



03/2021

NEWSLETTER



Our vision

is to shape the European hightech ecosystem to secure a sustainable and prosperous society.

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Editorial

CONTEMPORARY ISSUES FROM THE NETWORK

Dear Ladies and Gentlemen,

the third quarter of 2021 has kept BNN's team very busy with all the preparation for moving to our brand-new offices at the Kaiser-Josef-Platz in Graz. Some of you had already the opportunity to meet us there during the [Bio-NanoNet's Annual Forum & BNN Networking Session](#), organized in September, the first time as a hybrid event. This event highlighted some of the topics that are of utmost importance not only for the scientific and industrial field, but for the whole society, since our future is linked to the design and production of sustainable and innovative technologies that will allow solving important social challenges in the coming years. Some of the topics that were approached and discussed during the event were related to the role of nanomaterials in circular and toxic-free environment, the role of the OECD and its contribution in supporting harmonization of safety assessment and further refining the Safe-and-Sustainable-by-Design concept, or the needs of cooperation within PARC to approach it. Also results obtained in the BIORIMA project were presented (e.g., a technique that permits to study the skin reaction after an exposure to nanoparticles).

In July, we welcomed our new members of the BioNanoNet Association CHASE, BRFFA, Virtual Vehicle Research GmbH, Seven Past Nine and PyroScience GmbH in our [BioNanoNet Member Welcome Webinar](#), giving them the opportunity to introduce themselves and their expertise to us. The webinar highlighted once more the high variety of fields and sectors that merges within the BioNanoNet Association (e.g., focusing on sustainable digitalized chemical process industry, biomedical and life sciences, virtual vehicles development or data management) and that confers to BioNanoNet a perfect place to look for the right partners for the development of big, multidisciplinary and complex projects.

Last but not least, the BNN team is more than pleased and happy to welcome and introduce you Christina, our colleague that has been recently hired and who will lead our area of 'Complementary Business Support'.

We wish you a nice and fruitful autumn and are looking forward to contact you again showing BioNanoNet's latest news in December!

Andreas & the BNN-team

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BioNanoNet News

NEW BNN STAFF

We are happy to welcome our new BioNanoNet team member!



Christina PFEIFER

Hello!

My name is Christina Pfeifer and as a new Team-Member of BNN, it's my pleasure to introduce myself.

I studied Environmental System Sciences at the University of Graz and during this time I also had the opportunity to work at the Institute of Process and Particle Engineering at TU Graz where I was involved in projects on the optimization of technology networks, resource management and ecological assessments of industrial processes. This resulted in completing my master's thesis in the course of an EU research project.

After finishing my studies, I was the person in charge for environmental and energy management within a bigger company and have been responsible for the coordination, maintenance and further development of the management systems in Austria and Germany.

In June 2021 I joined the BNN team! With my background in Environmental System Sciences and project management I'm really happy to support the "Complementary Business Support" area.

Best wishes,
Christina

Contact:

christina.pfeifer@bnn.at

+43 699 155 266 04

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BioNanoNet member presentations

COMPETENCE CENTER CHASE GMBH

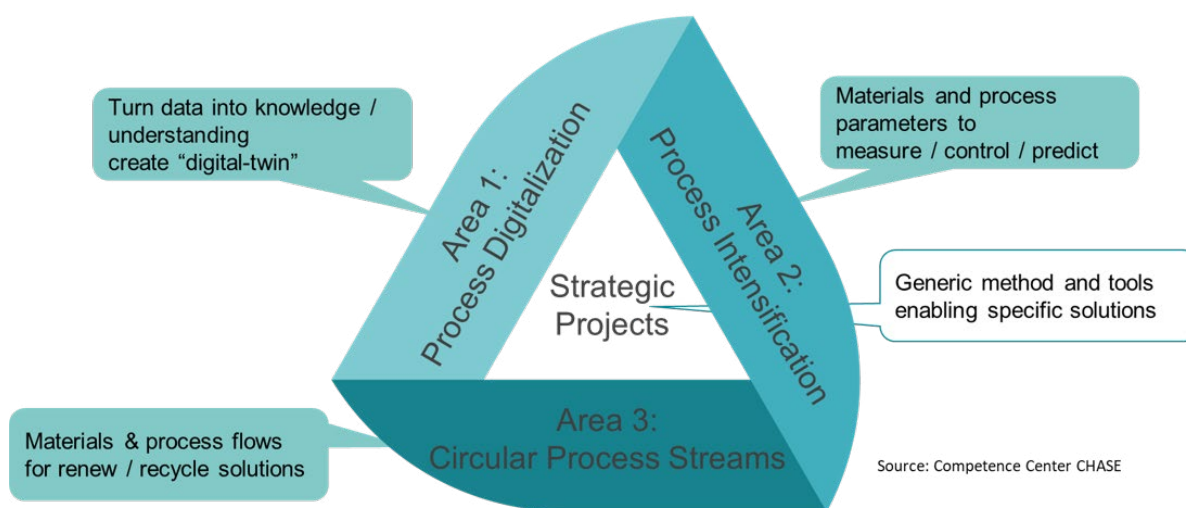


Chemical Systems engineering

The Competence Center CHASE GmbH, founded in October 2019 at the Johannes Kepler University Linz (JKU Linz) and the Technical University Vienna (TU Vienna), is a COMET Centre within the COMET – Competence Centers for Excellent Technologies Program and funded by BMK, BMDW and the federal states Vienna and Upper Austria. The COMET Program is managed by FFG.

Working towards a sustainable digitalized chemical process industry

CHASE is developing a new knowledge platform for the energy-, resource- and cost-intensive processes of the process industry. To this end, CHASE will generate a highly networked spectrum of methods in three research areas in the industrial environment:



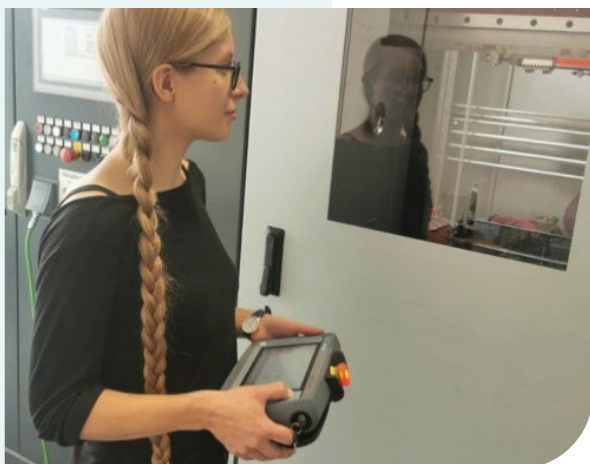
Research

The scientific work of the Competence Center CHASE GmbH is organized in Multi-Firm Projects that are grouped into these different Areas which are also linked to each other. In the Projects of each Area the participating companies are working together with the scientific partners to advance on applied topics of relevance to several industrial partners. These topics are supported by a Strategic Project from each Area, where the scientific partners concentrate work on

more fundamental aspects of CHASE related research topics. As CHASE develops in the upcoming years it is planned to advance these topics also into Multi-Firm Projects.

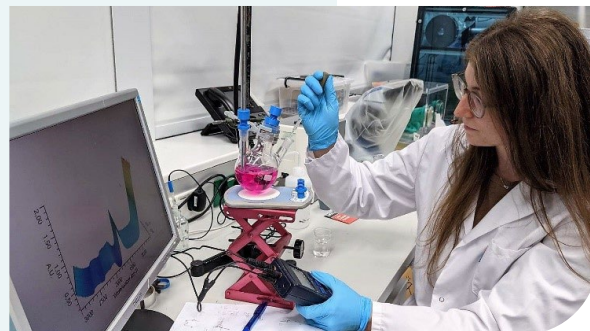
Area 1 – Process Digitalization

In the area of Process Digitalization, hybrid modeling methods are being developed to create digital twins of process and value chains. The combination of mechanistic modeling and novel approaches in data science reveals robust models for the industrial environment. This enables predictive and flexible production while improving the quality of products.



Area 2 – Process Intensification

The area Process Intensification is concerned with the design, research, development and application of innovative process and process equipment approaches, with a focus on the (bio)chemical and polymer technology industries. The aim of this research is to optimize process efficiency, sustainability and safety.



Area 3 – Circular Process Streams

In the field of circular economy, the central issue of data and knowledge management to improve quality assurance and process understanding of circular processes is addressed. The production of next generation regranulates and recompounds enables end products in a very wide range of applications.



Interdisciplinary

Many prestigious companies participate in the innovation work of the interdisciplinary competence center. By combining the scientific competencies of JKU Linz, TU Vienna and ot-

her non-university research institutions, CHASE enables these corporate partners to quickly enter efficient and sustainable production. With more than 30 partners from science and industry, CHASE can take the next big steps toward sustainable process industries.

CHASE has locations at the JKU Linz and the TU Vienna and currently employs 40 staff members.



JKU Linz – LIT-Factory (© OIC GmbH)



TU Vienna – Arsenal (© TU Vienna)

Contact

Competence Center CHASE GmbH
Patrick PAMMER, Managing Director
Christian PAULIK, Scientific Director
office@chasecenter.at
www.chasecenter.at



Patrick PAMMER
Managing Director



Christian PAULIK
Scientific Director

BIOMEDICAL RESEARCH FOUNDATION OF THE ACADEMY OF ATHENS (BRFAA)



Bionanotechnology and Nanochemistry Group, BRFAA

The Biomedical Research Foundation of the Academy of Athens (BRFAA) is the most recent addition to the Life Sciences research organizations in Greece, which began its activities in 2004 and one of the leading research institutes in Europe where basic and clinical research are co-hosted, with a focus on translational activities. BRFAA's assortment of facilities is complemented by:

a) The Greek Biobank for the collection and storage of tissues, fluids and surgical specimens. This infrastructure (BBMRI-GR) has formally joined the European entity as a member.

- b) The Greek Translational Medicine infrastructure (EATRIS-GR) which has started its activities in collaboration with the neighboring "Sotiria" hospital by developing a 36-bed clinical unit for Phase I clinical trials and drug Bioequivalence studies.
- c) The Greek Genome Center that is organized to offer genomic analyses (Next Generation whole genome or exome sequencing and RNA sequencing) and High-Performance Computational services at the cell population or single cell level.

Furthermore, BRFAA has recently received funding for the construction of a new center dedicated to Personalized Medicine and Nanotechnology.

The Bionanotechnology and Nanochemistry Group (BNCG) at BRFAA, established in 2010, has been involved in more than 12 EC and nationally funded projects and currently numbers 10 scientists (Postdoctoral Researchers, PhD and Master's students as well as Technicians). Its core expertise is the study of biomolecular interactions and interfacial phenomena, with emphasis being given on their applications in the development of biosensors, tissue engineering and nanomaterial-based drug delivery systems. The group is assisted in its activities by an impressive suite of state-of-the-art infrastructure for the characterization and optimization of biomolecular interactions, the development of advanced surface functionalization protocols and their applications in assay development, cell culturing and nano-carrier formulation for drug delivery, which includes a Potentiostat/Galvanostat/EIS analyzer, Spectrophotometers (Circular Dichroism, Multimode plate reader), a Quartz Crystal Microbalance (eQCM-D) and microfluidic control devices for flow injection analysis and nano-

particle synthesis. The group is very active in the following fields:

Aptamers: small and versatile

Aptamers are small oligonucleotide sequences whose acquisition of 2D and 3D conformations allows them to bind to a target analyte with comparable specificity, selectivity and avidity to antibodies. Unlike antibodies, they are much more resilient molecules as they are less sensitive to temperature and pH variations. Moreover, they can be synthesized at a fraction of the cost of antibodies and can be easily modified for downstream applications. Aptamers are usually selected through a process called Systematic evolution of ligands by exponential enrichment (SELEX). BNCG has developed a toolbox to considerably simplify this process, through the use of Molecular Docking and Dynamics simulations. This has allowed us to design aptamer sequence de novo against novel analytes of interests or optimize existing ones by employing a genetic algorithm that randomly introduces mutation

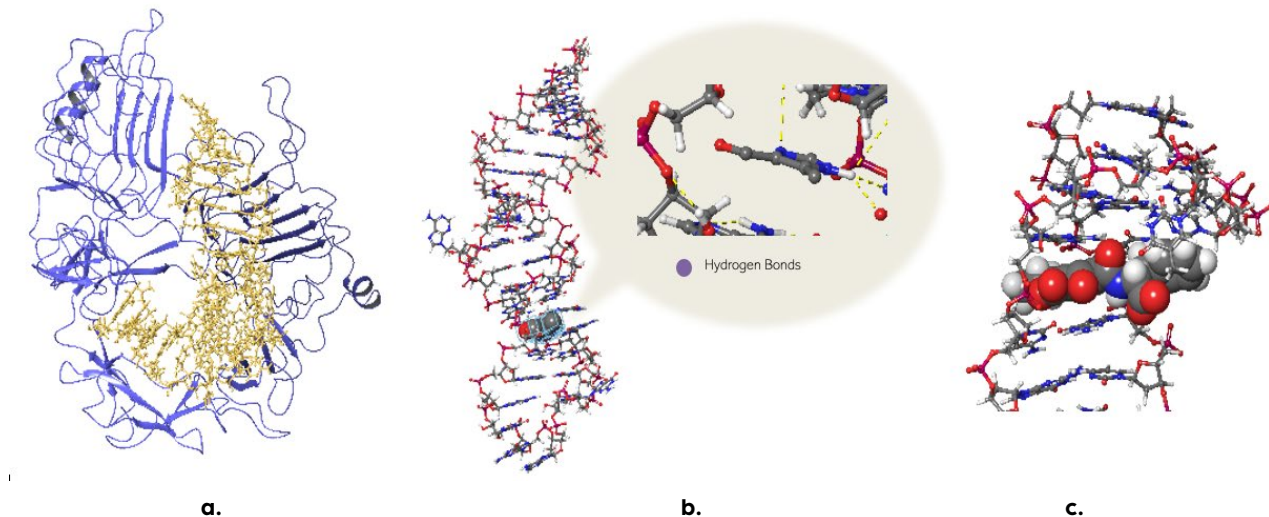


Figure 1: a. EGFR aptamer CL4 bound to the extracellular domain of EGFR, b. Repurposing the aptamer against histamine aptamer towards the recognition of Methylimidazole c. Optimized aptamer against Ochratoxin A

to the aptamer sequences. Optimized sequences have been extensively employed in the development of biosensors, and more recently in the field of medicine, as these functional nucleic acids can not only target cells with specific membrane receptors, but also exert and immunomodulatory role or act as small molecule inhibitors.

