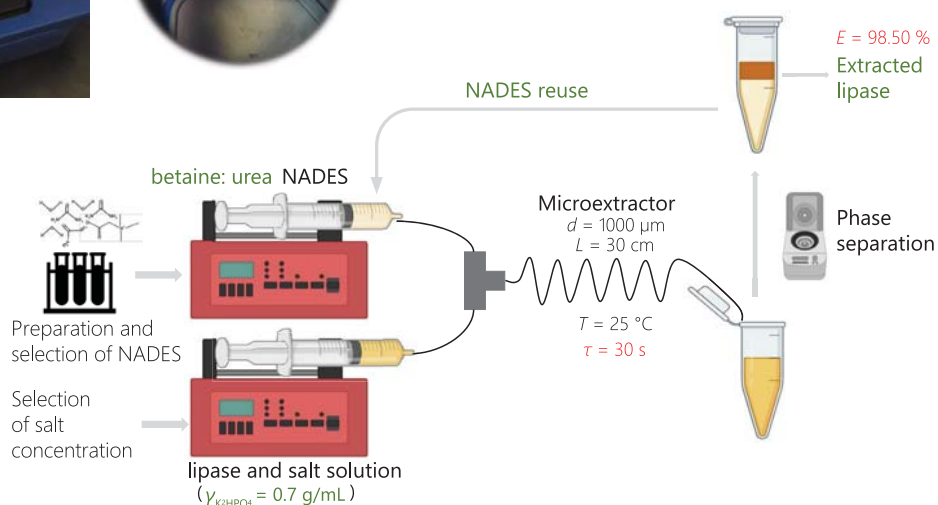


Name of the project	<b>Continuous Protein Extraction in a Micro-Extractor by Aqueous Two-Phase Systems Promoted with Natural Deep Eutectic Solvents: From Waste to Valuable Product(s)</b>
The name of the programme and funding agency	<i>PhosAgro / UNESCO / IUPAC Partnership in Green Chemistry for Life Research Grants</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• Josip Juraj Strossmayer University of Osijek Faculty of Food Technology Osijek (Croatia)</li> <li>• University of Zagreb Faculty of Food Technology and Biotechnology (Croatia)</li> </ul>
Funding	30,000.00 \$
Funding UNIZG FCET	30,000.00 \$
Duration	1 <sup>st</sup> May 2022 – 29 <sup>th</sup> April 2023
Leader (UNIZG FCET)	Assist. Prof. Anita Šalić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Martin Gojun, Ph.D.</li> </ul>
Abstract	<p>Green chemistry is based on 12 principles that represent rules, guidelines for facilitating the achievement of sustainability in process development. The aim of the project was to develop the production and application of enzymes based on the principles of green chemistry by combining food waste as a raw material, natural eutectic solvents (NADES) and microtechnology. For this purpose, specific objectives have been created to achieve the goals of the project:</p> <ul style="list-style-type: none"> <li>(i) preparation and characterization of NADES,</li> <li>(ii) extraction of enzymes at macro and micro level,</li> <li>(iii) mathematical modelling,</li> <li>(iv) development of an integrated extraction system, and</li> <li>(v) application of enzymes in the production of high-value compounds.</li> </ul>
Key words	microextractor, NADES, enzymes, aqueous two-phase systems

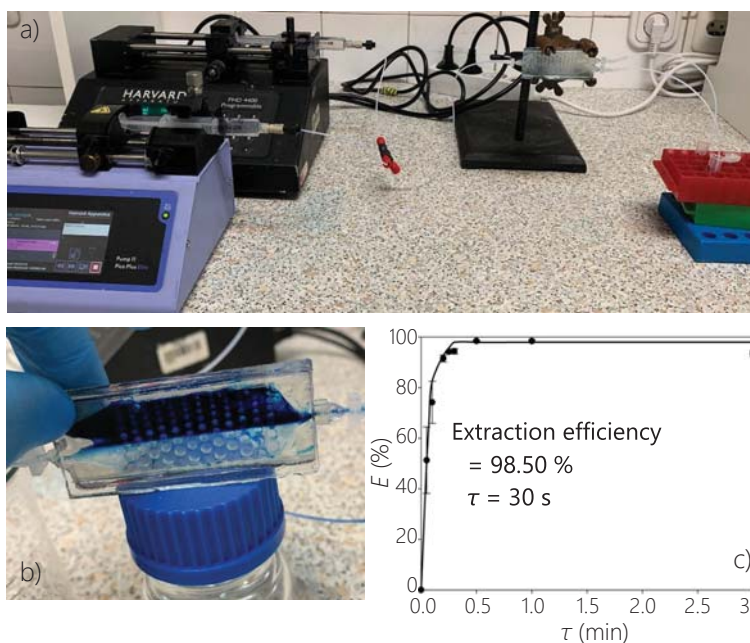


**Figure 1.** a) Microextractor and laminar flow inside b) the microchannel and c) at the entrance of the microchannel.

**Figure 2.** Schematic representation of the continuous extraction of the lipase with reuse of the eutectic solvent



**Figure 3.** a) Apparatus for continuous extraction and separation of enzymes in microstructured devices, b) microseparator, c) influence of residence time on the efficiency of enzyme extraction in a microextractor.





**Interreg**



EUROPEAN UNION

**Danube Transnational Programme**

**Danube Hazard m<sup>3</sup>c**

**INTERREG Danube  
Transnational  
Programme PROJECTS**







Name of the project	<b>Tackling Hazardous Substances Pollution in the Danube River Basin by Measuring, Modelling-Based Management and Capacity Building</b>
Acronym	<b>Danube Hazard m3c</b>
The name of the programme and funding agency	<i>Danube Transnational Programme</i>
Coordinator	<i>Vienna University of Technology (Austria)</i>
Partners	<ul style="list-style-type: none"> <li>• NTU Wien (Austria)</li> <li>• National Administration "Romanian Waters" (Romania)</li> <li>• Environment Agency Austria (Austria)</li> <li>• International Commission for the Protection of the Danube River (Austria)</li> <li>• Budapest University of Technology and Economics (Hungary)</li> <li>• <b>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</b></li> <li>• Water Research Institute (Slovakia)</li> <li>• Jozef Stefan Institute (Slovenia)</li> <li>• Bulgarian Water Association (Bulgaria)</li> <li>• Center for Ecotoxicological Research Podgorica (Montenegro)</li> <li>• Institute of Chemistry (Moldavia)</li> <li>• Ukrainian Hydrometeorological Institute State Service on Emergencies and National Academy of Sciences (Ukraine)</li> <li>• Public Institution "Waters of Srpska" (Bosnia and Herzegovina)</li> <li>• Ministry of Environmental Protection (Serbia)</li> <li>• General Directorate of Water Management (Hungary)</li> <li>• German Environment Agency (Germany)</li> <li>• Institute of Hydrometeorology and Seismology (Montenegro)</li> <li>• International Association of Water Service Companies in the Danube River Catchment Area (Austria)</li> <li>• Ministry of Foreign Affairs and Trade (Hungary)</li> <li>• Ministry of the Environment and Spatial Planning (Slovenia)</li> <li>• International Sava River Basin Commission (Croatia)</li> <li>• Ministry of the Environment of the Czech Republic (Czechia)</li> <li>• Federal Ministry of Agriculture, Regions and Tourism (Austria)</li> <li>• Ministry of Economy and Sustainable Development (Croatia)</li> </ul>
Funding	2,488,203.94 €
Funding UNIZG FCET	90,945.85 €
Duration	1 <sup>st</sup> July 2020 – 31 <sup>st</sup> March 2023
Leader (UNIZG FCET)	Prof. Tomislav Bolanča, Ph.D.

Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Šime Ukić, Ph.D.</li> <li>• Prof. Hrvoje Kušić, Ph.D.</li> <li>• Assoc. Prof. Dajana Kučić Grgić, Ph.D.</li> <li>• Assist. Prof. Matija Cvetnić, Ph.D.</li> <li>• Marinko Markić, M.Sc.</li> <li>• Martina Miloloža, mag. ing. oecoing.</li> <li>• Josipa Papac, mag. ing. oecoing.</li> <li>• Viktorija Martinjak, mag. ing. cheming.</li> </ul>
Abstract	<p>The project aims to achieve a durable and effective transnational control and reduction of HS water pollution. It contributes to the DTP objective of strengthening joint and integrated approaches to preserve and manage the diversity of natural assets in the Danube region and to the targets of Priority Area 4 of the EU Strategy for the Danube Region. Danube Hazard m3c builds on the three elements of water governance (measuring, modelling and management) complemented by capacity building.</p>
Key words	Danube region, transnational cooperation, hazardous substances, water pollution
Web page	<a href="https://www.interreg-danube.eu/approved-projects/danube-hazard-m3c">https://www.interreg-danube.eu/approved-projects/danube-hazard-m3c</a>