Surface (bio)functionalization techniques: nano-coatings and surface patterning

In parallel, the laboratory is very active in the development of advanced surface functionalization techniques for a plethora of applications. As an example, material-selective nano-coatings have been developed for the

biofunctionalization of silicon nitride over silicon dioxide surfaces, towards the development of a photonic-based sensor for cancer biomarker detection in blood (Fig. 2a). Moreover, BNCG has extensive expertise on the use of click-chemistry for the introduction of surface modifications, through, for example, photo-induced biomolecule grafting and hydrogel polymerization with high spatial resolution (Fig. 2b and 2c). Surface chemistry has also been applied for micro- and nano- patterning of polymer substrates for cell-culturing and tissue engineering and the investigation of cellular response to different substrate chemistries and topographies.

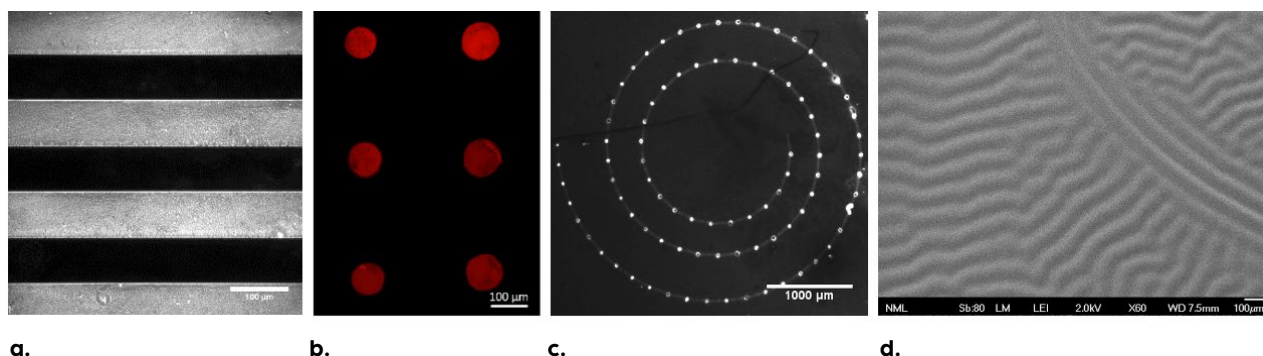


Figure 2 a. Material-selective surface functionalization where fluorescently-tagged antibodies get immobilized exclusively on silicon nitride versus adjacent silicon dioxide. b. Aptamers immobilized onto chemically-modified surfaces with the use of thiol-ene reactions c. Photoinduced hydrogel formation incorporating fluorescently-tagged antibodies d. SEM image of a PDMS substrate where topography that favors cell adhesion and proliferation has been introduced through chemical treatments

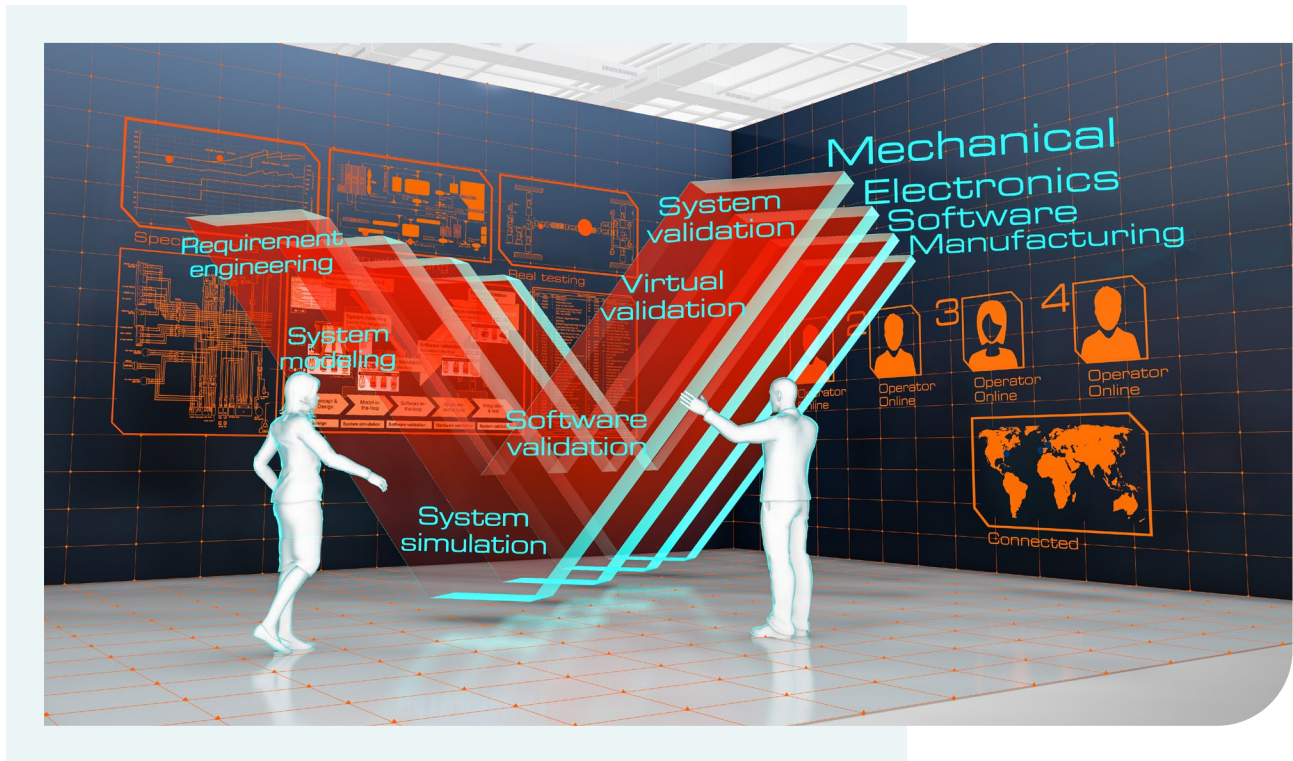
The Biomedical Research Foundation of the Academy of Athens (BRFAA). presented its organization at our 2nd BioNanoNet Member Welcome Webinar which took place virtually on 7th July 2021. This talk was given by George Tsekenis. [Enjoy watching the video here!](#)

Contact

Biomedical Research Foundation of the Academy of Athens (BRFAA), Greece
Bionanotechnology and Nanochemistry Group
George TSEKENIS
gtsekenis@bioacademy.gr
www.bioacademy.gr



VIRTUAL VEHICLE RESEARCH GMBH



Software is a strong research focus since it plays a central role for all industries.

Virtual Vehicle Research GmbH, based in Graz, is Europe's largest research centre for virtual vehicle development with around 300 employees. The research focus is the consistent virtualisation of vehicle development in the automotive and railway industries and software-defined functions. The close linking of numerical simulations and hardware tests leads to a comprehensive HW-SW overall-system design and to the automation of test and validation procedures at a defined quality level. The focus on industry-oriented research makes VIRTUAL VEHICLE an enabler for vehicle technologies of the future.

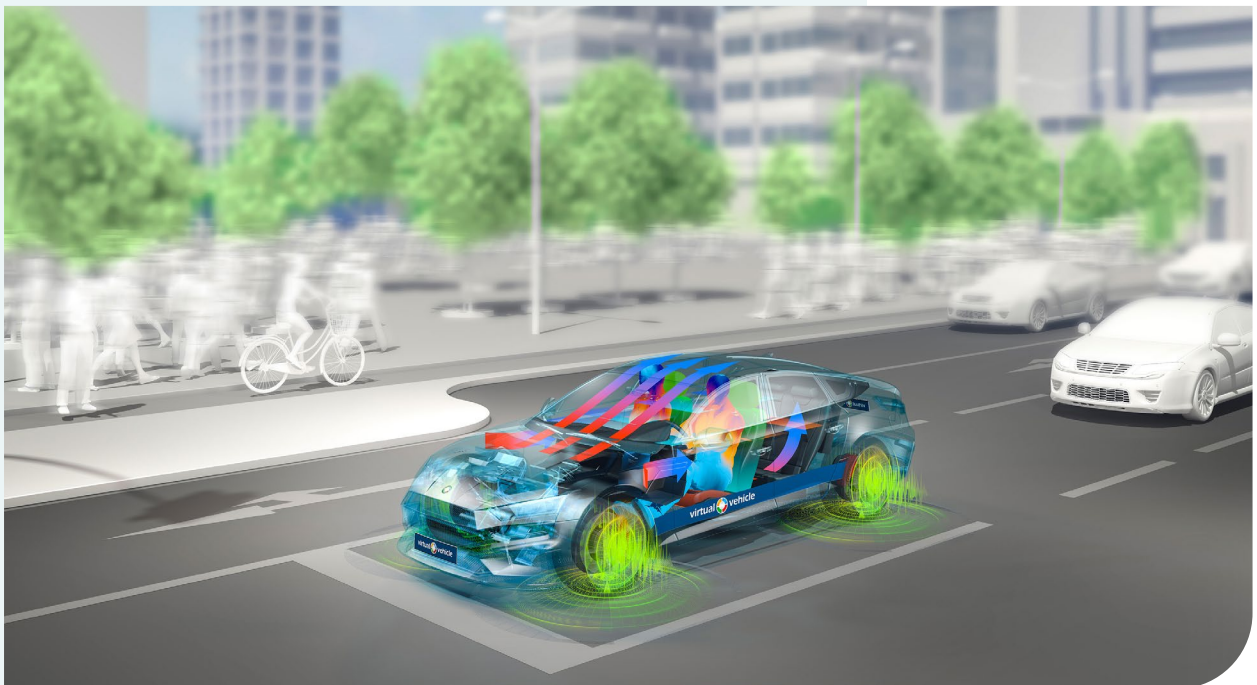
VIRTUAL VEHICLE is the largest COMET-funded research centre in Austria and cooperates with about 100 national and international industrial partners (OEMs, Tier-1 and Tier-2 suppliers as well as software providers) and more than 40 national and international scientific institutions.

Software in particular is a strong research focus since it plays a central role not only in the mobility industry – as software becomes central for all industries, this approach drives organizations to adapt their product visions, development approaches and business models.

A good example for the industry-shift to a software-centred approach is the EU-project USPIM, which is led by VIRTUAL VEHICLE. This international endeavour aims to unleash the potential in simulation - from smart engineering, virtual commissioning to predictive maintenance in system operation. Credible Digital Twins will be the game changer for accelerating innovation and reducing development costs in different industries. Increasing trust in system modelling and simulation will boost Digital Twin enriched system development, production, and operation.

As a technology enabler, VIRTUAL VEHICLE is leading the way in driving key pillars of

Green Mobility and Integrated Transport: the development of autonomous driving, connected vehicles and the electrification of the powertrain. The research centre enables clients to achieve a decisive technological lead, thanks to an innovative power, an effective integration in the European research platform, a global and close cooperation with the best universities and corporate R&D departments, and ultimately thanks to scientific excellence. VIRTUAL VEHICLE creates value by shaping the digitalisation of vehicle development and by connecting the virtual and real worlds. The foundation for this is a team of highly qualified and committed staff.

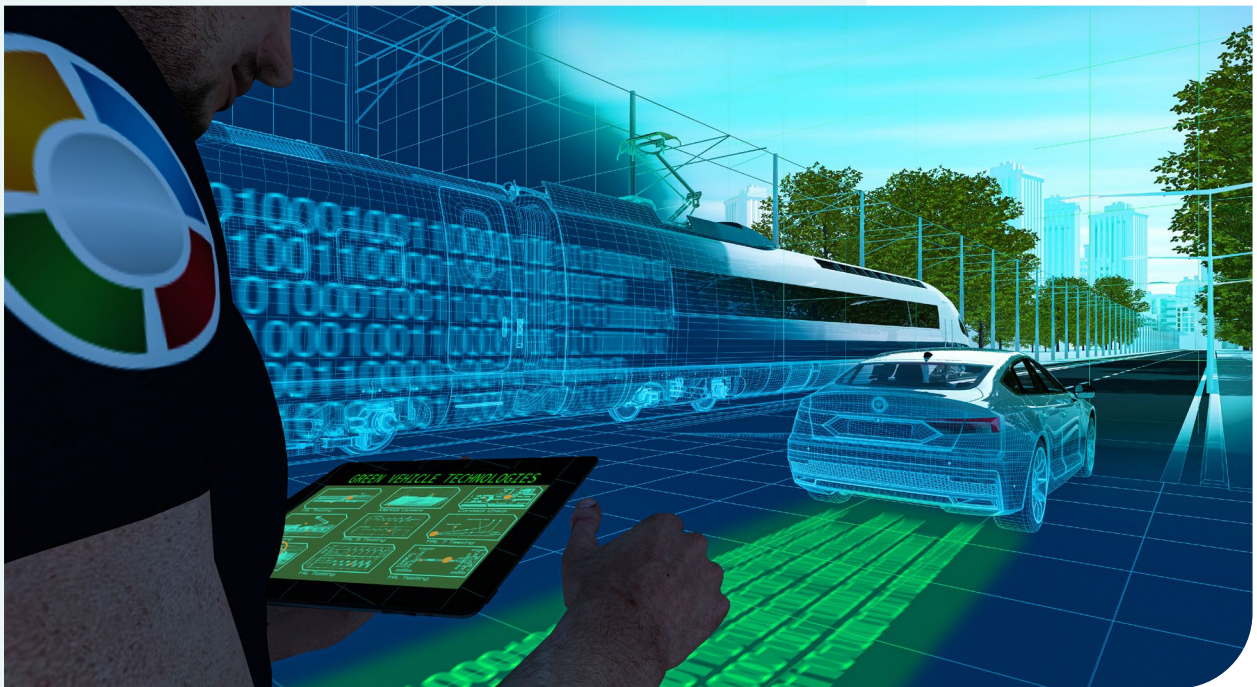


Software is a strong research focus since it plays a central role for all industries.

A close cooperation with industry and the scientific community is not just a tradition at VIRTUAL VEHICLE, it is also the foundation for the success of the research centre. This allows to deliver research and development results with determination and drive. This includes a personal responsibility for the joint effort to successfully complete whatever has been started. Balanced and interdisciplinary teams allow VIRTUAL VEHICLE to offer expert knowledge, creativity and innovative perspectives for the development future vehicles and beyond.

The goals are to deliver the best possible performance and to continuously improve

research and development. In this respect, VIRTUAL VEHICLE is broadly and sustainably anchored internationally and thus contributes to bringing focus to the profile of the international research community involved in virtual development. VIRTUAL VEHICLE acts with proprietary patents, own congresses and events and leads communities in order to increase our international visibility. Furthermore, VIRTUAL VEHICLE is a recognised partner in 40+ European research projects and has the overall lead in many EU projects and also helps to initiate and form European lead projects.



Research priority is the linking of numerical simulations, software-defined functions, and hardware-testing.

In A Nutshell

- ✓ Founded in 2002
- ✓ 300+ Employees
- ✓ Virtualization of the vehicle development
- ✓ From funded research to R&D contract work
- ✓ Turnover: 25 Mio. EUR/anno

Shareholders

- ✓ Graz University of Technology (34%)
- ✓ AVL List GmbH (16%)
- ✓ MAGNA STEYR Fahrzeugtechnik AG & Co KG (16%)
- ✓ Siemens Mobility Austria GmbH (10%)
- ✓ JOANNEUM RESEARCH Forschungsgesellschaft mbH (8%)
- ✓ voestalpine Metal Engineering GmbH (8%)
- ✓ Infineon Technologies AG (8%)

Contact

VIRTUAL VEHICLE Research GmbH
Jost BERNASCH, CEO

info@v2c2.at

www.v2c2.at



Recent scientific publications of BioNanoNet association members

In this newsletter issue only new publications of our members are listed.

Certainly, you can always view all members' publications sent to us from 2018 up to now by downloading the document [BioNanoNet member publications](#) or visiting our [website](#).

PERIOD JUNE – AUGUST 2021

Austrian Academy of Sciences

Adeel, M., Shakoor, N., Shafiq, M., Pavlicek, A., Part, F., Zafiu, C., Raza, A., Ahmad, M.A., Jilani, G., White, J.C., Ehmoser, E.-K., Lynch, I., Ming, X., Rui, Y., 2021. A critical review of the environmental impacts of manufactured nano-objects on earthworm species. Environ. Pollut. <https://doi.org/10.1016/J.ENVPOL.2021.118041>

Scharber, M., Rodin, V., Moser, S., Greßler, S., Pavlicek, A., Part, F., Fuchs, D., Sariçiftçi, S. N., Lindorfer, J., & Ehmoser, E. -K. (2021). „Advanced Materials“ für innovative Solarzelltechnologie NanoTrust-Dossier Nr. 056 - August 2021) (p. 7). Wien. doi:/10.1553/ita-nt-056

Graz University of Technology

A549 in-silico 1.0: A first computational model to simulate cell cycle dependent ion current modulation in the human lung adenocarcinoma”. Sonja Langthaler, Theresa Rienmüller, Susanne Scheruebel, Brigitte Pelzmann, Niroj Shrestha, Klaus Zorn-Pauly, Wolfgang Schreibmayer, Andrew Koff and Christian Baumgartner. PLoS Computational Biology, June 2021. <https://doi.org/10.1371/journal.pcbi.1009091>

Institute of Medical Research and Occupational Health

Vuković B, Cvetić Ž, Bendelja K, Barbir R, Milić M, Dobrošević B, Šerić V, Vinković Vrček I. (2021) In Vitro Study on the Immunomodulatory Effects of Differently Functionalized Silver Nanoparticles on Human Peripheral Blood Mononuclear Cells. JBIC J. Biol. Inorg. Chem. doi: 10.1007/s00775-021-01898-0.

Milić M, Cvetić Ž, Bendelja K, Vuković B, Galić E, Ćurlin M, Dobrošević B, Jurak Begonja A, Vinković Vrček I. (2021) Response of platelets to silver nanoparticles designed with different surface functionalization. J Inorg Biochem. doi: 10.1016/j.jinorgbio.2021.111565.

Ćurlin M, Barbir R, Dabelić S, Ljubojević M, Goessler W, Micek V, Žuntar I, Pavić M, Božičević L, Pavičić I, Vinković Vrček. (2021) Sex affects the response of Wistar rats to polyvinyl pyrrolidone (PVP)-coated silver nanoparticles in an oral 28 days repeated dose toxicity study. Part Fibre Toxicol. doi: 10.1186/s12989-021-00425-y

Tariba Lovaković B, Barbir R, Pem B, Goessler W, Ćurlin M, Micek V, Debeljak Ž, Božičević L, Ilić K, Pavičić I, Gorup D, Vinković Vrček I. (2021) Sex-related response in mice after sub-acute intraperitoneal exposure to silver nanoparticles. NanoImpact, 23, 100340. doi: 10.1016/j.im-pact.2021.100340

Pem B, Ćurlin M, Domazet Jurašin D, Vrček V, Barbir R, Micek V, Fratila R M, de la Fuente J M, Vinković Vrček I. (2021) Fate and transformation of silver nanoparticles in different biological conditions. Beilstein Journal of Nanotechnology. 12, 665–679. doi: 10.3762/bjnano.12.53

Kompetenzzentrum Holz GmbH – WOOD-K-Plus

S. Breitenbach, A. Lumetzberger, J. Duchoslav, C. Unterweger, D. Stifter, A. W. Hassel, C. Fürst, Viscose-based porous carbon fibers: Improving yield and porosity through optimization of the carbonization process by design of experiment, J. Porous Mater. (2021), <https://doi.org/10.1007/s10934-020-01026-4>

S. Breitenbach, N. Gavrilov, I. Pašti, C. Unterweger, J. Duchoslav, D. Stifter, A. W. Hassel, C. Fürst, Biomass-derived carbons as versatile materials for energy-related applications – capacitive properties vs. oxygen reduction reaction catalysis, C7 (2021) 55, <https://doi.org/10.3390/c7030055>

I. M. Minisy, U. Acharya, S. Veigel, Z. Morávková, O. Taboubi, J. Hodan, S. Breitenbach, C. Unterweger, W. Gindl-Altmutter, P. Bober. Sponge-like polypyrrole–nanofibrillated cellulose aerogels: synthesis and application, j. Mater. Chem. C (2021), <https://doi.org/10.1039/D1TC03006J>

Süss, R.; Kamm, B.; Arnezeder, D.; Zeilerbauer, L.; Paulik, C. Homogeneously catalyzed depolymerization of lignin from organosolv medium: Characterization, optimization, and minimization of coke formation. Can J Chem Eng (2021). DOI: 10.1002/cjce.24055.

MyBiotech GmbH

Lombardo, S. M.; Schneider, M.; Türel, A. E.; Günday Türel, N. (2020), Key for crossing the BBB with nanoparticles: the rational design, Beilstein J. Nanotechnol, 11, 866–883. doi:10.3762/bjnano.11.72

Rancan, F.; Jurisch, J.; Günday, C.; Türeli, E.; Blume-Peytavi, U.; Vogt, A.; Schaudinn, C.; Günday-Türeli, N., (2021), Screening of Surfactants for Improved Delivery of Antimicrobials and Poly-Lactic-co-Glycolic Acid Particles in Wound Tissue, *Pharmaceutics*, 13(7), 1093; <https://doi.org/10.3390/pharmaceutics13071093>

Technische Universität Wien

L. Zelaya-Lainez et al., Jaws of *Platynereis dumerilii*: Miniature Biogenic Structures with Hardness Properties Similar to Those of Crystalline Metals, *JOM* (2021). <https://link.springer.com/article/10.1007%2Fs11837-021-04702-1>

P. Grützmacher et al., Superior Wear-Resistance of Ti3C2Tx Multilayer Coatings, *ACS Nano*, 2021. <https://pubs.acs.org/doi/10.1021/acsnano.1c01555>

A. Niggas et al., Peeling graphite layer by layer reveals the charge exchange dynamics of ions inside a solid, *Communications Physics* (2021). <https://www.nature.com/articles/s42005-021-00686-1>

Project updates

NANOPAT – ACHIEVEMENTS IN SUMMER 2021



Zeolite synthesis by Despina Emmanouilidou in the Lab of Industrial Chemistry at ZHAW in Wädenswil.

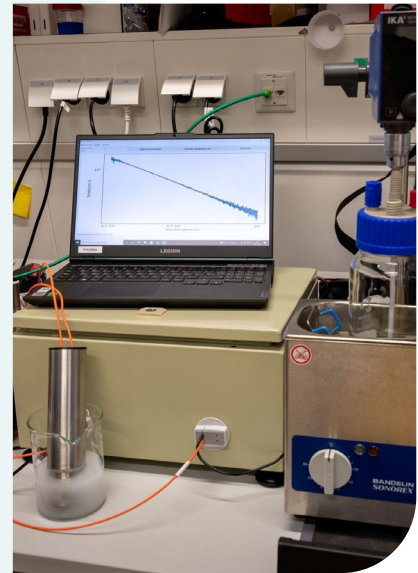
The EU-H2020 project [NanoPAT](#) aims to demonstrate three novel real-time nano-characterisation [Process Analytical Technologies \(PAT\)](#) that help to overcome problems and limitations of conventional characterization technologies: the (1) Photon Density Wave spectroscopy (PDW) , (2) Opto-Fluidic force induction (OF2i), and the (3) Turbidity spectrometry (TUS). Furthermore, NanoPAT will include real-time data handling for digital process monitoring and product quality control. Those will be validated in [5 different industrial](#) ceramic, polymer and mineral nanoparticles

manufacturing and converting environments. Thanks to a hardworking team, there have been plenty of activities going on during the summer 2021. Here is a summary of the project achievements since June 2021.

PAT devices delivered to the RTO pilots

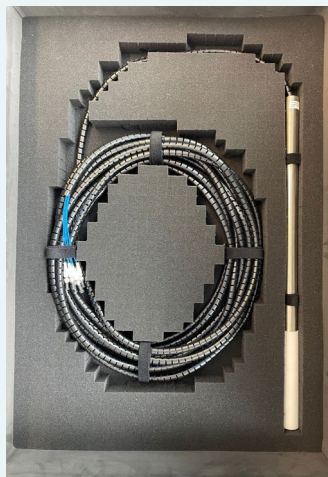
In July 2021, the PAT devices, developed by the technology providers [BRAVE](#), [PDWA](#) and [IRIS](#), have been ceremoniously handed over to the RTO pilots and are already installed for beginning with the measurements after an optimization of their configurations:

- ✓ PDW spectrometer from PDWA to [UPV/POLYMAT](#) (The PDW spectrometers were already installed in the past months at [ZHAW](#) and [UP/innoFSPEC](#)).
- ✓ OF2i device from BRAVE to [MUG](#).
- ✓ TUS device from IRIS to UPV/POLYMAT, MUG and UP/innoFSPEC.



BRAVE und MUG teams uncovering the brand-new BRAVE B1 prototypes

TUS systems delivered and installed



PDW probe packed for transport

Box containing PDW equipment

First PDW measurements at POLYMAT

On-site internal training and networking activities

During the summer months of 2021, some members of the NanoPAT team have managed to meet physically for training and networking purposes, which is an excellent opportunity given the challenges we are all facing with the COVID-19 pandemic. Below is a brief summary of these activities, which were mainly conducted by the RTO pilots.



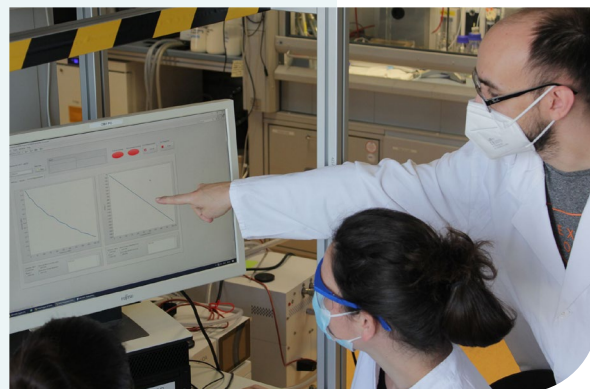
TUS equipment

IRIS visiting POLYMAT

Nicola Palombo, from [IRIS Technology Solutions](#) (Spain), visited [POLYMAT](#) (University of Basque Country, Spain) from 14 to 18 June 2021. He brought the [Turbidity Spectrometry \(TUS\)](#) equipment developed at IRIS to the POLYMAT laboratories in San Sebastian, Basque Country. While at POLYMAT, Nicola installed, tested and calibrated the TUS equipment so far with manual dilution, with the help of POLYMAT's Oihane Llorente, who carried out the nanoparticles synthesis.

POLYMAT team visiting UP

Usue Aspiazu, a student from the [University of the Basque Country](#) (Spain), visited the [University of Potsdam](#) (Germany). Usue, as a member of [POLYMAT](#), one of our partner institutions in the NanoPAT project, stayed for one month (June 2021) at the [innoFSPEC laboratory](#) in Golm to receive training in [PDW spectroscopy](#). The knowledge about the PDW measurement technique is and will further be used to monitor the NanoPAT polymer synthesis processes.



PDW training at UP

The system can be further used by the POLYMAT team. Furthermore, Nicola has trained the POLYMAT research team on how to use the TUS equipment to analyse polymer particle size.

ZHAW visiting UP

Despina Emmanouilidou, from the [Zurich University of Applied Sciences \(ZHAW\)](#), visited the [University of Potsdam \(UP\)](#) from 28 June to 2 July 2021. The aim of the visit was an intensive training by PDWS experts at [innoFSPEC Potsdam](#), with a focus on zeolite synthesis and first experiments with offline and inline [photon density wave spectroscopy \(PDWS\)](#). Additionally, measurement of zeolite properties with reference methods exclusively available in Potsdam were planned.

TEMASOL visiting UPV/POLYMAT

Blanca Suarez, from [TEMASOL](#), visited on July 15th the site where [UPV/POLYMAT](#) has [installed the TUS detector](#). Blanca Suarez was also introduced to the process behind using the detector and all equipment involved. This visit is part of TEMASOL's activities under Task 7.4 "Nanosafety assessment & Elaboration of safety/Safety-by-Design guidelines" where NanoPAT will work towards the identification of future safety issues relevant for commercially fully exploitable innovative technologies.



Visit in Potsdam – NanoPAT team members

TEMASOL at UPV/POLYMAT

TUS detector

The BioNanoNet members BRAVE Analytics GmbH, Medical University of Graz, Zurich University of Applied Sciences as well as BNN itself are consortium partners in NanoPAT.