**Figure 1.** On-line monitoring, TU-Wien (Austria), Nodbach station.



**Figure 2.** Stationary sampler, Wulka pilot area, Austria.



EUROPEAN COOPERATION  
IN SCIENCE & TECHNOLOGY

# European Cooperation in Science & Technology PROJECTS







Name of the project

## Multi-Disciplinary Innovation for Social Change

Acronym

**SHIINE**

The name of the programme and funding agency

*COST – European Cooperation in Science & Technology*

Coordinator

*Tallinn University (Estonia)*

Partners



Source: <https://socialchangelab.eu>

- Epoka University (Albania)
- World University Service (Austria)
- Xsentrik Arts (Austria)
- Artevelde University of Applied Sciences (Belgium)
- University of Tuzla (Bosnia and Herzegovina)
- Burgas Free University (Bulgaria)
- Sofia University (Bulgaria)
- University of Zagreb Faculty of Law (Croatia)
- University of Zagreb Faculty of Political Science (Croatia)
- **University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)**
- Georgios Afxentiou Research Laboratory Ltd (Cyprus)
- University of Cyprus (Cyprus)
- University of Pardubice (Czechia)
- Tomas Bata University in Zlin (Czechia)
- Diaconia University of Applied Sciences (Finland)
- MINES ParisTech – ARMINES (France)
- Efrei Paris Pantheon ASSAS University (France)
- Eyvor Institut (Germany)
- Aristotle University of Thessaloniki (Greece)
- University of Macedonia (Greece)
- Eötvös Loránd University, Bárczi Gusztáv Faculty of Special Needs Education (Hungary)
- Health Services Management Training Centre (Hungary)
- University of Iceland (Iceland)
- School of Social Sciences (Iceland)
- Athlone Institute of Technology (Ireland)
- Limerick Institute of Technology (Ireland)
- University of Haifa (Israel)
- University of Brescia (Italy)
- LUM University (Italy)
- Riga Technical University (Latvia)
- Transport and Telecommunication Institute (Latvia)
- Kaunas University of Technology (Lithuania)
- Vilnius University (Lithuania)
- University of Malta (Malta)
- Institute of Legal, Political and Sociological Researches (Moldavia)
- University of Montenegro (Montenegro)
- Hanze University of Applied Sciences (Netherlands)
- Saxion University of Applied Sciences (Netherlands)
- Goce Delcev University of Štip (North Macedonia)
- International University Europa Prima (North Macedonia)



Partners	<ul style="list-style-type: none"> <li>• Oslo Metropolitan (Norway)</li> <li>• Elisabeth Marie Cassidy (Norway)</li> <li>• Kozminski University (Poland)</li> <li>• Poznan University of Life Sciences (Poland)</li> <li>• Universidade de Aveiro Campus de Santiago (Portugal)</li> <li>• NECE-UBI – Research Centre for Business Sciences (Portugal)</li> <li>• Bucharest University of Economic Studies (Romania)</li> <li>• University of Bucharest (Romania)</li> <li>• Faculty of Sport and Physical Education, University of Novi Sad (Serbia)</li> <li>• Youth Council Kruševac (Serbia)</li> <li>• Technical University in Zvolen (Slovakia)</li> <li>• Faculty of Informatics and Information Technologies (Slovakia)</li> <li>• Biotechnical Faculty University of Ljubljana (Slovenia)</li> <li>• InnoRenew CoE (Slovenia)</li> <li>• Faculty of Social Sciences Universitat de València (Spain)</li> <li>• University of Gothenburg (Sweden)</li> <li>• Open Knowledge Sweden (Sweden)</li> <li>• SwissIQ GmbH (Switzerland)</li> <li>• University of Applied Sciences (Switzerland)</li> <li>• Izmir Katip Celebi University (Turkey)</li> <li>• Ataturk University (Turkey)</li> <li>• The Skill Mill Northern Design Centre (United Kingdom)</li> <li>• Northumbria University (United Kingdom)</li> </ul>
Duration	3 <sup>rd</sup> October 2019 – 2 <sup>nd</sup> October 2023
Leader (UNIZG FCET)	Andrej Vidak, Ph.D.
Abstract	<p>In an increasingly complex and rapidly changing world, traditional disciplinary approaches to framing and solving social and economic problems bring diminishing returns. Knowledge alliances between higher education institutions and companies that aim to foster innovation, entrepreneurship, creativity, employability, knowledge exchange and/or multidisciplinary teaching and learning are therefore becoming increasingly necessary and relevant. The challenge is to determine what needs to be taught in the future and how it can be achieved.</p>
Key words	multidisciplinary innovations, higher education, social entrepreneurship
Web page	<a href="https://www.cost.eu/actions/CA18236">https://www.cost.eu/actions/CA18236</a> <a href="https://socialchangelab.eu">https://socialchangelab.eu</a>

Name of the project

## Green Chemical Engineering Network towards Upscaling Sustainable Processes

Acronym

**GREENERING**

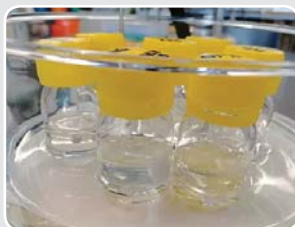
The name of the programme and funding agency

*COST – European Cooperation in Science & Technology*

Coordinator

*Associação para a Inovação e Desenvolvimento da FCT (Portugal)*

Partners



Source: <https://greenering.org>

- Faculty of Natural Sciences, University of Tirana (Albania)
- Vienna University of Technology (Austria)
- Graz University of Technology (Austria)
- Thomas More Kempen Kleinhoefstraat (Belgium)
- University of Tuzla (Bosnia and Herzegovina)
- University of Chemical Technology and Metallurgy (Bulgaria)
- University of Zagreb Faculty of Food and Biotechnology (Croatia)
- **University of Zagreb**  
**Faculty of Chemical Engineering and Technology (Croatia)**
- University of Chemistry and Technology Prague (Czechia)
- Institute of Chemical Process Fundamentals of the CAS (Czechia)
- Tallinn University of Technology (Estonia)
- University of Tartu, Institute of Physics (Estonia)
- M2P2-UMR 7340 (France)
- Sup Eng (France)
- Technical University Dortmund (Germany)
- Ruhr-University Bochum (Germany)
- National Technical University of Athens (Greece)
- Centre for Research and Technology Hellas (Greece)
- Budapest University of Technology and Economics (Hungary)
- Atmonia ehf. (Iceland)
- Atlantic Technological University Sligo (Ireland)
- Trinity College Dublin (Ireland)
- Dead Sea and Arava Science Center (Israel)
- Bar Ilan University (Israel)
- Consiglio Nazionale delle Ricerche (Italy)
- Università Politecnica delle Marche (Italy)
- Institute of General Chemical Engineering (Latvia)
- Riga Technical University (Latvia)
- Kaunas University of Technology (Lithuania)
- University of Montenegro (Montenegro)
- University of Twente (Netherlands)
- Faculty of Technology and Metallurgy, University of Skopje (North Macedonia)
- SINTEF Industry (Norway)
- Polish Academy of Sciences (Poland)
- Wroclaw University of Science and Technology (Poland)
- Instituto de Biologia Experimental e Tecnológica (Portugal)
- DES Solutio, Lda. (Portugal)
- Dunarea de Jos University of Galati (Romania)

Partners	<ul style="list-style-type: none"> <li>• Gheorghe Asachi Technical, University of Iasi (Romania)</li> <li>• Faculty of Technology and Metallurgy (Serbia)</li> <li>• Faculty of Technology, University of Novi Sad (Serbia)</li> <li>• Slovak Academy of Sciences, Institute of Chemistry (Slovakia)</li> <li>• Faculty of Medicine, University of Maribor (Slovenia)</li> <li>• Valladolid University (Spain)</li> <li>• University of Santiago de Compostela (Spain)</li> <li>• Chalmers University of Technology (Sweden)</li> <li>• University of Applied Sciences Fribourg (Switzerland)</li> <li>• Deasyl (Switzerland)</li> <li>• Middle East Technical University (Turkey)</li> <li>• Faculty of Engineering, Karadeniz Teknik University (Turkey)</li> <li>• University of Leicester (United Kingdom)</li> </ul>
Duration	14 <sup>th</sup> October 2019 – 13 <sup>th</sup> April 2024
ITC CG coordinator (UNIZG FCET)	Assoc. Prof. Dajana Kučić Grgić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Assist. Prof. Martina Sudar, Ph.D.</li> </ul>
Abstract	<p>The objective of GREENERING COST action is to promote and boost the industrial application of green chemistry and sustainable technologies, developing the tools for the scale-up and implementation of emerging processes into industry. The development of novel processes and high added value products from the integration of highly innovative technologies has been pursued and it is the objective of different programs and projects.</p> <p>Within these settings, GREENERING arises to provide tools and knowledge to the participants enabling them to be highly competitive in new breakthrough developments.</p>
Key words	green chemistry, sustainable development, supercritical fluids, industrial applications, circular economy
Web page	<a href="https://www.cost.eu/actions/CA18224">https://www.cost.eu/actions/CA18224</a> <a href="https://www.greenering.eu">https://www.greenering.eu</a>



Name of the project

# Advanced Engineering and Research of AeroGels for Environment and Life Sciences

Acronym

**AERoGELS**

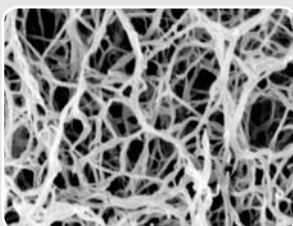
The name of the programme and funding agency