Get connected with NanoPAT on:



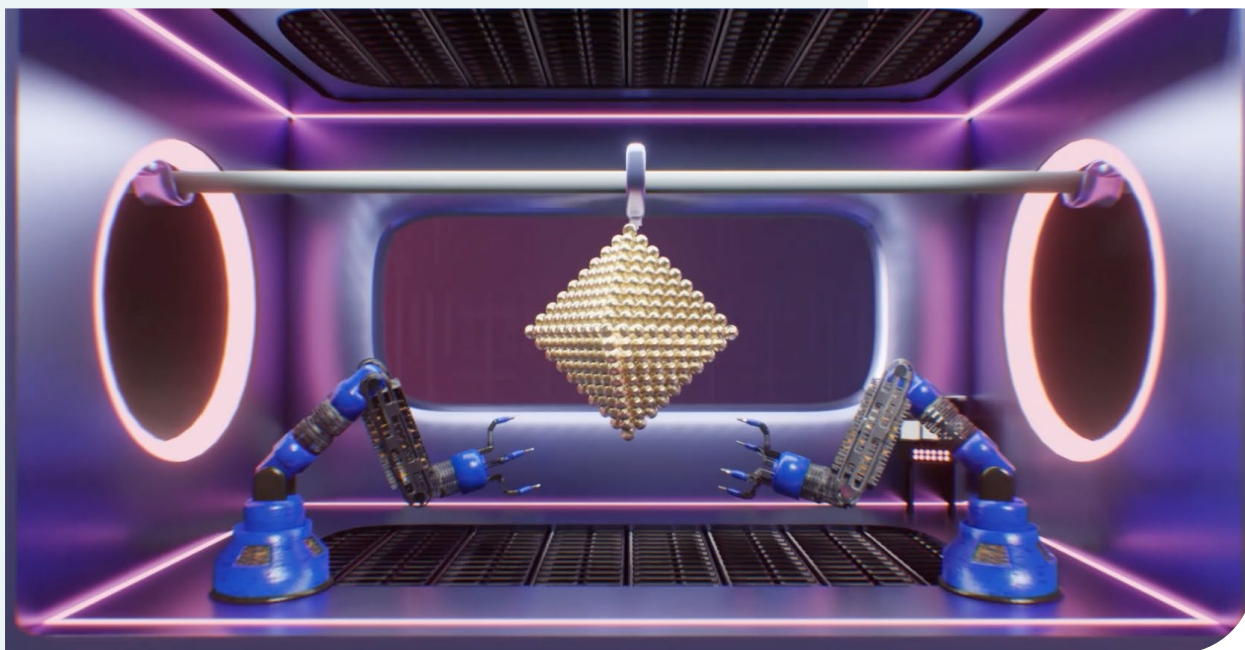
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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862583.

SABYDOMA PROJECT OVERVIEW VIDEO



SABYDOMA is pleased to introduce a [project overview video](#) presenting the main concepts and ideas behind the project: “Nanomaterials have the potential to be harmful to humans and other forms of life in ways we have not fully understood yet. To minimize this risk, SABYDOMA brings together a team of 19 international organizations with the aim of using the “Safety-by-Design” concept to minimize these risks at the earliest stages of nanomaterial production. We will establish high-throughput platforms to manufacture nanomaterials and to screen their toxicity directly at the point of production. The SABYDOMA platform will use physicochemical and biological sensor elements, with the resulting signals produced being used to control the redesign and production of safe but functional nanomaterials within a feedback loop. Our approach will also

enable the manufacture of safer chemicals and pharmaceuticals, cutting down on subsequent testing. Such an important innovation will not only prevent potential hazards, but will speed up the production process, decrease manufacturing costs and minimize waste in the circular economy.”



This project has received funding from the European Union’s HORIZON 2020 research and innovation programme under grant agreement n° 862296.

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PHOENIX: PHARMACEUTICAL OPEN INNOVATION TEST BED FOR ENABLING NANO- PHARMACEUTICAL INNOVATIVE PRODUCTS



Industrial Partners

Nano-pharmaceuticals have the potential to drive the scientific and technological uplift offering great clinical and socioeconomic benefits to the society in general, industry and key stakeholders. Affordable and advanced testing, manufacturing facilities and services for novel nano-pharmaceuticals are main prerequisites for successful implementation. PHOENIX project will provide a solution to that unmet need. PHOENIX aims to enable the seamless, timely and cost-friendly transfer of nano-pharmaceuticals from lab bench to clinical trials by implementing a “fast-track-to-GMP” strategy where the necessary advanced, affordable and easily accessible PHOENIX-OITB - a consolidated network covering the whole supply chain - will overcome the hurdle in the translational process by guiding the GMP manufacturing path.

Along with five academic and research technical organization partners, five industrial partners dedicate their already existing facilities, infrastructure and quality management system to establish the flexible yet robust services immediately at the beginning of the project at industrially relevant environment. In addition to scientific coordination, **MyBiotech**, as an innovative SME with long years of R&D&I track, offering contractual development and manufacturing services for innovative nano-pharmaceuticals and nanomaterials with their proprietary production technologies, will

lead development and implementation of this strategy. The GMP certified manufacturing facilities of MyBiotech will enable the operability of the pilot OITB. MyBiotech has also a demo-case for demonstrating of nanocrystals manufacturing at pilot scale. Partner **Nanomol Technologies** is an SME delivering advanced solutions to obtain high-added-value products by particle technologies and nano-formulations. They have already an operative GMP compliant contract analysis unit for the particle characterization and has already consolidated deep knowledge on particle size and shape analysis, complemented by a vast experience to characterize APIs, pharmaceutical intermediates and final formulations. Besides, they are partners of two demo-cases with their proprietary robust green and sustainable DELOS platform, that uses compressed CO₂ as solvent, for design, engineering and production of nano-pharmaceuticals. **LeanBio**, is a market oriented CDMO that develops and manufactures biopharmaceutical products as new entities and biosimilars, applying “Lean bioproduction” through tailored QbD and ICH compliant approach to maximize success, minimize time to market, costs and risks. LeanBio will optimize the bioprocessing process for one demo-case. Additionally, they offer vast experience and infrastructure for analysis for biomolecules of demo-cases. Once this bioprocessing is developed at their facilities, technology transfer will take place to another SME, **Grace Bio** which will produce the GMP

compliant pilot batch. Grace Bio concentrates on the segments and specialties to provide access to “in demand” production facilities and to provide solutions for biotherapeutics manufacture with highest quality and affordable price in a sustainable business model. The core services that Grace Bio offers also include GMP compliant purification of therapeutic proteins and antibodies, release testing and drug substance stability testing and quality control services. **RECENDT** is an internationally well recognized Research Center for Materials Characterization and Non-Destructive Testing. It focuses on developing photonic and acoustic methods for material characterization and non-destructive testing, mainly as Process Analytical Technologies (PAT), enabling process development and optimization. One of the key strengths is the focus on developing custom sensing solutions for industrial processes, but not limited to in-line solutions. RECENDT will develop customized PAT for two demo-cases. During the project run time, five demo-cases are assigned to undergo the whole process and be demonstrated in a relevant

industrial environment to establish the PHOENIX services. **Cenya Imaging** is an SME dedicating one of these demo-cases taking the end-user role. It focuses on developing multi-scale imaging nanoparticle agents. Cenya aims to optimise personalised medicine by using unique polymeric NPs for imaging which are suitable for ultrasound, photoacoustics, fluorescence and nuclear imaging. Another SME with end-user role is **Topas Therapeutics**, a biotechnology company developing products to address major unmet need, including autoimmune diseases, allergies and anti-drug antibodies. The Topas Particle Conjugates (TPC) technology platform provide major competitive advantages, including in vivo traceability, dose-ability, biodegradability and scalability along GMP requirements. For more information visit the PHOENIX website and follow us on social media to stay tuned and follow our progress.



This project has received funding from the European Union’s HORIZON 2020 research and innovation programme under grant agreement n° 953110.

Get connected with PHOENIX-OITB on:



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HARMLESS PROJECT FLYER



The new HARMLESS project trifold flyer is available for [download now](#). It gives a general overview of the project objectives & impact, the partners, the five case studies and the work plan.

Get connected with HARMLESS on:



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This project has received funding from the European Union's HORIZON 2020 research and innovation programme under grant agreement n° 953183.

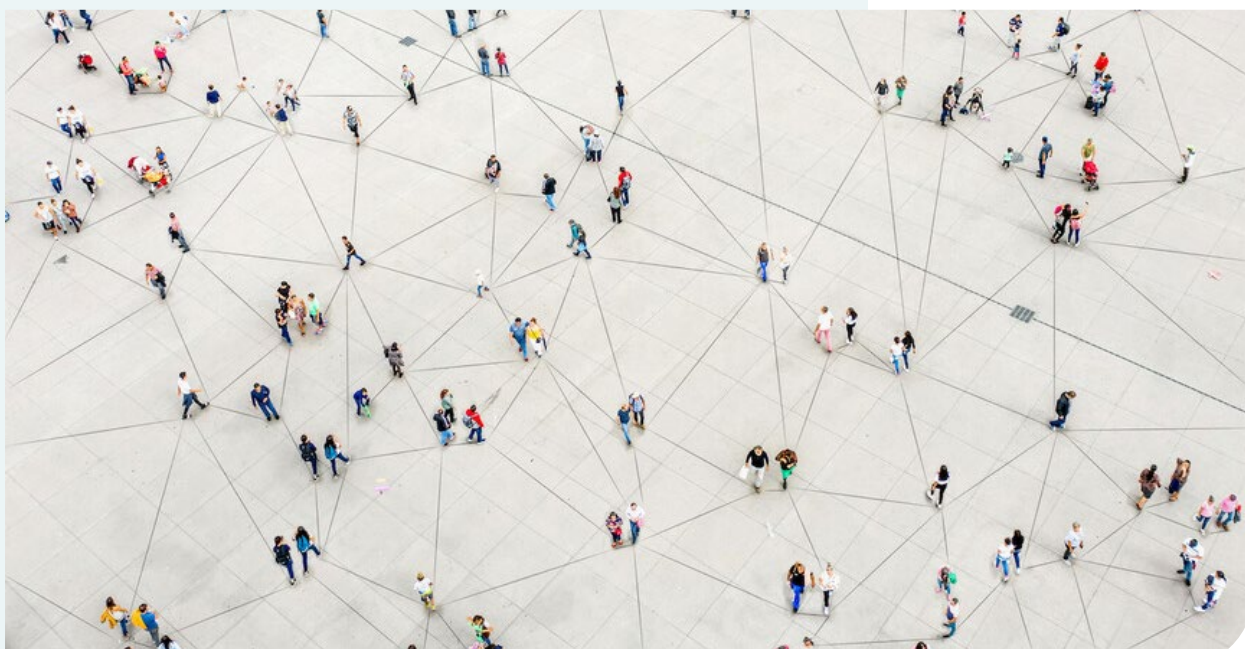
BioNanoNet Member Contributions

CONTRIBUTION FROM AUSTRIAN
ACADEMY OF SCIENCES, ITA

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AUSTRIAN
ACADEMY OF
SCIENCES

**Nanotrust–Advanced: Risk Governance of Nanomaterials
and Advanced Materials**

ITA



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Nanomaterials and other innovative materials (advanced materials) offer interesting functions and application possibilities. They are therefore increasingly used in new products and in many different industries. However, the possible undesirable consequences also need to be carefully researched and assessed. NanoTrust-Advanced, the 6th phase of the long-term NanoTrust project, which

has been running since 2007, plays an important role in this endeavor.

In Europe nanomaterials (NM) and advanced materials (AM) are considered to be so-called “key enabling technologies”, which should guarantee the competitiveness of the European economy for the coming decades.

NanoTrust-Advanced examines the safety and risk-relevant aspects of NM and AM. The results are published regularly within the established [NanoTrust dossiers](#) and in scientific journals. Topics are discussed at the annual [NanoTrust conferences](#).

Science-based policy advice, in which acquired knowledge serves as the primary starting point for qualified decisions, is of great importance. Since 2016, the NanoTrust team has been identifying possible research topics for the Austrian nano environment, health and safety research program (“Nano-EHS”) for which the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) is responsible. This research program represents the implementation of one of the main recommendations of the Austrian Nanotechnology Action Plan (ÖNAP) and is continuously adapted to current developments in this research area.

NanoTrust-Advanced also offers an independent discussion platform for ministries, public authorities and other actors active in nanosafety. This enables the exchange of views in an

objective context. The NanoTrust-Advanced project leader André Gázsó is chairing the second term of the Nano Information Commission (NIK) for its duration until 2023, enabling the use of governance instruments developed on the basis of the Austrian Nanotechnology Action Plan for the structured exchange of knowledge and opinions. The team members of NanoTrust-Advanced also contribute to the working group for nano worker protection of the Austrian Workers’ Compensation Board (AUVA) and the [standardization group „nano-technology“](#) of the Austrian standardization institute Austrian Standards. This permanent exchange of knowledge and experience, which takes place on many levels and in numerous committees, contributes to the safe and sustainable development of these new materials.

The project page for the previous NanoTrust phases (until 09/2020) can be found [here](#).

For more details visit www.oeaw.ac.at/en/ita/projects/current-projects/nanotrust-advanced.

Contact:

Austrian Academy of Sciences, Institute of Technology Assessment

Anna PAVLICEK

anna.pavlicek@oeaw.ac.at

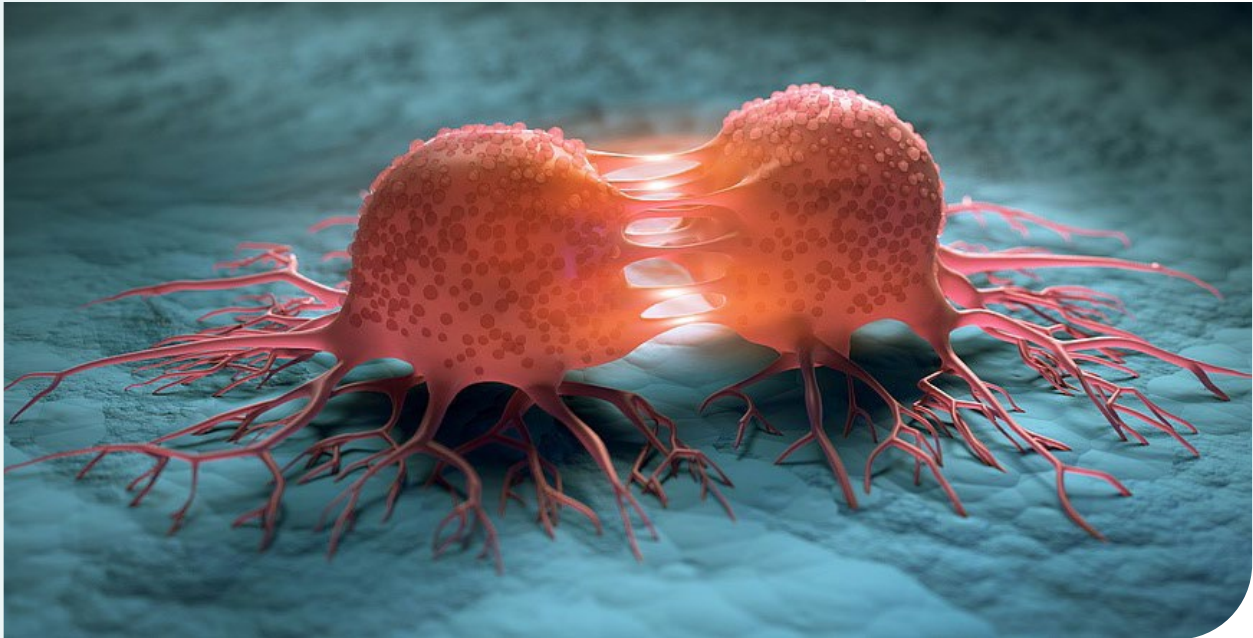
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CONTRIBUTION FROM GRAZ
UNIVERSITY OF TECHNOLOGY



The World's First Digital Model of a Cancer Cell



With the first cancer cell model, researchers at TU Graz were able to launch an essential tool for modern cancer research and drug development. Pictured: a graphical representation of a dividing cancer cell. © peterschreiber.media – AdobeStock

The computer model, developed under the lead management of researchers at TU Graz, simulates the cyclical changes in the membrane potential of a cancer cell using the example of human lung adenocarcinoma and opens up completely new avenues in cancer research.

Computer models have been standard tools in basic biomedical research for many years. However, around 70 years after the first publication of an ion current model of a nerve cell by

Hodgkin & Huxley in 1952, researchers at Graz University of Technology (TU Graz), in collaboration with the Medical University of Graz and the Memorial Sloan Kettering Cancer Center in New York, have finally succeeded in developing the world's first cancer cell model, thus launching „an essential tool for modern cancer research and drug development,“ reports a delighted Christian Baumgartner. The head of the Institute of Health Care Engineering with European Testing Center of Medical De-

vices at TU Graz is senior author of the publication in which the digital model is presented in the journal [PLoS Computational Biology](#).

Excitable and non-excitable cells

Digital cell models have so far focused on excitable cells such as nerve or cardiac muscle cells, allowing the simulation of electrophysiological processes not only at the cellular level, but also at the tissue and organ level. These models are already being used to support diagnosis and therapy in everyday clinical practice. The international research team led by Baumgartner focused on the specific electrophysiological properties of non-excitable cancer cells for the first time.

In excitable cells, an electrical stimulus triggers so-called action potentials. This leads to short-term changes in electrical potential lasting milliseconds at the cell membrane that transmit „electrical“ information from cell to cell. Through this mechanism, neural networks communicate or the heart muscle is activated, which contracts as a result. It is known from experimental studies that „non-excitable“ cells also exhibit characteristic fluctuations of potential at the cell membrane. However, compared to excitable cells, the potential changes occur very slowly and over the entire cell cycle, i.e. over hours and days, and serve as a signal for the transition between the individual cell cycle phases,” explains Christian Baumgartner. Together with the deputy head of the institute, Theresa Rienmüller, and PhD student Sonja Langthaler, Christian Baumgartner was the first to pursue the idea of developing a simulation model of these mechanisms.

Lung tumour example

Pathological changes in cell membrane voltage, particularly during the cell cycle, are fundamental to cancer development and progression. Sonja Langthaler continues in detail: „Ion channels connect the outside to the inside of a cell. They enable the exchange of ions such as potassium, calcium or sodium and thereby regulate the membrane potential. Changes in the composition of ion channels, as well as altered functional behaviour of the same, can result in disruptions in cell division, possibly even affecting cell differentiation and thus transforming a healthy cell into a diseased (carcinogenic) cell.“

For their digital cancer cell model, the team chose the example of the human lung adenocarcinoma cell line A549. The computer model simulates the rhythmic oscillation of the membrane potential during the transition between cell cycle phases and enables prediction of the changes in membrane potential that are caused by drug-induced switching on and off of selected ion channels. „So we get information about the effects of targeted interventions on the cancer cell,” Baumgartner adds.

„Freezing“ cancer cells during growth or inducing them to commit suicide

The activity of certain ion channels can also drive the division of diseased cells and thus accelerate tumour growth. If ion channels are now manipulated in a targeted manner, as is the case with new, promising agents and drugs, the cell membrane voltage and thus the entire electrophysiological system can be thrown

off track, so to speak. „This could be used to arrest cancer cells at a certain phase in the cell cycle, but also to induce premature cell death (apoptosis). One could „freeze“ cancer cells while they are growing or induce them to commit suicide. And it is precisely such mechanisms that can be simulated with the help of models.“ Baumgartner and his team see the first digital cancer cell model as the beginning of more comprehensive research. In order to

increase the level of detail of the model, plans for further experimental and measurement validations have been made and submitted to the Austrian Science Fund FWF for funding.

For publication reference see “Recent scientific publications of BioNanoNet association members” on page 16!

Contact:

TU Graz, Institute of Health Care Engineering
with European Testing Center for Medical
Advices

Christian BAUMGARTNER

christian.baumgartner@tugraz.at

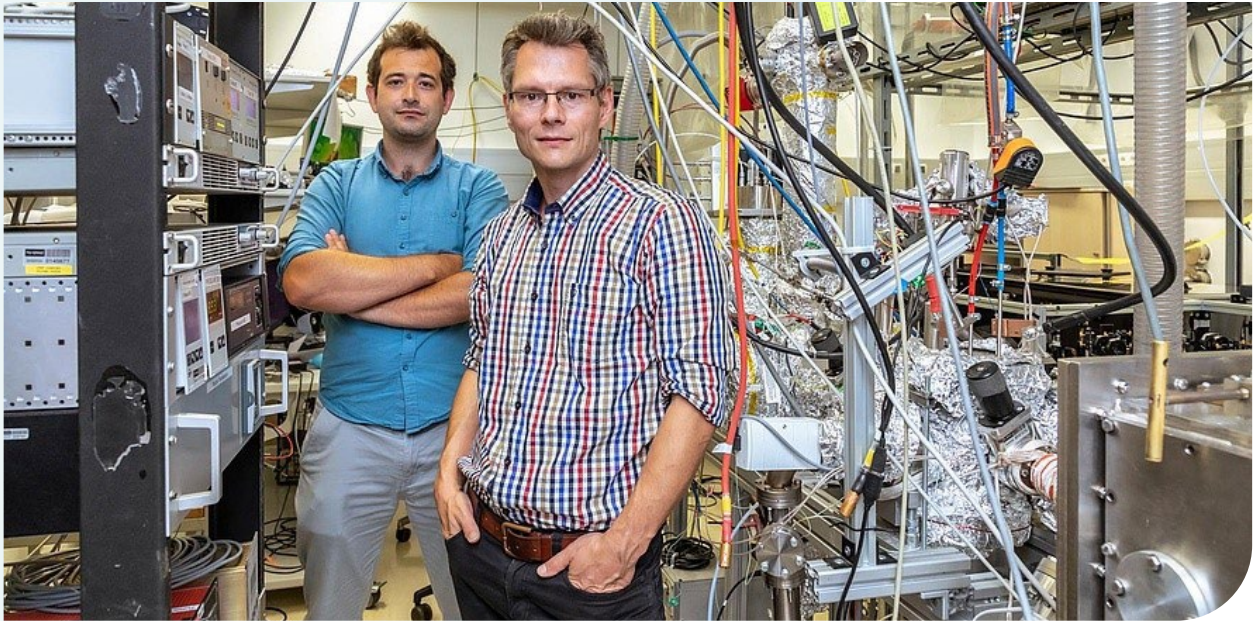
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CONTRIBUTION FROM GRAZ UNIVERSITY OF TECHNOLOGY



Electrons in Quantum Liquid gain Energy from Laser Pulses



Leonhard Treiber, here with doctoral supervisor Markus Koch (right) made the discovery as part of his thesis at TU Graz. © Lunghammer – TU Graz

The absorption of energy from laser light by free electrons in a liquid has been demonstrated for the first time. Until now, this process was observed only in the gas phase. The findings, led by Graz University of Technology, open new doors for ultra-fast electron microscopy.

The investigation and development of materials crucially depends on the ability to observe smallest objects at fastest time scales. The necessary spatial resolution for investigations in the (sub-)atomic range can be achieved

with electron microscopy. For the most rapid processes, however, proceeding within a few femtoseconds (quadrillionths of a second), the time resolution of conventional electron microscopes is insufficient. To improve the time duration of electron pulses, electrons would have to be selected within a shorter time window – in analogy to a camera shutter, which controls the exposure time in photography.

In principle, this temporal selection is possible with extremely short laser pulses through

a process called laser-assisted electron scattering (LAES). In this process, electrons can absorb energy from the light field during collisions with atoms of the sample under investigation. „Structural information is provided by all electrons, but those that have a higher energy level can be assigned to the time window in which the light pulse was present. With this method, it is possible to select a short time window from the long electron pulse and thus improve the time resolution,“ explains Markus Koch, professor at the Institute of Experimental Physics at Graz University of Technology. So far, however, LAES processes have only been observed in the gas phase, despite their investigation for about 50 years.

Markus Koch and his team, in collaboration with researchers from [Photonics Institute at Vienna University of Technology](#) and the Institute of Chemistry at [Tokyo Metropolitan University](#), have now demonstrated for the first time that laser-assisted electron scattering can also be observed in condensed matter, specifically in superfluid helium.

Superfluid helium leading to success

The TU Graz researchers performed the experiment in a superfluid helium droplet of few nanometer diameter (3-30 nm), into which they loaded single atoms (indium or xenon) or molecules (acetone) that served as an electron source – [a field of expertise at the institute](#). „The free electrons can move almost without friction within the droplet and absorb more energy in the light field than they lose in

collisions with the helium atoms,“ says Leonhard Treiber, the PhD student in charge of the experiment. The resulting acceleration allows for the observation of much faster electrons.

The experiments could be interpreted in cooperation with Markus Kitzler-Zeiler, an expert for strong-field processes at TU Wien, and the LAES process was confirmed through simulations by Reika Kanya from Tokyo Metropolitan University. The results were published in Nature Communications.

In the future, the LAES process will be studied within thin films of various materials, also produced inside helium droplets, in order to determine important parameters such as the optimal film thickness or the favourable intensity of the laser pulses for application in an electron microscope.

Contact:

TU Graz, Institute of Experimental Physics
Markus KOCH
markus.koch@tugraz.at
www.tugraz.at



CONTRIBUTION FROM INSTITUTE FOR MEDICAL RESEARCH & OCCUPATIONAL HEALTH

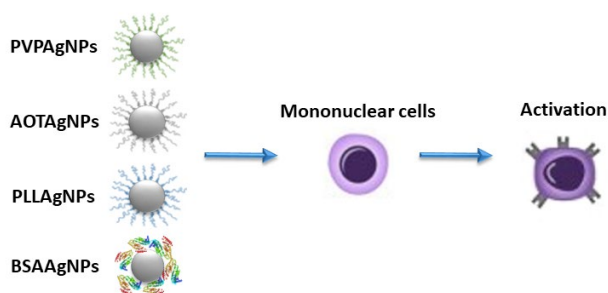


Institute
for Medical
Research and
Occupational
Health

In Vitro Study Focused on Immunomodulatory Effects of Differently Functionalized Silver Nanoparticles (AgNPs) on Human Peripheral Blood Mononuclear Cells

The absorption of energy from laser light by free electrons in a liquid has been demonstrated for the first time. Until now, this process was observed only in the gas phase. The findings, led by Graz Researchers from the NanoBioFaces group at the Institute for Medical Research and Occupational Health, Zagreb, Croatia are proud to report scientific achievements that were financially supported by the Croatian Science Foundation and the RiskGO-NE Horizon 2020 project.

In vitro study focused on immunomodulatory effects of differently functionalized silver nanoparticles (AgNPs) on human peripheral blood mononuclear cells (Scheme 1) has been published in *Journal of Biological and Inorganic Chemistry* ^[1].



Scheme 1. In vitro effects of differently functionalized silver nanoparticles (AgNPs) on human peripheral blood mononuclear cells.

In this study, the activation of lymphocytes and monocytes by AgNPs was investigated

considering coating-, time- and dose-dependent response. Influence of coating was observed using positive (poly-L-lysine, PLL), neutral (polyvinyl pyrrolidone, PVP), negative (bis(2-ethylhexyl) sulfosuccinate sodium, AOT) and protein-based (bovine serum albumin, BSA) agents for surface stabilization of AgNPs. Results showed that all tested AgNPs induced apoptosis and necrosis in a dose- and time-dependent manner. The highest toxicity was observed in case of positively charged AgNPs and protein-coated AgNPs. BSA- and PLL-AgNPs stimulated B-cells, as well as natural killer cells and monocytes, while there was no significant T-cell activation.

However, depletion of CD4-receptor on T-helper cell surface was observed. This study has deepened scientific knowledge about biomedical safety of AgNPs focusing on response of immune system.