*COST – European Cooperation in Science & Technology*

Coordinator

*Universidad De Santiago De Compostela (Spain)*

Partners



Source: <https://cost-aerogels.eu>

- University of Medicine (Albania)
- Faculty of Mathematical and Physics Engineering (Albania)
- University of Natural Resources and Life Sciences Vienna (Austria)
- Katholieke Universiteit Leuven (Belgium)
- University of Liège (Belgium)
- University of Sarajevo (Bosnia and Herzegovina)
- University of Tuzla (Bosnia and Herzegovina)
- Institute of Metal Science (Bulgaria)
- **University of Zagreb**  
**Faculty of Chemical Engineering and Technology (Croatia)**
- University of Cyprus (Cyprus)
- VŠB-Technical University of Ostrava (Czechia)
- Tallinn University of Technology (Estonia)
- University of Oulu (Finland)
- University of Helsinki (Finland)
- Centre for Materials Forming (France)
- Key Aerogel (France)
- Institute of Materials Research (Germany)
- Uhde High Pressure Technologies GmbH (Germany)
- Hamburg University of Technology (Germany)
- Institute of Chemical Engineering Sciences (Greece)
- National and Kapodistrian University of Athens (Greece)
- Foundation for Circular Economy (Hungary)
- University of Debrecen (Hungary)
- Faculty of Pharmaceutical Sciences (Iceland)
- Technion-Israel Institute of Technology (Israel)
- University of Salerno (Italy)
- Politecnico di Torino (Italy)
- Faculty of Materials Science and Applied Chemistry (Latvia)
- University of Latvia (Latvia)
- Vilnius University (Lithuania)
- Kaunas University of Technology (Lithuania)
- Flen Health (Luxembourg)
- Polytechnic University (Luxembourg)
- University of Malta (Malta)
- Alexandru Ciubotaru National Botanical Garden (Moldavia)
- Faculty of Management in Herceg Novi (Montenegro)
- University of Montenegro (Montenegro)
- Utrecht University (Netherlands)
- Institute for Advanced Composites and Robotics (North Macedonia)

Partners	<ul style="list-style-type: none"> <li>• Faculty of Technology, University Goce Delcev (North Macedonia)</li> <li>• RISE PFI AS (Norway)</li> <li>• AGH University of Science and Technology (Poland)</li> <li>• Instituto de Investigação e Inovação em Saúde (Portugal)</li> <li>• University of Coimbra (Portugal)</li> <li>• "Victor Babes" National Institute of Pathology (Romania)</li> <li>• Petru Poni Macromolecular Chemistry Institute (Romania)</li> <li>• Vinca Institute for Nuclear Sciences, University of Belgrade (Serbia)</li> <li>• Polymer Institute, Slovak Academy of Sciences (Slovakia)</li> <li>• University of Maribor (Slovenia)</li> <li>• University of Ljubljana (Slovenia)</li> <li>• University of Vigo Facultad de Biología (Spain)</li> <li>• RISE Bioeconomy (Sweden)</li> <li>• RISE Innventia AB (Sweden)</li> <li>• Swiss Federal Laboratories for Materials Science and Technology (Switzerland)</li> <li>• Koc University (Turkey)</li> <li>• Altınbaş (Kemerburgaz) Üniversitesi (Turkey)</li> <li>• London South Bank University (United Kingdom)</li> </ul>
Duration	30 <sup>th</sup> April 2019 – 29 <sup>th</sup> October 2023
Leader (UNIZG FCET)	Assoc. Prof. Vilko Mandić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Ivana Panžić, Ph.D.</li> <li>• Arijeta Bafti, mag. chem.</li> </ul>
Abstract	<p>The AERoGELS action brings together knowledge on the research and technology of aerogels at the European level, uniting the academic community, industry, and regulatory experts. Aerogels are a special class of mesoporous materials with very high porosity and adjustable physicochemical properties. Although some types of aerogels have already reached the market for construction materials and aerospace engineering, the full potential of aerogels is yet to be assessed for other sectors. This action explores the application of aerogels in environmental science and life science using a multidisciplinary approach to address some of the main challenges in Europe.</p>
Key words	aerogels, advanced materials, biomedical applications, environmental applications, materials engineering
Web page	<a href="https://www.cost.eu/actions/CA18125">https://www.cost.eu/actions/CA18125</a> <a href="https://cost-aerogels.eu">https://cost-aerogels.eu</a>
Awards	<p><b>STSM</b> – Ivana Panžić, Ph.D.  <b>STSM</b> – Arijeta Bafti, mag. chem. (2)  <b>STSM</b> – Floren Radovanović-Perić, mag. ing. cheming.</p>



Name of the project

## Focused Ion Technology for Nanomaterials

Acronym

**FIT4NANO**

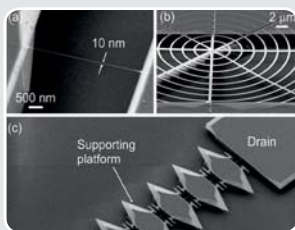
The name of the programme and funding agency

*COST – European Cooperation in Science & Technology*

Coordinator

*Helmholtz-Zentrum Dresden Rossendorf (Germany)*

Partners



Source: <https://fit4nano.eu>

- Albanian University (Albania)
- Vienna University of Technology (Austria)
- Montanuniversität Leoben (Austria)
- University of Zenica (Bosnia and Herzegovina)
- University of Tuzla (Bosnia and Herzegovina)
- **University of Zagreb**  
**Faculty of Chemical Engineering and Technology (Croatia)**
- Institute of Scientific Instruments of the CAS (Czechia)
- CEITEC (Czechia)
- Mads Clausen Institute (Denmark)
- University of Jyväskylä (Finland)
- University of Helsinki (Finland)
- Orsay Physics (France)
- Institut de Physique et de Chimie des Matériaux de Strasbourg (France)
- Bielefeld University Physik Supramolekularer Systeme (Germany)
- Helmholtz-Zentrum Berlin für Materialien und Energie (Germany)
- Foundation for Research and Technology – Hellas (Greece)
- National Technical University of Athens (Greece)
- Wigner Research Centre for Physics (Hungary)
- Waterford Institute of Technology (Ireland)
- Trinity College Dublin (Ireland)
- Technion – Israel Institute of Technology (Israel)
- University of Rome Tor Vergata (Italy)
- Institute of Solid State Physics, University of Latvia (Latvia)
- Luxembourg Institute of Science and Technology (Luxembourg)
- University of Malta (Malta)
- D. Ghitu Institute of Electronic Engineering and Nanotechnology of Academy of Science of Moldova (Moldavia)
- D. Ghitu Institute of Electronic Engineering and Nanotechnologies (Moldavia)
- Eindhoven University of Technology (Netherlands)
- University of Bergen (Norway)
- University of Oslo (Norway)
- Wrocław University of Science and Technology (Poland)
- Institute of Nuclear Physics Polish Academy of Sciences (Poland)
- University of Lisbon (Portugal)
- University of Minho (Portugal)
- "Petru Poni" Institute of Macromolecular Chemistry (Romania)
- University of Medicine and Pharmacy Grigore T. Popa (Romania)
- VINČA Institute of Nuclear Sciences (Serbia)
- University of Belgrade, Faculty of Mechanical Engineering (Serbia)

Partners	<ul style="list-style-type: none"> <li>• Institute of Materials Research (Slovakia)</li> <li>• University of Ljubljana (Slovenia)</li> <li>• Institute of Metals and Technology (Slovenia)</li> <li>• Facultad de Ciencias (Spain)</li> <li>• Institut Microelectronica de Barcelona (Spain)</li> <li>• Uppsala University (Sweden)</li> <li>• HES-SO University of Applied Sciences and Arts Western Switzerland (Switzerland)</li> <li>• Swiss Federal Laboratories for Materials Science and Technology (Switzerland)</li> <li>• Sabanci University (Turkey)</li> <li>• University of Surrey (United Kingdom)</li> <li>• University of Sheffield (United Kingdom)</li> </ul>
Duration	15 <sup>th</sup> October 2020 – 14 <sup>th</sup> October 2024
Leaders (UNIZG FCET)	Assoc. Prof. Vilko Mandić, Ph.D. Ivana Panžić, Ph.D.
Abstract	<p>The goal of the action is to create coordinated efforts in the field of ion beam-based nanoengineering that will position European researchers and commercial companies at the forefront of the rapidly advancing field of functional nanostructured materials. The action is focused on the most efficient sets of tools and techniques for the identification, fabrication, and characterization of next-generation functional nanomaterials.</p> <p>The project addresses the development of ion sources and instrumentation for the production and analysis of materials with dimensions smaller than 10 nm. The objectives are achieved through networking across Europe among researchers from theoretical and experimental groups that traditionally have not been in close interaction.</p>
Key words	focused ion beam, nanotechnology, nanomanufacturing, materials science
Web page	<a href="https://www.cost.eu/actions/CA19140">https://www.cost.eu/actions/CA19140</a> <a href="https://fit4nano.eu">https://fit4nano.eu</a>
Awards	<b>STSM</b> – Ivana Panžić, Ph.D.

Name of the project

# Network for Research, Innovation and Product Development on Porous Semiconductors and Oxides

Acronym

**NETPORE**

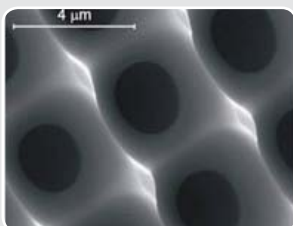
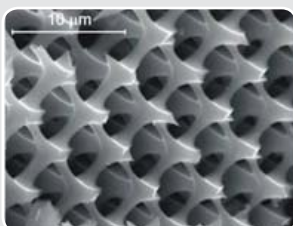
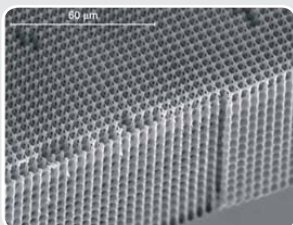
The name of the programme and funding agency

*COST – European Cooperation in Science & Technology*

Coordinator

*Universitat Rovira i Virgili (Spain)*

Partners



Source: <https://netpore.eu/NTP>

- Albanian University (Albania)
- Faculty of Mathematical and Physics Engineering (Albania)
- Porous Silicon (Austria)
- University of Graz (Austria)
- Faculty of Medicine (Bosnia and Herzegovina)
- International University of Sarajevo (Bosnia and Herzegovina)
- University of Sofia (Bulgaria)
- University of Chemical Technology and Metallurgy (Bulgaria)
- Ruđer Bošković Institute (Croatia)
- **University of Zagreb**  
**Faculty of Chemical Engineering and Technology (Croatia)**
- Faculty of Chemical Technology (Czechia)
- Brno University of Technology (Czechia)
- University of Turku (Finland)
- Åbo Akademi University (Finland)
- CNRS Université de Montpellier (France)
- Ecole Nationale Supérieure des Mines de Saint-Etienne (France)
- Friedrich-Alexander-Universität Erlangen-Nürnberg (Germany)
- National and Kapodistrian University of Athens (Greece)
- NCSR DEMOKRITOS Agia Paraskevi (Greece)
- Reykjavik University (Iceland)
- Holon Institute of Technology (Israel)
- Technion-Israel Institute of Technology (Israel)
- University of Pisa (Italy)
- Istituto Nazionale di Ricerca Metrologica (Italy)
- Riga Technical University (Latvia)
- Institute of Solid State Physics, University of Latvia (Latvia)
- Center for Physical Sciences and Technology (Lithuania)
- University of Malta, Department of Metallurgy and Materials (Malta)
- University Medical Center Groningen (Netherlands)
- University of South-Eastern Norway (Norway)
- Military University of Technology (Poland)
- Jagiellonian University (Poland)
- The Institute of Physics for Advanced Materials, Nanotechnology and Photonics (Portugal)
- Faculty of Sciences of University of Porto (Portugal)
- Politehnica University of Timisoara (Romania)
- Politehnica University of Bucharest (Romania)
- Biosense Institute (Serbia)
- Vinca Institute of Nuclear Sciences (Serbia)

Partners	<ul style="list-style-type: none"> <li>• University of Ljubljana (Slovenia)</li> <li>• National Institute of Chemistry (Slovenia)</li> <li>• AWSensors (Spain)</li> <li>• TOBB University of Economics and Technology (Turkey)</li> <li>• Okyay Tech (Turkey)</li> <li>• Macias Sensors (United Kingdom)</li> </ul>
Funding	600,000.00 €
Duration	21 <sup>st</sup> October 2021 – 20 <sup>th</sup> October 2025
Leader (UNIZG FCET)	Ivana Panžić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Assoc. Prof. Vilko Mandić, Ph.D.</li> </ul>
Abstract	<p>The NETPORE COST Action will create an international network of world-class researchers and stakeholders to promote joint ideas and initiatives aiming to bridge the gap between fundamental developments and practical applications of technologies based on porous semiconductors and oxides.</p> <p>NETPORE COST Action network will:</p> <ol style="list-style-type: none"> <li>develop of a joint research roadmap to boost the transfer of knowledge by coordinating strategies among different actors with the objective of addressing big societal challenges in energy, health and the environment, harnessing advanced technologies using porous semiconductors and oxides;</li> <li>act as a platform to further advance potentially marketable technologies by identifying strengths and weaknesses, needs and requirements of markets;</li> <li>create venues to disseminate these technological advances and provide technical formation activities for young emerging researchers; and</li> <li>promote networking activities in order to attract talent, build more and better joint research projects with clearly defined objectives to exploit technological advances and open exciting new business opportunities.</li> </ol>
Key words	porous semiconductors – nanopores, mesopores, macropores – smart functional surfaces
Web page	<a href="https://www.cost.eu/actions/CA20126">https://www.cost.eu/actions/CA20126</a> <a href="http://www.netpore.eu">http://www.netpore.eu</a>



Name of the project

## Network for Equilibria and Chemical Thermodynamics Advanced Research

Acronym

**NECTAR**

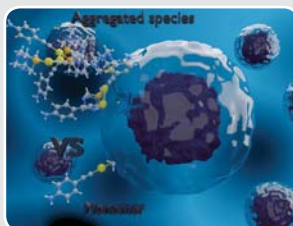
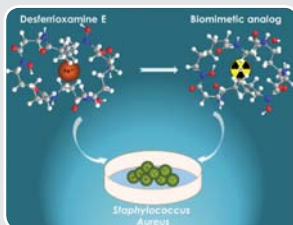
The name of the programme and funding agency

*COST – European Cooperation in Science & Technology*

Coordinator

*Università degli Studi di Messina (Italy)*

Partners



Source: <https://www.cost-nectar.eu>

- Albanian University (Albania)
- Institute of Inorganic Chemistry, University of Vienna (Austria)
- Procter and Gamble Innovation Center (Belgium)
- University of Banja Luka (Bosnia and Herzegovina)
- University of Sarajevo (Bosnia and Herzegovina)
- Institute of Electronics (Bulgaria)
- Institute of Molecular Biology (Bulgaria)
- Ruđer Bošković Institute (Croatia)
- **University of Zagreb**  
**Faculty of Chemical Engineering and Technology (Croatia)**
- Faculty of Science, Charles University (Czechia)
- Faculty of Science, Masaryk University (Czechia)
- Department of Pharmacy, University of Copenhagen (Denmark)
- University of Tartu (Estonia)
- University of Turku (Finland)
- Department of Chemistry, University of Helsinki (Finland)
- Institut des Sciences Moléculaires de Marseille (France)
- CNRS Université de Bourgogne (France)
- Technische Universität München, Molekulare Katalyse (Germany)
- Friedrich-Schiller-Universität Jena (Germany)
- Institute of Nanosciences and Nanotechnology (Greece)
- National Center for Scientific Research Demokritos (Greece)
- Faculty of Science and Informatics, University of Szeged (Hungary)
- Department of Inorganic and Analytical Chemistry, University of Debrecen (Hungary)
- University of Iceland (Iceland)
- Royal College of Surgeons in Ireland (Ireland)
- University of Florence (Italy)
- University of Parma (Italy)
- State Scientific Research Institute Center for Physical Sciences and Technology (Lithuania)
- Vilnius University (Lithuania)
- University of Malta (Malta)
- Institute of Chemistry (Moldavia)
- Faculty of Medical Sciences, University Goce Delcev (North Macedonia)
- University Ss. Cyril and Methodius (North Macedonia)
- University of Białystok (Poland)
- University of Wrocław (Poland)



Partners	<ul style="list-style-type: none"> <li>• Universidade do Algarve DQF – FCT (Portugal)</li> <li>• Instituto Superior Técnico, Universidade de Lisboa (Portugal)</li> <li>• "Petru Poni" Institute of Macromolecular Chemistry Iasi (Romania)</li> <li>• Faculty of Sciences University of Novi Sad (Serbia)</li> <li>• Vinca Institute of Nuclear Sciences (Serbia)</li> <li>• Slovak University of Technology in Bratislava (Slovakia)</li> <li>• Pavol Jozef Šafarik, University in Košice (Slovakia)</li> <li>• University of Ljubljana (Slovenia)</li> <li>• Universidad de Burgos (Spain)</li> <li>• Instituto de Ciencia Molecular, Universidad de Valencia (Spain)</li> <li>• University of Geneva (Switzerland)</li> <li>• Department of Chemistry, University of Zurich (Switzerland)</li> <li>• Department of Analytical Chemistry, Cukurova University (Turkey)</li> <li>• University of East Anglia (United Kingdom)</li> <li>• Imperial College London (United Kingdom)</li> </ul>
Duration	2 <sup>nd</sup> October 2019 – 1 <sup>st</sup> October 2023
Leader (UNIZG FCET)	Assoc. Prof. Vilko Mandić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Irena Ivanišević, Ph.D.</li> </ul>
Abstract	The thermodynamic study of chemical equilibria represents the core of many important branches of chemistry. Coordination and supramolecular chemistry, molecular modelling, and drug design are just a few examples. The significance of chemical equilibria and chemical thermodynamics, in general, arises from the simple assertion that many properties of elements and compounds largely depend on their interactions within a given system: the biological activity of an element or molecule and its impact on the environment can be explained by a detailed examination of these interactions, whose nature and strength can be assessed through chemical equilibrium and other thermodynamic studies.
Key words	chemical thermodynamics, chemical equilibria, coordination chemistry, complexes, stability constant databases
Web page	<a href="https://www.cost.eu/actions/CA18202">https://www.cost.eu/actions/CA18202</a> <a href="http://www.cost-nectar.eu">http://www.cost-nectar.eu</a>



Name of the project

## Chemobrionics

Acronym

**CBrio**

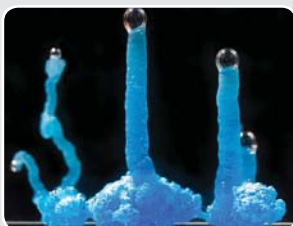
The name of the programme and funding agency