This research was extended to the second study published by Milić et al. ^[2], which evaluated platelet response on AgNPs. Platelet viability, activation and particle uptake as well as oxidative stress response and P-selectin expression were measured after platelet treatment with the same AgNPs as used in previous study. Results showed coating- and dose-dependent cytotoxicity and uptake of AgNPs to platelets. Cytotoxicity was proved to be higher in the case of positively charged PLL-AgNPs

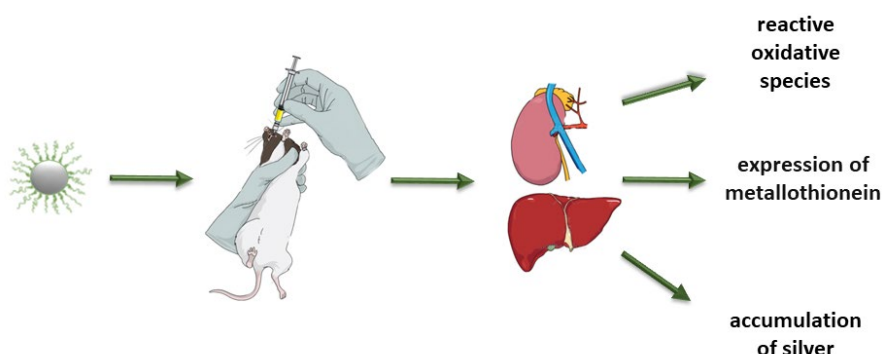
compared to other types of AgNPs. Hyperpolarization of the mitochondrial membrane, depletion of GSH and oxidative stress response were found after platelets treatment. Statistically significant difference in P-selectin expression was also observed. Obtained results demonstrate that different surface coatings on AgNPs surface influence biological effects on platelets.

In the frame of EU H2020 project (H2020-NMBP-13-2018 RIA) RiskGONE (Science-based Risk Governance of Nano-Technology; grant agreement n° 814425), study focused on sex-related response to PVP-coated AgNPs after sub-acute exposure of Wistar rats was conducted [3].

Biodistribution and accumulation of silver were observed after oral administration of 0.1 and 1 mg of AgNPs per kg of body weight. Hematological and biochemical parameters in blood of rats, and levels of reactive oxidative species (ROS) and glutathione in liver and kidney tissues were measured after sub-acute

28-days exposure. In addition, the activity of enzymes participating in oxidative stress (catalase, superoxide dismutase and glutathione peroxidase) as well as expression of metallothionein (Mt) genes and level of Mt proteins were also evaluated. Results showed changes in oxidative stress and blood parameters in treated animals even at low doses, indicating AgNPs toxicity. Female rats showed efficient elimination AgNPs at low doses compared to males, while higher doses caused opposite effect. Accumulation of silver was higher in female organs. Interestingly, lower expression of Mt genes and proteins were measured in liver and kidney of males, whereas for females no changes have been observed. Our study showed the importance of investigating sex-related toxicity of AgNPs and it contributes to knowledge of changes that occur at the cellular and organ level due to AgNPs exposure.

For publication reference see “Recent scientific publications of BioNanoNet association members” on page 16!



Contact

IMI – Institute for Medical Research and
Occupational Health
NanoBioFaces group
Ivana VINKOVIC VRCEK

ivinkovic@imi.hr

www.nanobiofaces.imi.hr

CONTRIBUTION FROM JOANNEUM RESEARCH – HEALTH



New Managing Director for JOANNEUM RESEARCH



Heinz Mayer is new CEO of JOANNEUM RESEARCH Forschungsgesellschaft mbH © JOANNEUM RESEARCH/Salon Deluxe

Heinz Mayer succeeds Wolfgang Pribyl as of 1 September 2021 and takes over the management of Austria's second largest non-university research organisation with headquarters in Graz.

JOANNEUM RESEARCH develops solutions and technologies for business and industry in a broad range of sectors and conducts cutting-edge research at an international level. Well embedded in the national and international innovation network, the researchers de-

velop innovations in the three thematic areas of Information and Production Technologies, Human Technology and Medicine, and Society and Sustainability. Now telematics expert Heinz Mayer will take the helm and steer the company with its seven research units through the great challenges of our time.

Heinz Mayer (52) knows the company inside out, having previously headed the largest research unit at JOANNEUM RESEARCH, the DIGITAL Institute. He studied telematics at

TU Graz, where he gained several years of experience as a university assistant. He then worked at Magna Steyr, including as head of the information management department. In 2007 Mayer moved to JOANNEUM RESEARCH and successfully acted as deputy institute director of DIGITAL, the Institute for Information and Communication Technologies, and as research group leader of the group „Image Analysis and Measurement Systems“. In 2013, he took over the management of DIGITAL with 130 employees.

„Most recently, the digitalisation process in business and industry really picked up speed due to the Corona crisis. With our expertise, we are at the forefront and can offer our customers and partners from business and industry technology solutions for tomorrow. For example, we have focused on the topics of highly automated driving, Industry 4.0 and artificial intelligence and have built up the corresponding know-how to be able to play a leading

role in the international research network,“ Mayer explains the success story of „his“ DIGITAL Institute.

Digitisation and the Green Deal are the big issues of the future, and not only at the European level. The DIGITAL, MATERIALS, ROBOTICS, COREMED, HEALTH, LIFE and POLICIES research units located in Graz, Vienna, Klagenfurt, Weiz, Niklasdorf and Pinkafeld are ideally equipped for the upcoming challenges of our time.

„I am in the fortunate position of being able to take over an innovative and well-positioned company from my predecessor Wolfgang Pribyl. With foresight, for example, he launched the Research Axis South and brought the states of Carinthia and Burgenland on board. This strengthens our national and international visibility and the location,“ says the new managing director.

Contact

JOANNEUM RESEARCH Forschungsgesellschaft mbH

Heinz MAYER, Managing Director

heinz.mayer@joanneum.at

www.joanneum.at



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CONTRIBUTION FROM JOANNEUM RESEARCH - HEALTH



20 Years of Cutting-Edge Research in the Health Sector



The team of the HEALTH Institute in Graz, photo: JOANNEUM RESEARCH/ Schwarzl

HEALTH - Institute of Biomedicine and Health Sciences at JOANNEUM RESEARCH researches medical technology solutions to improve people's lives. Now the institute is celebrating its 20th anniversary.

Health is our most valuable asset. We have become very aware of this again in the last one and a half years. The 70 or so experts at HEALTH are eagerly researching, for example, better processes for drug development and approval, drug measurements, medical

sensors and digital solutions in the healthcare sector. The location of the concentrated innovation and health power is the ZWT - Centre for Knowledge Transfer in Medicine in Graz. Our researchers benefit greatly from this location with the possibility of close cooperation with the Medical University of Graz and other partners in the medical environment.

„It is incredible to see what has developed from the founding idea of HEALTH. We started in 2001 as the Institute for Medical Systems

Engineering and Health Management with three employees in a small office in Graz's Krenngasse. In the meantime, we have become a fixed and irreplaceable part of the Styrian research landscape on the campus of the Medical University of Graz. I am proud of our success and thank our staff, without whom none of this would have been possible," says Institute Founder and Director [Thomas Pieber](#), pleased with the scientific successes his institute has achieved.

What all happens in HEALTH's communication-friendly rooms and laboratories in the heart of Medical Science City Graz?

„Here at the location we have a very good and cooperative exchange with important local facilities and institutions in the healthcare sector, such as the Medical University of Graz, KAGes, CBmed GmbH, Human.technology Styria GmbH, the Geriatric Health Centres and FH JOANNEUM, and of course many other networks and initiatives. In this environment, a number of technologies and methods have been and are being developed that directly fulfil a medical benefit and for which we are sought out and approached by representatives from science and industry," says 2nd HEALTH Director [Frank Sinner](#).

He was instrumental in one of these groundbreaking technology developments:

„A great success is the so-called [open microperfusion](#), a minimally invasive method for measuring active substances in tissue - for example, skin or fatty tissue. Since 2013, this research has also been funded by the American FDA (US Food and Drug Administration), among others. This carries our reputation far

beyond Austria and makes us an important partner of the pharmaceutical industry for drug development. From small biotech companies to the very big international players in the pharmaceutical industry, many work with us to develop new drugs and improved therapies - especially in the fields of dermatology, neurology and metabolic diseases," Sinner explains.

Digitisation in medicine

„JOANNEUM RESEARCH is a publicly owned research company, so we also clearly see the mission to make our contribution to improving the healthcare system. In the future, we want to focus even more on this. Especially in the area of digitalisation, there is an enormous need to catch up - the pandemic has painfully shown us that. But there is incredible potential in this - for improved services, improved communication and ultimately improved health care. And everyone in the system benefits from this: the patients themselves, but also all professional groups, insurance companies and institutions," Pieber explains.

It was clear to the two directors of the JOANNEUM RESEARCH Institute HEALTH from the outset that the path must go in the direction of digitalised healthcare. That is why a lot of know-how was built up for digital medical products or web-based tools. As early as 2001, „Healthgate BARS" went into operation at JOANNEUM RESEARCH - practically at the same time as the institute was founded. The online tool, which has since been renamed [CDS-BARS](#), provides real-world data for risk assessment and can also be used, for example, for COVID-19 disease.

Spin-off: off into the free market

Two spin-offs from HEALTH took place in 2016. On the one hand, the group around the successful product „[GlucoTab®](#)“ became independent. The „decide Clinical Software GmbH“ is now operating highly successfully and offers

solutions to support clinical decisions and clinical processes, especially in the area of blood glucose management. With „EPIG GmbH“, the health sciences expert group went into business for themselves and founded an institute for development and planning in the health sector.

Contact

JOANNEUM RESEARCH Forschungs GmbH,
HEALTH
Franz FEICHTNER
franz.feichtner@joanneum.at
www.joanneum.at



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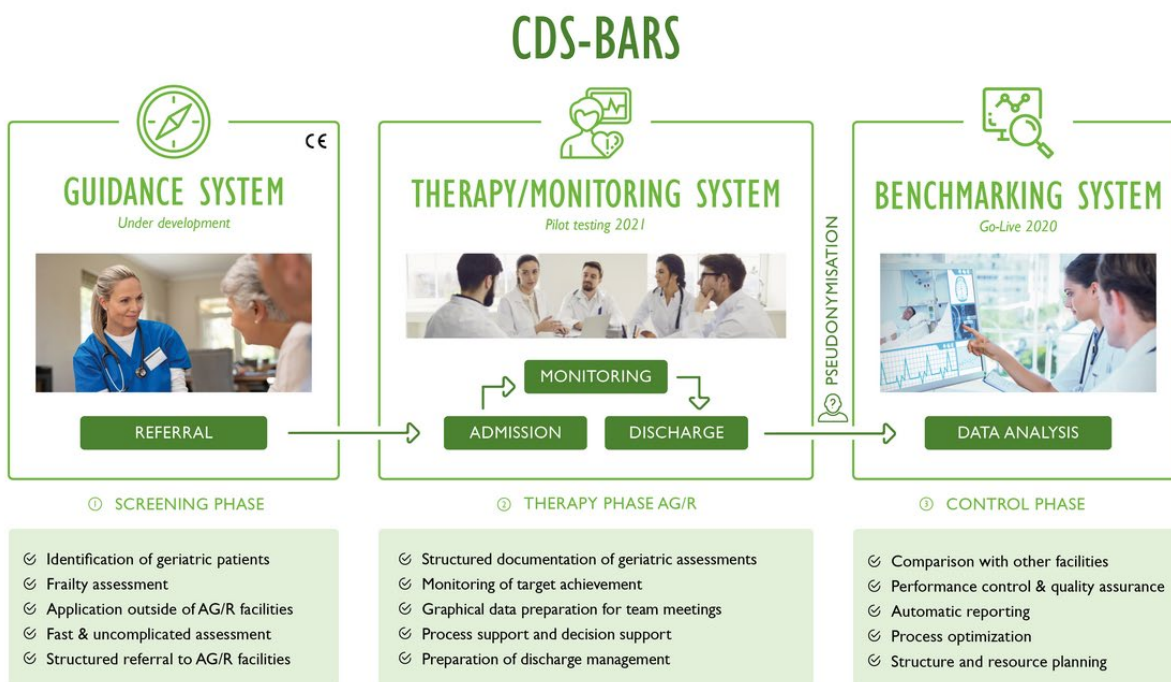
RESEARCH - HEALTH



CDS-BARS – Clinical Decision Support and Benchmarking in Acute Geriatrics Units

Approximately 40% of Austrian facilities for acute geriatrics and remobilization (AG/R) participate in the cross-carrier and cross-state initiative 'Benchmarking in Austrian Acute Geriatrics', which has been collecting Real World Data (RWD) for quality assurance purposes via the BARS (Benchmarking and Reporting) system (<http://healthgate.at>) since 2008. In ad-

dition, BARS is and has been used in Austria and Germany for structured data collection in the treatment of other chronic diseases such as diabetes, cardiovascular diseases or hepatitis C, since the beginning of the 2000s. More than half a million patients from more than 700 participating centers have already been documented.



© Illustration: JOANNEUM RESEARCH - HEALTH, Photos: Adobe Stock

Project content

Vision CDS-BARS. The Guidance System (1) outside the AG/R supports the identification

of geriatric patients, the Therapy/Monitoring System (2) within the AG/R supports, among other things, the documentation of geriatric

assessments. The collected data are used in the Benchmarking System (3) for performance control and comparison with other facilities.

As part of the CDS-BARS initiative, the benchmarking system is being modernized (<http://cds-bars.eu>) and linked to innovative eHealth systems for process and decision support in acute geriatrics. The goals are higher process quality, reduced workload and time saving by avoiding multiple documentation.

The vision includes a Guidance System, which supports the identification of geriatric patients outside the AG/R (e.g. in emergency departments), as well as a Therapy/Monitoring System, which supports healthcare professionals in the AG/R (e.g. in interdisciplinary team meetings, documentation of geriatric assess-

ments, monitoring of individual goal achievement and discharge management). The collected data is automatically pseudonymized and transferred to the Benchmarking System, which can be used for performance monitoring and for comparison with other facilities. The conceptual design and iterative development of the eHealth systems is carried out together with future users within the framework of a co-creation process. This includes interdisciplinary focus groups and interviews, as well as process observations and workshops.

For more details and project key facts please visit <https://www.joanneum.at/en/health/referenzprojekte/clinical-decision-support/cds-bars>.