*COST – European Cooperation in Science & Technology*

Coordinator

*Faculty of Sciences, University of Granada (Spain)*

Partners



Source: <https://www.chemobrionics.eu>

- Vienna University of Technology (Austria)
- University of Vienna (Austria)
- Université libre de Bruxelles (Belgium)
- University of Sarajevo (Bosnia and Herzegovina)
- University of Tuzla (Bosnia and Herzegovina)
- Faculty of Chemistry and Pharmacy (Bulgaria)
- Institute of Chemical Engineering (Bulgaria)
- Ruđer Bošković Institute (Croatia)
- **University of Zagreb**  
**Faculty of Chemical Engineering and Technology (Croatia)**
- University of Chemistry and Technology Prague (Czechia)
- Aarhus University (Denmark)
- Technical University of Denmark (Denmark)
- University of Tartu (Estonia)
- Faculty of Science and Engineering (Finland)
- Aalto University (Finland)
- Université Grenoble Alpes (France)
- Universidade Nova de Lisboa (Portugal)
- National and Kapodistrian University of Athens (Greece)
- Aristotle University of Thessaloniki (Greece)
- University of Szeged (Hungary)
- University of Limerick (Ireland)
- University of Bologna (Italy)
- CNR Area Territoriale di Ricerca di Bologna (Italy)
- Faculty of Material Science and Applied Chemistry (Latvia)
- Utrecht University (Netherlands)
- Eindhoven University of Technology (Netherlands)
- University of Information Science and Technology (North Macedonia)
- Macedonian Academy of Sciences and Arts (North Macedonia)
- Norwegian University of Science and Technology (Norway)
- University of Warsaw (Poland)
- Faculty of Engineering University of Porto (Portugal)
- Universidade de Aveiro (Portugal)
- Politehnica University of Bucharest (Romania)
- Institutul de Cercetari Metalurgice (Romania)
- Institute of Physics Belgrade (Serbia)
- Institute of Chemistry, Technology and Metallurgy (Serbia)
- Faculty of Natural Sciences (Slovakia)
- Computer History Museum (Slovenia)
- Projekt Atol Institute (Slovenia)
- Instituto Andaluz de Ciencias de la Tierra (Spain)
- Mediterranean Institute for Advanced Studies (Spain)

Partners	<ul style="list-style-type: none"><li>• University of Gothenburg (Sweden)</li><li>• Uppsala University (Sweden)</li><li>• HES-SO Haute Ecole Spécialisée de Suisse Occidentale (Switzerland)</li><li>• ETH Zurich (Switzerland)</li><li>• Bandırma Onyedi Eylül University (Turkey)</li><li>• Ege University (Turkey)</li><li>• University of Cambridge (United Kingdom)</li><li>• University of Glasgow (United Kingdom)</li></ul>
Duration	15 <sup>th</sup> October 2018 – 14 <sup>th</sup> April 2023
Leader (UNIZG FCET)	Assoc. Prof. Vilko Mandić, Ph.D.
Abstract	<p>Self-organizing deposition processes, such as chemical gardens forming biomimetic micro- and nano-tubular shapes, have the potential to drastically improve the future design of materials and enable us to develop new methodologies for exploring, quantifying, and understanding non-equilibrium chemical systems. Chemobrionics is a newly emerging field of fundamental nonlinear and complex systemic science that intertwines with physics, chemistry, biology, and materials science, involving the study of biomimetic materials as complex systems based on self-organized structures, including semi-permeable membranes, amorphous, and polycrystalline solids.</p> <p>The aim of this COST action is to connect research groups across Europe to stimulate new, innovative, and highly efficient interdisciplinary scientific research in chemobrionics.</p>
Key words	chemical garden, complex system, origin of life, nonlinear physics, self-organization
Web page	<a href="https://www.cost.eu/actions/CA17120">https://www.cost.eu/actions/CA17120</a> <a href="https://www.chemobrionics.eu">https://www.chemobrionics.eu</a>



Name of the project	<b>Non-conventional Yeast for the Production of Bioproducts</b>
Acronym	<b>Yeast4Bio</b>
The name of the programme and funding agency	<i>COST – European Cooperation in Science &amp; Technology</i>
Coordinator	<i>Fundacion IMDEA Energia (Spain)</i>
Partners	<ul style="list-style-type: none"> <li>• Agricultural University of Tirana (Albania)</li> <li>• University of Natural Resources and Life Sciences (Austria)</li> <li>• bisy GmbH (Austria)</li> <li>• University of Antwerp (Belgium)</li> <li>• Université de Liège (Belgium)</li> <li>• University of Banja Luka (Bosnia and Herzegovina)</li> <li>• University of Mostar, Faculty of Agriculture and Food Technology (Bosnia and Herzegovina)</li> <li>• University of Chemical Technology and Metallurgy (Bulgaria)</li> <li>• University of Zagreb Faculty of Food Technology and Biotechnology (Croatia)</li> <li>• <b>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</b></li> <li>• Institute of Microbiology Academy of Sciences of the Czech Republic (Czechia)</li> <li>• Institute of Physiology of the Czech Academy of Sciences (Czechia)</li> <li>• Chr. Hansen A/S (Denmark)</li> <li>• Technical University of Denmark (Denmark)</li> <li>• Tallinn University of Technology (Estonia)</li> <li>• University of Tartu (Estonia)</li> <li>• Häme University of Applied Sciences (Finland)</li> <li>• Institut MICALIS (France)</li> <li>• Université Clermont Auvergne (France)</li> <li>• Goethe University (Germany)</li> <li>• Technische Universität München (Germany)</li> <li>• University of Patras (Greece)</li> <li>• Agricultural University of Athens (Greece)</li> <li>• Budapest University of Technology and Economics (Hungary)</li> <li>• University of Akureyri Borgir (Iceland)</li> <li>• BioPol ehf. (Iceland)</li> <li>• University College Cork, Microbiology Department (Ireland)</li> <li>• UCD Lyons Research Farm (Ireland)</li> <li>• Bar-Ilan University, Department of Chemistry (Israel)</li> <li>• Oranim College Biology (Israel)</li> <li>• University of Bari (Italy)</li> <li>• University of Milano (Italy)</li> <li>• University of Latvia (Latvia)</li> <li>• Kaunas University of Technology (Lithuania)</li> <li>• Luxembourg Institute of Science and Technology (Luxembourg)</li> <li>• Faculty of Civil Engineering and Geosciences (Netherlands)</li> <li>• Faculty of Technology and Metallurgy, University of Skopje (North Macedonia)</li> </ul>

Partners	<ul style="list-style-type: none"> <li>• Norwegian University of Life Sciences (Norway)</li> <li>• Wroclaw University of Environmental and Life Sciences (Poland)</li> <li>• University of Rzeszow (Poland)</li> <li>• National Laboratory for Energy and Geology (Portugal)</li> <li>• Institute for Bioengineering and Biosciences, Instituto Superior Técnico (Portugal)</li> <li>• Faculty of Technology Novi Sad (Serbia)</li> <li>• Faculty of Chemical and Food Technology (Slovakia)</li> <li>• Institute of Chemistry (Slovakia)</li> <li>• Biotechnical Faculty, University of Ljubljana (Slovenia)</li> <li>• IMDEA Energy (Spain)</li> <li>• Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (Spain)</li> <li>• Swedish University of Agricultural Sciences (Sweden)</li> <li>• University of Bern (Switzerland)</li> <li>• Cukurova University (Turkey)</li> <li>• Atatürk Üniversitesi (Turkey)</li> <li>• University of Kent (United Kingdom)</li> <li>• Imperial College London (United Kingdom)</li> </ul>
Duration	7 <sup>th</sup> November 2019 – 6 <sup>th</sup> May 2024
Leader (UNIZG FCET)	Prof. Ana Vrsalović Presečki, Ph.D.
Abstract	<p>Economically viable conversion of low-cost renewable feedstock into biofuels and biochemicals is of utmost importance to the establishment of a robust bioeconomy.</p> <p>In this context, the use of microorganisms for the generation of bioproducts from renewable resources offers many advantages. Yeasts have great potential to generate industrially relevant compounds from natural sources and wastes in a cost-effective and environmentally-friendly manner. Non-conventional yeasts are attracting attention owing to their potential to metabolize complex carbon sources, their alternative metabolic routes and their ability to cope with wide range of process conditions.</p>
Key words	non-conventional yeasts, organic residues, biochemicals, biofuels, fermentation
Web page	<a href="https://www.cost.eu/actions/CA18229">https://www.cost.eu/actions/CA18229</a> <a href="https://yeast4bio.eu">https://yeast4bio.eu</a>





Name of the project	<h2>Taste and Odor in Early Diagnosis of Source and Drinking Water Problems</h2>
Acronym	<b>WATERTOP</b>
The name of the programme and funding agency	<i>COST – European cooperation in science &amp; technology</i>
Coordinator	<i>Institute of Nanoscience and Nanotechnology (Greece)</i>
Partners	<ul style="list-style-type: none"> <li>• Faculty of Natural Sciences, University of Tirana (Albania)</li> <li>• University of Innsbruck (Austria)</li> <li>• University of Vienna (Austria)</li> <li>• Faculty of Science and Mathematics, University of Banja Luka (Bosnia and Herzegovina)</li> <li>• Bulgarian Water Association (Bulgaria)</li> <li>• Global Water Partnership (Bulgaria)</li> <li>• <b>University of Zagreb</b>  <b>Faculty of Chemical Engineering and Technology (Croatia)</b></li> <li>• University of Zagreb Faculty of Medicine (Croatia)</li> <li>• University of Cyprus (Cyprus)</li> <li>• Water Board of Lemesos (Cyprus)</li> <li>• Masaryk University (Czechia)</li> <li>• Institute of Hydrodynamics, Czech Academy of Sciences (Czechia)</li> <li>• Technical University of Denmark (Denmark)</li> <li>• VIA University College (Denmark)</li> <li>• AS Tallinna Vesi (Estonia)</li> <li>• Estonian University of Life Sciences, Center for Limnology (Estonia)</li> <li>• Abo Akademi University, Department of Biosciences (Finland)</li> <li>• Ålands Vatten Ab (Finland)</li> <li>• VEOLIA (France)</li> <li>• ESPCI (France)</li> <li>• Leibniz-Institute for Food Systems Biology, Technical University of Munich (Germany)</li> <li>• University of Patras (Greece)</li> <li>• National Center for Scientific Research Demokritos (Greece)</li> <li>• National Public Health Center (Hungary)</li> <li>• University of Debrecen (Hungary)</li> <li>• IT Sligo (Ireland)</li> <li>• Kinneret Academic College (Israel)</li> <li>• Ariel University (Israel)</li> <li>• University of Naples (Italy)</li> <li>• Istituto Superiore di Sanità (Italy)</li> <li>• Riga Technical University (Latvia)</li> <li>• Vilnius Gediminas Technical University (Lithuania)</li> <li>• Klaipeda University (Lithuania)</li> <li>• Malta College of Arts, Science and Technology (Malta)</li> <li>• Water Services Corporation (Malta)</li> <li>• IBED (Netherlands)</li> </ul>

Partners	<ul style="list-style-type: none"> <li>• Faculty of Technology and Metallurgy, University of Skopje (North Macedonia)</li> <li>• InkoHem d.o.o. (North Macedonia)</li> <li>• Norwegian Institute for Water Research (Norway)</li> <li>• Institute of Oceanography, University of Gdańsk (Poland)</li> <li>• Polytechnic of Porto (Portugal)</li> <li>• Centro Interdisciplinary de Investigação Marinha e Ambiental (Portugal)</li> <li>• Babes-Bolyai University (Romania)</li> <li>• National Institute for Research and Development of Isotopic and Molecular Technologies (Romania)</li> <li>• Faculty of Sciences, University of Novi Sad (Serbia)</li> <li>• Institute of Chemistry, Technology and Metallurgy (Serbia)</li> <li>• National Institute of Biology (Slovenia)</li> <li>• Polytechnic University of Catalonia (Spain)</li> <li>• University of Vic (Spain)</li> <li>• Lund University (Sweden)</li> <li>• Spacetek Technology AG (Switzerland)</li> <li>• Istanbul University (Turkey)</li> <li>• Robert Gordon University CyanoSol, School of Pharmacy &amp; Life (United Kingdom)</li> <li>• Department of Chemical Engineering, Loughborough University (United Kingdom)</li> </ul>
Funding	331,100.00 €
Duration	28 <sup>th</sup> August 2019 – 27 <sup>th</sup> February 2024
Leader (UNIZG FCET)	Prof. Danijela Ašperger, Ph.D.
Abstract	<p>An unpleasant taste and smell of water can indicate quality problems or possible risks for human health, and thus make the water unacceptable for consumers.</p> <p>Substances present in water that can cause the taste and smell of water are of natural or anthropogenic origin, and can enter the water at the source, during processing or in distribution networks.</p> <p>Solving water odor and taste problems requires the integration of</p> <ol style="list-style-type: none"> <li>a) sensory analysis to describe the problem,</li> <li>b) chemical analysis to determine the identity and concentration of odor and taste,</li> <li>c) assessment of associated risks, and</li> <li>d) appropriate water treatment to control odor and taste.</li> </ol> <p>Expertise in Europe in these dimensions is still dispersed and fragmented.</p>
Key words	water quality, sensor analysis, chemical analysis, water treatment, water safety
Web page	<a href="https://www.cost.eu/actions/CA18225">https://www.cost.eu/actions/CA18225</a> <a href="https://watertopnet.eu">https://watertopnet.eu</a>

Name of the project	<h2>European MIC Network – New Paths for Science, Sustainability and Standards</h2>
Acronym	<b>Euro – MIC</b>
The name of the programme and funding agency	<i>COST – European Cooperation in Science &amp; Technology</i>
Coordinator	<i>Bundesanstalt für Materialforschung und Prüfung (Germany)</i>
Partners	<ul style="list-style-type: none"> <li>• Faculty of Natural Science, University of Tirana (Albania)</li> <li>• Antwerp Maritime Academy (Belgium)</li> <li>• University of Banja Luka (Bosnia and Herzegovina)</li> <li>• University of Tuzla (Bosnia and Herzegovina)</li> <li>• University of Plovdiv (Bulgaria)</li> <li>• South-West University (Bulgaria)</li> <li>• <b>University of Zagreb</b> <b>Faculty of Chemical Engineering and Technology (Croatia)</b></li> <li>• Cyprus University of Technology (Cyprus)</li> <li>• University of Nicosia (Cyprus)</li> <li>• University of Chemistry and Technology (Czechia)</li> <li>• Grundfos Holding A/S (Denmark)</li> <li>• VIA University College (Denmark)</li> <li>• Institute of Molecular and Cell Biology (Estonia)</li> <li>• Research Center Wander (Finland)</li> <li>• Abo Akademi University (Finland)</li> <li>• University of Toulouse (France)</li> <li>• DECHEMA Research Institute (Germany)</li> <li>• Proact Consultants (Greece)</li> <li>• National Technical University of Athens (Greece)</li> <li>• Faculty of Water Sciences (Hungary)</li> <li>• South East Technological University – Carlow Campus (Ireland)</li> <li>• Ricerca sul Sistema Energetico (Italy)</li> <li>• Politecnico di Torino (Italy)</li> <li>• Faculty of Material Science and Applied Chemistry (Latvia)</li> <li>• Endures Bevesierweg (Netherlands)</li> <li>• Imbuss BV (Netherlands)</li> <li>• Norwegian University of Science and Technology (Norway)</li> <li>• Lodz University of Technology (Poland)</li> <li>• Nicolaus Copernicus University in Torun (Poland)</li> <li>• Faculdade de Engenharia da Universidade do Porto (Portugal)</li> <li>• Faculdade de Ciências Universidade de Lisboa (Portugal)</li> <li>• Raluca Ripan Institute of Research in Chemistry (Romania)</li> <li>• Faculty of Biology, University of Bucharest (Romania)</li> <li>• Institute of Technical Sciences, Serbian Academy of Sciences and Arts (Serbia)</li> <li>• Faculty of Pharmacy, University of Belgrade (Serbia)</li> <li>• Institute of Materials and Machine Mechanics of SAS (Slovakia)</li> <li>• Faculty of Mechanical Engineering, University of Ljubljana (Slovenia)</li> </ul>

Partners	<ul style="list-style-type: none"> <li>• Consejo Superior de Investigaciones Científicas (Spain)</li> <li>• Universidad de Zaragoza (Spain)</li> <li>• Research Institutes of Sweden (Sweden)</li> <li>• SGS (Switzerland)</li> <li>• Faculty of Engineering, Duzce University (Turkey)</li> <li>• COATEK Engineering (Turkey)</li> <li>• University of Surrey (United Kingdom)</li> <li>• University of Southampton (United Kingdom)</li> </ul>
Funding	150,000.00 €
Duration	26 <sup>th</sup> October 2021 – 25 <sup>th</sup> October 2025
Leader (UNIZG FCET)	Prof. Sanja Martinez, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Marija Vuković Domanovac, Ph.D.</li> <li>• Monika Šabić Runjavec, Ph.D.</li> </ul>
Abstract	<p>Corrosion under microbiological influence (MIC) is a phenomenon that is increasingly becoming a problem for society. MIC describes the negative effects that a material can experience due to the presence of microorganisms.</p> <p>In Europe, several research groups/other industry stakeholders are already working on MIC. Unfortunately, discussions are fragmented and the exchange of information is limited. A transdisciplinary approach is needed to rise to the challenge of materials science and biology.</p>
Key words	corrosion under microbiological influence, corrosion management, critical infrastructure, materials, standards
Web page	<a href="https://www.cost.eu/actions/CA20130">https://www.cost.eu/actions/CA20130</a> <a href="https://www.euro-mic.org">https://www.euro-mic.org</a>

Name of the project

# One Health Drugs Against Parasitic Vector Borne Diseases in Europe and Beyond

Acronym

**OneHealthdrugs**

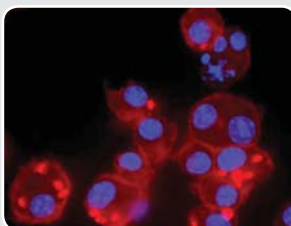
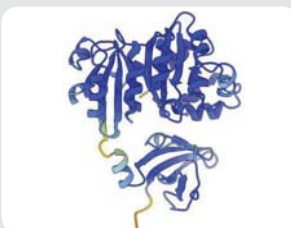
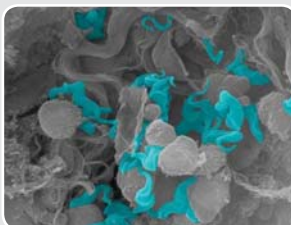
The name of the programme and funding agency

*COST – European Cooperation in Science & Technology*

Coordinator

*Universita di Modena e Reggio Emilia (Italy)*

Partners

Source: [www.onehealthdrugs.com](http://www.onehealthdrugs.com)