Contact

JOANNEUM RESEARCH Forschungs GmbH,
HEALTH

Klaus DONSA

klaus.donsa@joanneum.at

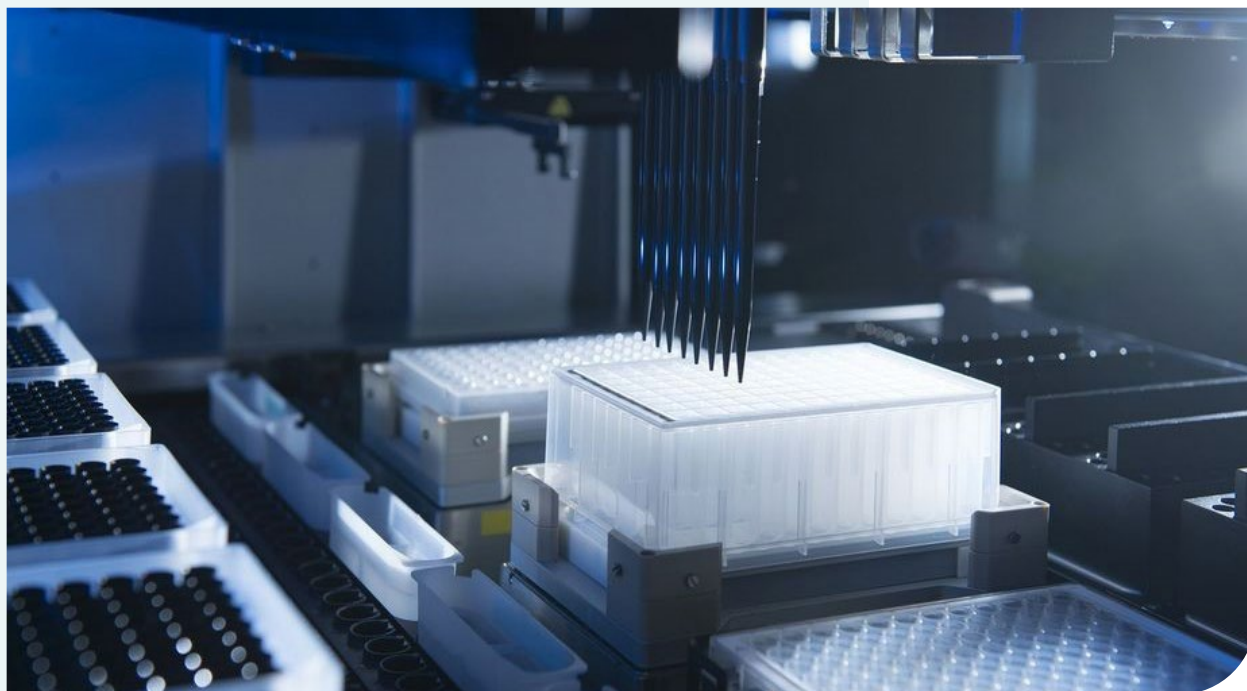
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HEALTH is involved in medical research and research disciplines related to medicine and positions itself at the interface between technology and medicine.

CRO is a term commonly used in the pharmaceutical industry. It stands for Contract or Clinical Research Organisation, i.e. a service provider for research projects. HEALTH positions itself as a CRO and offers customised solutions in the early phase of drug development in co-operation with various local and international

partners. We combine scientific expertise with service orientation and high quality standards (GLP/GCP).

As a CRO, we compare, for example, different formulation approaches for topical products or conduct preclinical and clinical phase 1 studies to test the pharmacokinetics and pharmacodynamics of new active substances. For this purpose, we also operate a laboratory where we develop, optimise and validate the analytical measurement methods. All data are

processed by us according to international standards and reported in formats suitable for official use.

Who benefits from the services of the HEALTH Institute?

HEALTH supports its clients, which include pharmaceutical, biotech and medtech companies as well as start-ups and universities. We focus on the areas of dermatology, metabolic research and neurology. [You can find the comprehensive service portfolio here.](#)

Learn more about our CRO services in our free online webinars:

Best-practice study designs in metabolic research

Discover selected analytical methods for diabetes and obesity research by joining our latest webinar. Univ. Prof. Thomas Pieber, Dr. Christoph Magnes and Dr. Reingard Raml address a range of interesting topics, including the quantification of peptides that regulate metabolism and the use of stable isotope tracers in clinical trials.

Webinar Resources:

- ✓ [Live Recording](#)
- ✓ [Presentation Slides](#)
- ✓ [Presentation Slides with Speaker Notes](#)

Informed decisions in dermal drug development with dOFM

Thomas Birngruber and Frank Sinner present valuable insights on improved formulation screening and local dermal PK and PD using dOFM sampling. This webinar gives you a concise overview of dOFM capabilities and introduce possible setups for preclinical and clinical studies.

Webinar Resources:

- ✓ [Live Recording](#)
- ✓ [Presentation Slides](#)
- ✓ [Presentation Slides with Speaker Notes](#)

Contact

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CONTRIBUTION FROM KNOW-CENTER GMBH

360° Certification for Artificial Intelligence



Know-Center, SGS, TU Graz and the University of Graz are researching and developing efficient and independent testing methods and testing technologies for AI systems within the scope of a strategic partnership. Left to right: Harald KAINZ, Stefanie LINDSTAEDT, Barbara EIBINGER-MIEDL, Martin SCHAFFER, Stefan THALMANN © Know-Center

Artificial intelligence (AI) has the potential of changing the health and life science sector considerably. AI-powered tools and monitoring apps are already being used to support human expertise in diagnostics. In the future, AI applications are expected to relieve physicians and nurses of routine tasks and administrative processes and assist them with medical and nursing interventions. The main goal on using AI is to offer innovative, efficient and individualized solutions that improve the patient care while reducing the healthcare spending. However, particularly in the healthcare

industry, complex regulations must be considered, which poses quite a few challenges. The use of AI is still regarded with suspicion. Errors made by automated systems could lead to false diagnoses and harm people under the worst-case scenario. Health data is considered sensitive and must be handled with adequate protection. Generally speaking, in order to exploit AI's potential, trustworthy handling of data is a requirement, as well as guaranteed fairness and reliability of algorithms and their safety.

Strict Regulation for High Risk

In the future, the European Commission intends to introduce a regulation that is similar to the General Data Protection Regulation (GDPR) to regulate AI systems in security-relevant areas. Special emphasis will be made on the so-called „high-risk AI systems.“ This means that there are different regulations depending on the potential risk to central legal interests such as health, safety and fundamental rights. The draft distinguishes between AI applications with unacceptable, high, low or minimal risk. Most AI applications used in healthcare are expected to be considered high-risk AI systems. This means that mandatory conformity assessments will be conducted by manufacturers and providers in the future. In case of AI application, it will lead to additional rules on top of the existing strict regulations in the healthcare sector. Moreover, regulations for medical devices in the medical sector must also be considered. These comprehensive obligations could overburden companies and reduce or even prevent AI's value creation.

Creating Trust in AI

Within the framework of the „Trust your AI“ initiative, renowned research institutions and companies have joined forces to support providers in realizing competitive and trustworthy AI-based products and systems. The goal is to research and develop efficient and independent testing procedures and testing technologies for AI systems. A 360° all-round view

will ensure that AI applications are technically compliant, reliable and unbiased. The initiators are Know-Center, a leading European research center for data-driven business and artificial intelligence, the SGS Group, a global leader in testing, verification and certification, and the IAIK Institute of Graz University of Technology, one of the leading research teams in cybersecurity. Ethical and legal aspects are contributed by the Business Analytics and Data Science Center of the University of Graz. The joint expertise covers all areas that are essential for high quality and trustworthiness of AI: data, algorithms, cybersecurity, processes, ethics and law.

Companies such as Energie Steiermark AG, Infineon, Leftshift One, NXP and Redwave are participating in the project with use cases. The initiative is open to more partners from industry and academia who are interested in working together on AI testing methods.

Further information: <https://trustyour.ai>

Contact

KNOW Center GmbH

Research Center for Data-Driven Business & Big Data Analytics

info@know-center.at

www.know-center.tugraz.at



CONTRIBUTION FROM MYBIOTECH GMBH

Bio2Brain Set to Develop Effective Drug Delivery to Central Nervous System



Bio2Brain



MyBiotech



The aim of the [Bio2Brain](#) network is the development of a research and training program to train young scientists in innovating novel technologies to deliver biopharmaceuticals efficiently from the nose to the brain. Bio2Brain will create the fundament for the future transfer of the developed technologies for a later clinical development and GMP manufacturing.

Project partners from academia and industry have joined forces in the Bio2Brain network to investigate efficient administration routes of biopharmaceuticals for the treatment of disorders of the central nervous system (CNS). The challenge is an endogenous defence system that normally protects the CNS from unwanted substances. The downside, however,

is that commercial or even potential drugs cannot readily cross this barrier. In order to respond to this challenge, the Bio2Brain network will pursue more effective approaches and develop new paradigms for drug delivery technologies in the treatment of CNS diseases.

Disorders of the CNS, including multiple sclerosis and Alzheimer's and Parkinson's diseases, affect around 165 million people in Europe. These disorders are often associated with severe suffering of the patients and their families, as well as an enormous burden on the social systems. A highly critical challenge in that context is the existence of the blood-brain barrier (BBB), an effective human defen-

ce system that protects the CNS from circulating pathogens. However, it also results in a low central availability of drugs in the CNS, especially innovative biopharmaceuticals like monoclonal antibodies (mAbs). As a consequence, drugs with a low CNS bioavailability are currently delivered directly to the CNS via intrathecal, intracerebroventricular, or intraparenchymal injections. Unfortunately, such delivery systems are invasive, require surgery with high risks, have very low patient compliance, and are poorly controllable. Hence, there is a critical need for an effective new approach for drug delivery technologies in the treatment of brain diseases with CNS active molecules.

The Bio2Brain network will create a research environment for the interdisciplinary and intersectoral training of 13 Early Stage Researchers (ESRs) supported by 11 academic teams, 6 key industrial stakeholders, and an academic non-profit organization. Over a duration of 36 months, each ESR will work on their individual research projects (IRPs) in the scientific work packages (WPs) based on the training-through-research principle. A personalised training programme combining local trainings, network training, and international training via conferences and secondments will guide them. The research and training programme covers the development of new advanced materials, formulations, and engineered proteins for the intranasal CNS delivery of mAbs. The ESRs will obtain experience in the entire transdisciplinary development cycle of the medicinal product, from pharmacological drug pathway validation, product and process design, synthesis to characterization, as well as validation and quality control. The training

will be complemented with useful tools for the time to market and commercialisation phase.

Participation of MyBiotech GmbH

The MyBiotech GmbH will employ one ESR who will work on (bio)polymer-based particulate formulations for the intranasal transmucosal delivery of biopharmaceuticals. The ESR will conduct research on developing pharmaceutically approved (bio)polymer based biopharmaceutical delivery systems with tailored transmucosal passage properties.

Bio2Brain project consortium:



Contact

MyBiotech GmbH
Nazende GÜNDAY-TÜRELI;
Head of R&D Pharma
n.gunday-tuereli@mybiotech.de
www.mybiotech.de

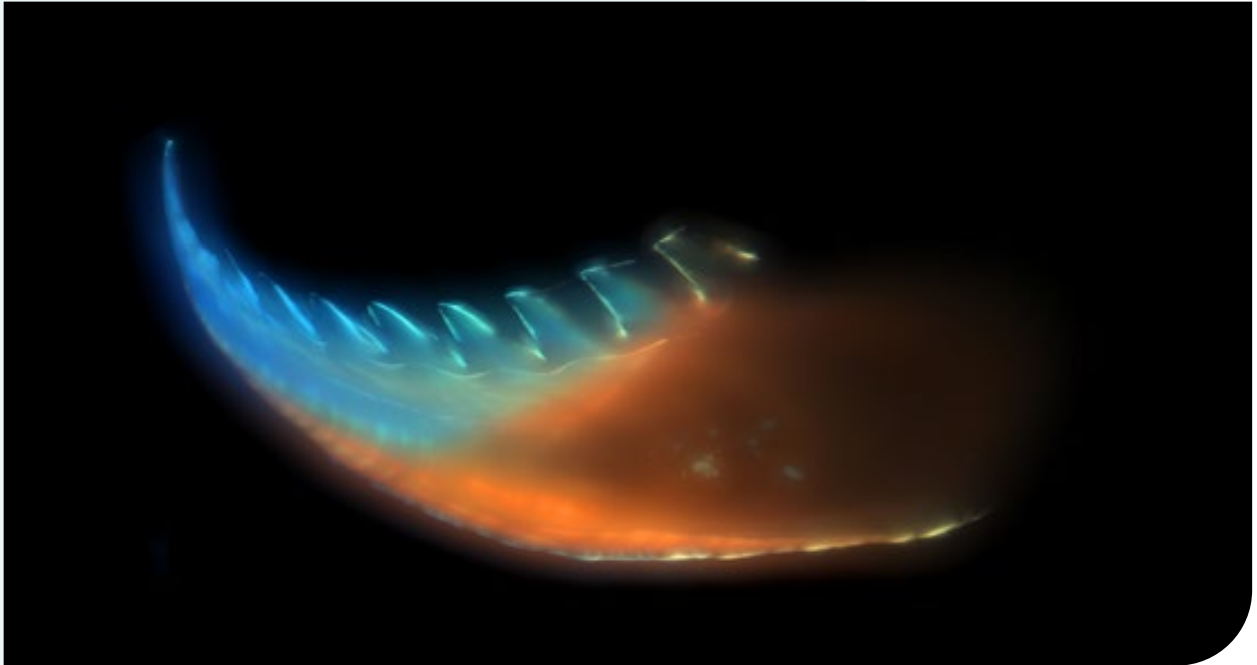


This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 956977.

CONTRIBUTION FROM TECHNISCHE
UNIVERSITÄT WIEN



The Iron Jaws of the Bristle Worm



© Dr. Kyojiro Ikeda/Universität Wien

Bristle worm jaws

Bristle worms are found almost everywhere in seawater, they have populated the oceans for hundreds of millions of years. Nevertheless, some of their special features have only now been deciphered: Their jaws are made of remarkably stable material, and the secret of this stability can now be explained by experiments at TU Wien in cooperation with Max Perutz Labs.

Metal atoms, which are incorporated into the protein structure of the material, play a decisive role. They make the material hard and flexible at the same time - very similar to ordinary metals. Further research on this class of materials aims at producing novel, industrially usable materials in a natural way.

Individual metal atoms

„The materials that vertebrates are made of are well researched,“ says Prof. Christian Hellmich from the Institute of Mechanics of Materials and Structures at TU Wien. „Bones, for example, are very hierarchically structured: There are organic and mineral parts, tiny structures are combined to form larger structures, which in turn form even larger structures.“ It’s different with bristle worms. Their jaws are extremely strong and unbreakable, but they do not contain mineral granules like vertebrate bones do. Instead, they contain metals. Of course, this has nothing to do with pure metal objects such as gold teeth or artificial hips made of titanium: The bristle worm uses metals such as magnesium or zinc in the form of individual atoms that are incorporated into a protein structure.