- Institute of Public Health (Albania)
- University of Antwerp (Belgium)
- Faculty of Medicine, University of Sarajevo (Bosnia and Herzegovina)
- Faculty of Medicine, University of Banja Luka (Bosnia and Herzegovina)
- **University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)**
- Croatian Veterinary Institute (Croatia)
- Institute of Microbiology ASCR Prague (Czechia)
- Roskilde University (Denmark)
- University of Tartu (Estonia)
- Abo Akademi University (Finland)
- Centre National de la Recherche Scientifique (France)
- University Paris-Sud Chimiothérapie Antiparasitaire (France)
- National Center for Disease Control and Public Health (Georgia)
- University of Münster, Institute of Pharmaceutical Biology and Phytochemistry (Germany)
- Boehringer Ingelheim Animal Health (Germany)
- National Hellenic Research Foundation (Greece)
- National and Kapodistrian University of Athens (Greece)
- University of Iceland (Iceland)
- Koret School of Veterinary Medicine, Hebrew University of Jerusalem (Israel)
- Kimron Veterinary Institute (Israel)
- Alma Mater Studiorum – University of Bologna (Italy)
- Latvian Institute of Organic Synthesis (Latvia)
- University of Malta (Malta)
- Vetcare Animal Clinic (Malta)
- Faculty of Medical Sciences, University Goce Delcev (North Macedonia)
- Faculty of Veterinary Medicine (North Macedonia)
- University of Warsaw (Poland)
- University of Porto (Portugal)
- Regional Institute of Oncology (Romania)
- Grigore T. Popa University of Medicine and Pharmacy of Iasi (Romania)
- ICTM institute, University of Belgrade (Serbia)
- University of Belgrade, Faculty of Chemistry (Serbia)
- Institute of Parasitology of Slovak Academy of Sciences (Slovakia)



Partners	<ul style="list-style-type: none"> <li>• University of Ljubljana (Slovenia)</li> <li>• Universidad Complutense de Madrid (Spain)</li> <li>• Universitat Autònoma de Barcelona (Spain)</li> <li>• AC Bioscience SAEPFL Innovation Park (Switzerland)</li> <li>• Bursa Technical University (Turkey)</li> <li>• Hatay Mustafa Kemal University, Faculty of Veterinary Medicine (Turkey)</li> <li>• University of Glasgow (United Kingdom)</li> <li>• Diamond Light Source Harwell Science and Innovation Campus (United Kingdom)</li> </ul>
Duration	24 <sup>th</sup> October 2022 – 23 <sup>rd</sup> October 2026
Leader (UNIZG FCET)	Prof. Sandra Babić, Ph.D.
Abstract	<p>The recent COVID-19 pandemic revealed the problems of transmission of infections from animals to humans and <i>vice versa</i>. Almost 75 % of new infections originate from animals, and existing drugs for the same are rare. In addition, drugs have been found in the environment as a result of their production and usage which raises concerns about their potentially negative impact on ecosystems.</p> <p>Therefore, the goal of this COST action is to coordinate the activity of research and development of new drugs against neglected infectious diseases, taking into account the global social and economic context of the disease.</p> <p>This will be made possible by creating an interdisciplinary network of researchers and interested stakeholders in the field of drug development.</p> <p>The intention is to develop effective, cheaper medicines, with improved tolerability and minimal impact on the environment by applying the principle of "One Health" in every step of the research process.</p>
Key words	drug development, human and animal diseases, vector-borne parasitic diseases, "One Health" approach, integrated approach
Web page	<a href="https://www.cost.eu/actions/CA21111">https://www.cost.eu/actions/CA21111</a> <a href="https://onehealthdrugs.com">https://onehealthdrugs.com</a>



Name of the project	<h2>European Network for the Promotion of Portable, Affordable and Simple Analytical Platforms</h2>
Acronym	<b>PortASAP</b>
The name of the programme and funding agency	<i>COST – European Cooperation in Science &amp; Technology</i>
Coordinators	<i>LEPABE – Laboratory for Process Engineering, Environment, Biotechnology and Energy University of Porto Faculty of Engineering (Portugal)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Liège (Belgium)</li> <li>• Faculty of Engineering and Natural Sciences, International University of Sarajevo (Bosnia and Hercegovina)</li> <li>• Institute of Electronics (Bulgaria)</li> <li>• Team Intellect (Bulgaria)</li> <li>• University of Zagreb Faculty of Geotechnical Engineering (Croatia)</li> <li>• <b>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</b></li> <li>• Institute of Analytical Chemistry (Czechia)</li> <li>• Institute of Organic Chemistry &amp; Biochemistry of the Czech Academy of Sciences (Czechia)</li> <li>• Aarhus University (Denmark)</li> <li>• Karlsruhe Institute of Technology (Denmark)</li> <li>• Tallinn University of Technology (Estonia)</li> <li>• University of Tartu (Estonia)</li> <li>• University of Helsinki (Finland)</li> <li>• Zone Luminy Biotech (France)</li> <li>• WynSep SAS (France)</li> <li>• Friedrich-Schiller-University Jena (Germany)</li> <li>• Saarland University (Germany)</li> <li>• Aristotle University of Thessaloniki (Greece)</li> <li>• Technical University of Crete (Greece)</li> <li>• Materials and Surface Science Institute, University of Limerick (Ireland)</li> <li>• Dublin City University (Ireland)</li> <li>• Ben-Gurion University of the Negev (Israel)</li> <li>• University of Florence (Italy)</li> <li>• University of Rome La Sapienza (Italy)</li> <li>• Riga Technical University (Latvia)</li> <li>• Institute of Solid State Physics, University of Latvia (Latvia)</li> <li>• Luxembourg Institute of Science and Technology (Luxembourg)</li> <li>• Delft University of Technology (Netherlands)</li> <li>• University Mother Teresa (North Macedonia)</li> <li>• Foundation Szigija Skopje (North Macedonia)</li> <li>• Nabas AS (Norway)</li> <li>• Norwegian Institute for Water Research (Norway)</li> <li>• Wroclaw University of Technology (Poland)</li> <li>• Maria Curie Skłodowska University (Poland)</li> <li>• International Iberian Nanotechnology Laboratory (Portugal)</li> </ul>

Partners	<ul style="list-style-type: none"> <li>• University of Porto (Portugal)</li> <li>• National Institute for Lasers, Plasma and Radiation Physics (Romania)</li> <li>• Emergency University Hospital, Ophthalmology Clinic (Romania)</li> <li>• Institute of Physics Belgrade (Serbia)</li> <li>• Faculty of Technology, University of Novi Sad (Serbia)</li> <li>• InnoRenew CoE (Slovenia)</li> <li>• University of Ljubljana (Slovenia)</li> <li>• University of Murcia (Spain)</li> <li>• University of Alicante (Spain)</li> <li>• Uppsala University (Sweden)</li> <li>• Haute Ecole Spécialisée de Suisse Occidentale (Switzerland)</li> <li>• University of Geneva (Switzerland)</li> <li>• İstinye University (Turkey)</li> <li>• Nanosolar Plasmonics (Turkey)</li> <li>• University of Liverpool (United Kingdom)</li> <li>• Paraytec Ltd (United Kingdom)</li> </ul>
Duration	3 <sup>rd</sup> October 2017 – 2 <sup>nd</sup> April 2022
Leader (UNIZG FCET)	Prof. Dragana Mutavdžić Pavlović, Ph.D.
Abstract	<p>Research in separation science is a thriving field with dedicated journals and conferences. Separation methods play a very important role in analytical, pharmaceutical and industrial practice as well as in medicine, forensics, food analysis, <i>etc.</i></p> <p>However, the high cost of such instruments and the need for skilled professionals to operate them are limiting their use to a few social and economic spheres of society. Modern separation techniques are no longer limited to large instrumentation, with numerous studies demonstrating the possibility of achieving fast and efficient analysis using low-cost devices. Such devices are very useful for small and medium-sized companies and small organizations that do not have the financial and human resources to afford big and expensive instruments.</p> <p>Ideally, these instruments should also be portable allowing their use on site/in the field and be easily carried around.</p> <p>The portASAP Cost Action aims to work toward this goal by involving scientists working in separation sciences, engineers, chemometricians and other scientific fields, with end-users without expertise in analytical chemistry and instrument manufacturers. PortASAP will provide a platform where analytical needs in applied areas can be matched with expertise. It will also provide formation and promote awareness regarding the potential of low-cost analytical techniques.</p>
Key words	lab-on-a-chip, capillary electrophoresis, forensic, agri/food, hardware
Web page	<a href="https://www.cost.eu/actions/CA16215">https://www.cost.eu/actions/CA16215</a> <a href="https://portasap.eu">https://portasap.eu</a>





Erasmus+

ERASMUS  
PROJECTS

10





Name of the project	<b>Creating a Digital Study Environment for Sustainable Chemistry</b>
Acronym	<b>DigiChem</b>
The name of the programme and funding agency	<i>Erasmus</i>
Coordinator	<i>University of Zagreb Faculty of Chemical Engineering and Technology (Croatia)</i>
Partners	<ul style="list-style-type: none"> <li>• Justus Liebig University Giessen (Germany)</li> <li>• University of Padua (Italy)</li> <li>• University of Ljubljana (Slovenia)</li> </ul>
Funding	256,122.00 €
Funding UNIZG FCET	42,700.00 €
Duration	1 <sup>st</sup> February 2022 – 31 <sup>st</sup> January 2025
Leader (UNIZG FCET)	Prof. Hrvoje Kušić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Ana Lončarić Božić Ph.D.</li> <li>• Prof. Tatjana Gazivoda Kraljević Ph.D.</li> <li>• Assist. Prof. Marin Kovačić Ph.D.</li> <li>• Assist. Prof. Matija Cvetnić Ph.D.</li> <li>• Josipa Papac Zjačić, mag. ing. oecoiing.</li> <li>• Stefani Tonković, mag. ing. oecoiing.</li> <li>• Ivana Sokol, mag. appl. chem.</li> </ul>
Abstract	The aim of the project is development of platform for education of students at master level in the field of sustainable chemistry. In that purpose four modules ( <i>i.e.</i> courses) are developed and held to students in hybrid mode: one part will undergo contact classes, while another online including combination of pre-recorded materials and teaching over digital platforms ( <i>Zoom, Teams</i> ), along with the recording of contact classes and laboratory practice. In such manner, al the modules' materials will be available to students at anytime.
Key words	sustainable environment, digital education, advanced materials, water treatment, sustainable chemistry

4<sup>th</sup> Semester (December, 2023–January, 2024)

### Sustainable Water Treatment

UNIZG FCET, Zagreb, Croatia



1<sup>st</sup> Semester (January–February, 2023)

### Introduction to Sustainability

UNIPD, Padova, Italy



3<sup>rd</sup> Semester (September–October, 2023)

### Sustainable Materials Chemistry: Energy Materials

JLU, Giessen, Germany



2<sup>nd</sup> Semester (May–June, 2023)

### Sustainable Organic Chemistry

UL, Ljubljana, Slovenia

**Figure 1.** DigiChem: Digital platform for teaching of graduate students in the area of the sustainable chemistry which includes four institutions from Italy, Germany, Slovenia and Croatia.



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Name of the project	<b>Bridging the Gap Between Biotechnology and Industry: Integrating Design Thinking and Flipped Learning</b>
Acronym	<b>BIOTE(A)CH</b>
The name of the programme and funding agency	<i>Erasmus+ KA220-HED – Cooperation partnerships in higher education</i>
Coordinator	<i>Çanakkale Onsekiz Mart University (Turkey)</i>
Partners	<ul style="list-style-type: none"> <li>• University of Maribor (Slovenia)</li> <li>• Tuscia University (Italy)</li> <li>• University of Zagreb (Croatia)</li> <li>• Mellis Education Technology (Turkey)</li> <li>• Democritus University of Thrace (Greece)</li> <li>• Glycogest (Turkey)</li> </ul>
Funding	250,000.00 €
Funding UNIZG FCET	31,700.00 €
Duration	30 <sup>th</sup> December 2022 – 29 <sup>th</sup> December 2024
Leader (UNIZG FCET)	Assist. Prof. Anita Šalić, Ph.D.
Co-workers (UNIZG FCET)	<ul style="list-style-type: none"> <li>• Prof. Bruno Zelić, Ph.D.</li> </ul>
Abstract	<p>The project aims to create a <i>curriculum</i> that will help students in transition from higher education to the labor market oriented towards agricultural biotechnology.</p> <p>By combining "design thinking" and "flipped learning" principles, students will be able to learn about the latest technological approaches in an active process.</p> <p>The main idea behind the project is to train students and equip them with sufficient knowledge and tools to face the gaps in the current market focused on agricultural biotechnology and environmental sustainability.</p> <p>During the learning process, the main focus will be on solving new challenges in the industry and overcoming the limitations of traditional approaches so that students have practical skills upon graduation.</p>
Keywords	<i>curriculum</i> development, design thinking, flipped learning, biotechnology
Web page	<a href="https://www.bioteacheu.com">https://www.bioteacheu.com</a>

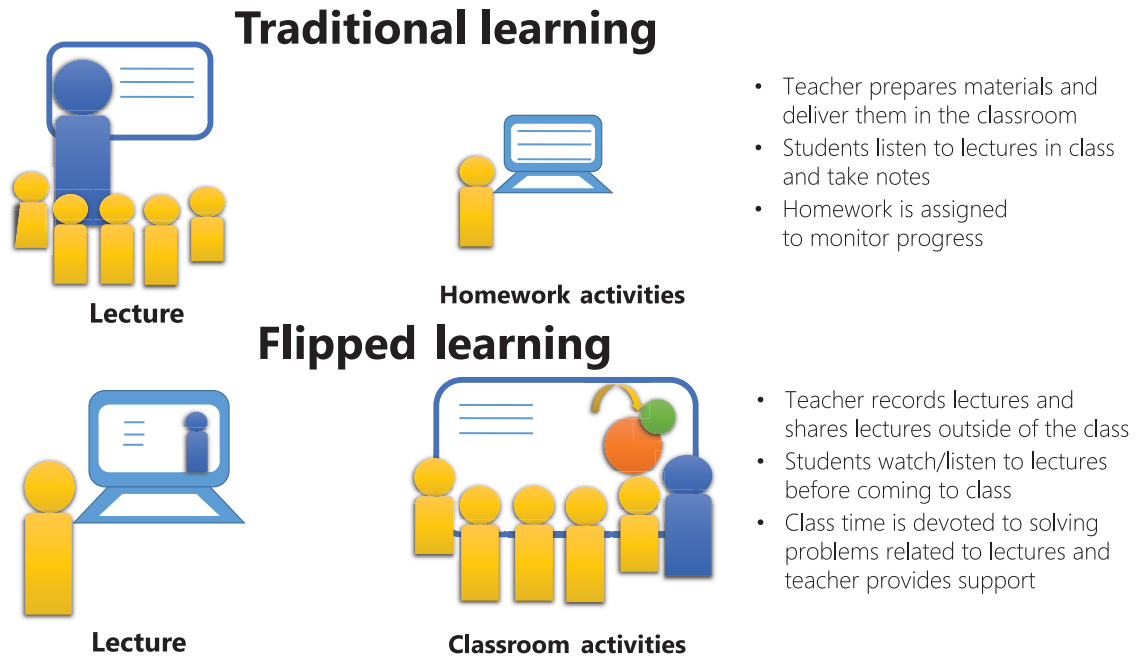


Figure 1. Comparison of the traditional and flipped learning approach.



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University of Zagreb  
Faculty of Chemical Engineering  
and Technology



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“Chemical Engineers are not gentle people,  
they like high temperatures and high pressures.”

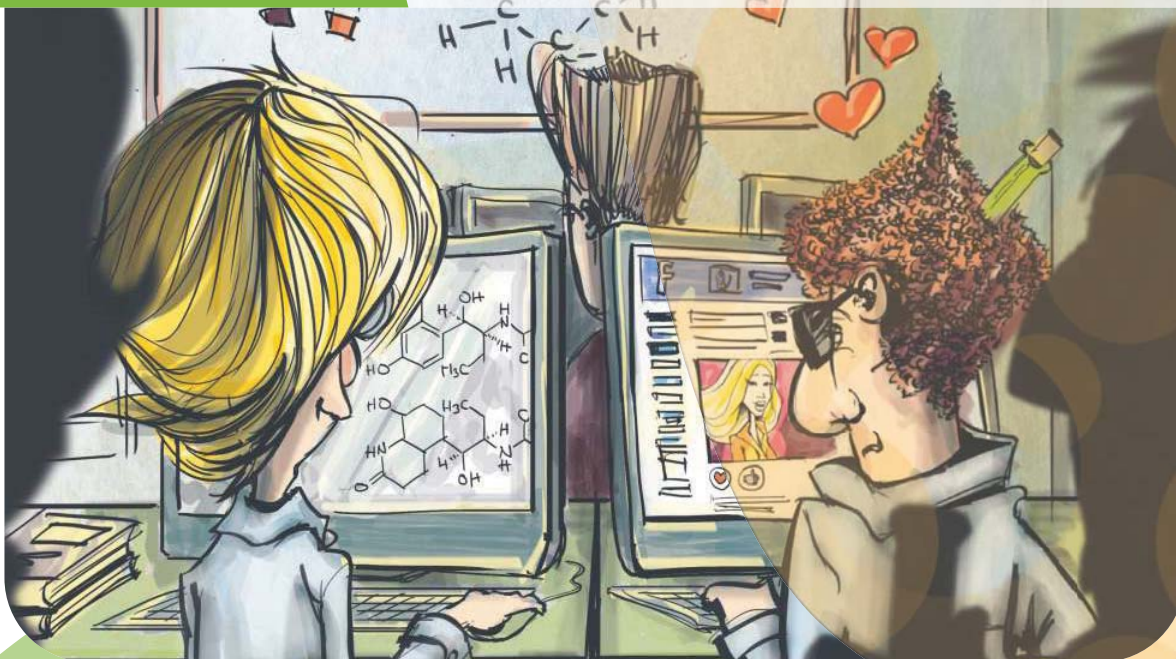
*Steve LeBlanc*

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# University of Zagreb Faculty of Chemical Engineering and Technology



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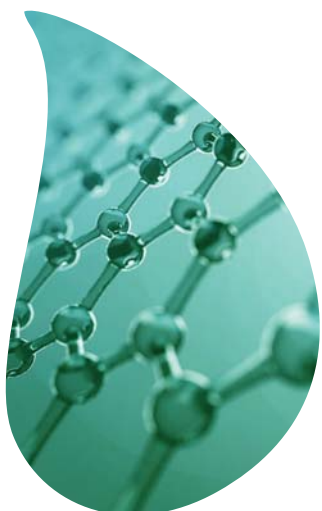
## ENVIRONMENTAL ENGINEERING

- microorganisms in environmental protection and production of chemicals
- ecodesign of products and processes
- treatment of waste streams
- climate neutral technologies





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