„On its own, the fact that there are metal atoms in the bristleworm jaw does not explain its excellent material properties,“ says Christian Hellmich. The typical properties known from everyday metals - apart from their hardness and elasticity, above all their toughness - are ultimately only created through the interaction of many atoms. Sliding surfaces are created along which the atoms move against each other. This can be investigated with so-called nanoindentation tests: A force is exerted on the material in a precisely defined way and then the resulting deformations are studied. Surprisingly, it turned out that the material of the bristleworm jaw behaves very similarly to metal.

An ancient high-performance material

„The construction principle that has made bristle worm jaws so successful apparently originated about 500 million years ago,“ says Florian Raible of the Max Perutz Labs, a joint venture of the University of Vienna and the Medical University of Vienna. „The metal ions are incorporated directly into the protein chains and then ensure that different protein chains are held together.“ In this way, the bristle worm can produce three-dimensional shapes from a particularly stable protein matrix.

At the same time, this structure also allows for deformation: When an external force is exerted on the material, the protein chains can slide past each other. The material allows elastoplastic deformations, rather than being brittle and fragile.

„It is precisely this combination of high strength and deformability that is normally characteristic of metals,“ says Luis Zelaya-Lainez, the study’s lead author, who used materials science techniques to examine the tiny jaws. „Here we are dealing with a completely different material, but interestingly, the metal atoms still provide strength and deformability there, just like in a piece of metal.“

Whereas industrially manufactured metals can only be produced using a large amount of energy, the bristle worm achieves a similar feat in a much more efficient way. „Biology could serve as inspiration here, for completely

new kinds of materials,” Hellmich hopes. „Perhaps it is even possible to produce high-performance materials in a biological way - much more efficiently and environmentally friendly than we manage today.“

The joint study between Hellmich’s and Raible’s working groups was made possible in part by support from the Austrian Academy

of Sciences’ „Research, Science and Society“ innovation fund, which supports innovative basic research at the frontier of established research fields.

For publication reference see “Recent scientific publications of BioNanoNet association members” on page 18!

Contact

TU Wien

Christian HELLMICH

christian.hellmich@tuwien.ac.at

www.tuwien.ac.at

Max Perutz Labs, Vienna University

Florian RAIBLE

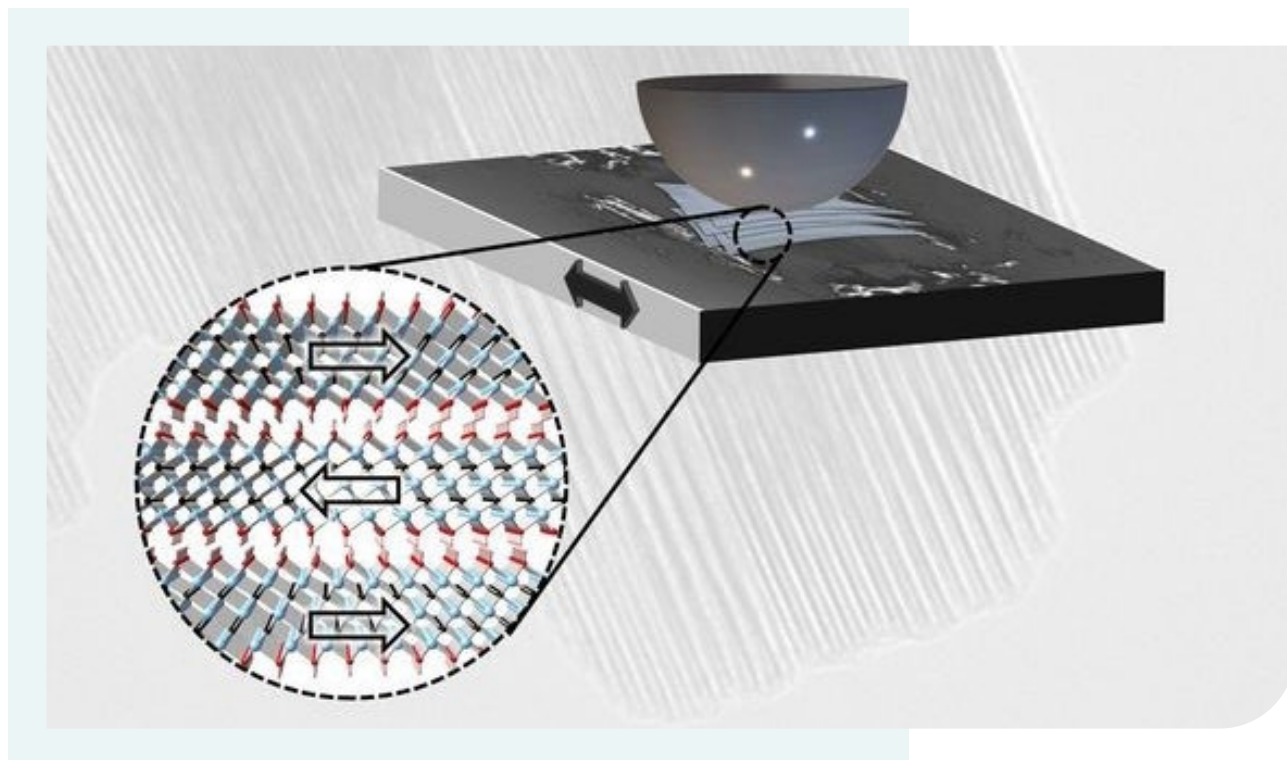
florian.raible@univie.ac.at



CONTRIBUTION FROM TECHNISCHE
UNIVERSITÄT WIEN



2D Nanomaterial MXene: the Perfect Lubricant



The atomic layers can move relative to one another, reducing friction. © TUWien

In extreme heat or in the vacuum of space: a novel nanomaterial delivers top performance in extreme situations, as demonstrated by TU Wien (Vienna) with international partners.

You can lubricate a bicycle chain with oil, but what do you do with a Mars rover or a red-hot conveyor belt in the steel industry? Very special nanomaterials have now been studied by the TU Wien together with research groups from Saarbrücken (Germany), Purdue University in the USA and the Universidad de Chile

(Santiago, Chile). The material class of MXenes (pronounced “maxene”) has caused quite a stir in recent years in connection with novel battery technologies. But it now turns out that they are also an excellent solid lubricant that is extremely durable and performs its task even under the most difficult conditions. These remarkable properties of MXenes have now been published in the renowned journal ACS Nano.

Like a stack of sheets of paper

Just like the carbon material graphene, MXenes belong to the class of so-called 2D materials: their properties are essentially determined by the fact that they are ultra-thin layers, single atomic layers, without strong bonds to the layer above or below. „You first start with so-called MAX phases, which are special layer systems consisting of titanium, aluminium and carbon, for example,“ says Prof. Carsten Gachot, head of the Tribology Group at the Institute of Engineering Design and Product Development at TU Wien. „The crucial trick is to etch out the aluminium with hydrofluoric acid.“ What then remains is a stack of atomically thin layers of titanium and carbon that lie loosely on top of each other, much like sheets of paper. Each layer is relatively stable on its own, but the layers can easily be shifted against each other. This displaceability of the atomic layers among each other makes the material an excellent dry lubricant: without generating abrasion, extremely low-resistance sliding is made possible. The friction between steel surfaces could thus be reduced to one sixth - and with exceptionally high wear resistance: even after 100,000 movement cycles, the MXene lubricating layer still functions without problems. This is perfect for use under difficult conditions: While lubricating oil would evaporate immediately in a vacuum during space missions, for example, MXene in the form of fine powder can also be used there.

Independent of atmosphere and temperature

„Similar things have been tried with other thin-film materials, such as graphene or molybdenum disulphide,“ says Carsten Gachot. „But they react sensitively to moisture in the

atmosphere. Water molecules can change the bonding forces between the individual layers. With MXenes, on the other hand, this plays a lesser role.“ Another decisive advantage is the heat resistance of MXenes: „Many lubricants oxidise at high heat and lose their lubricity. MXenes, on the other hand, are much more stable, and can even be used in the steel industry, where mechanically moving parts can sometimes reach a temperature of several hundred degrees Celsius,“ explains Gachot. The powdery lubricant was investigated in several experiments at TU Wien by Dr. Philipp Grütz-macher from Prof. Gachot’s research group as well as at Saarland University in Saarbrücken and Purdue University in the USA. At the other end of the world, Prof. Andreas Rosenkranz in Chile played a major role in initiating and designing the work. „There is also already great interest in these materials on the part of industry. We assume that such MXenes can soon be produced on a larger scale,“ says Carsten Gachot.

For publication reference see “Recent scientific publications of BioNanoNet association members” on page 18!

Contact

Institute of Engineering Design and Product Development, TU Wien

Carsten GACHOT

carsten.gachot@tuwien.ac.at

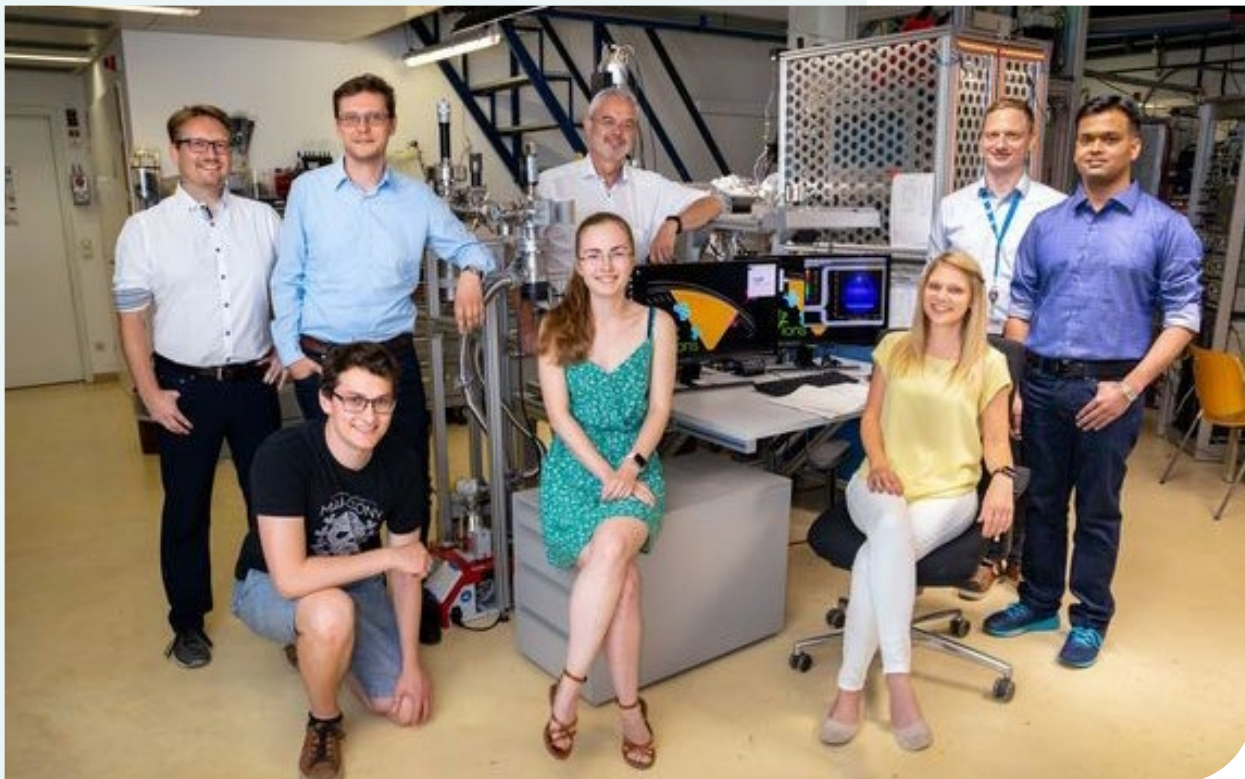
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CONTRIBUTION FROM TECHNISCHE UNIVERSITÄT WIEN



How Ions Get their Electrons Back



Biochip technology, developed at TU Wien

What happens when ions are passing through solid materials? It is nearly impossible to observe this directly, but scientists at TU Wien found a way to overcome this problem.

Very unusual atomic states are produced at TU Wien: Ions are created by removing not just one but 20 to 40 electrons from each atom. These “highly charged ions” play an important

role in current research. For a long time, people have been investigating what happens when such highly charged ions hit solid materials. This is important for many areas of application in materials research. Therefore it is crucial to know how the charge state of the ions change when they penetrate a material – but this is exactly what has been impossible to observe

directly until now. New measurements at TU Wien (Vienna) show that the ions obey remarkably simple laws.

Probing materials layer by layer

When highly charged ions penetrate a solid material, they can retrieve the missing electrons from the material and thus become electrically neutral. But how and where this happens exactly is difficult to investigate, because it happens inside the material. „We knew that this process must be very fast, because even a fairly thin layer of material is enough to completely neutralise ions,“ says Anna Niggas, first author of the present study. She is currently working on her dissertation in Prof. Richard Wilhelm’s group at the Institute of Applied Physics at TU Wien. Visually observing the processes inside the material may be nearly impossible, but novel 2D materials such as graphene, which consists of only a single layer of carbon atoms, now give scientists a chance to get to the bottom of these phenomena for the first time: „Graphene layers can be stacked on top of each other, so that thicker and thicker samples are created - you can assemble a solid body layer by layer,“ says Richard Wilhelm. „We have studied single, double and triple graphene layers. That way, we can see step by step, atomic layer by atomic layer, how the highly charged ions change.“ In this way, you can study a transition, from a single atomic layer to an ordinary three-dimensional material. Graphite, the material pencil leads are made of, is nothing more than a large number of graphene layers stacked on top of each other.

It’s the time that matters

The ions go through the different carbon layers at different velocities. It turns out that the decisive factor is the time the projectile spends in the immediate vicinity of the atomic layers. „If we take into account that the ions spend two or three times as long in contact with carbon atoms on their way through two or three graphene layers as they do in a single graphene layer, then it can be explained with a simple formula how quickly the ions capture electrons and change their charge state,“ Anna Niggas explains. „With our results, we can now calculate for the first time how many atomic layers you need until the ions are electrically neutral.“

Dynamics with great significance

In order to study the dynamics of the electron capture, one must first prepare the samples very carefully. Dr. Bernhard C. Bayer from the Institute of Materials Chemistry at TU Wien succeeded in precisely characterising the atomic layers using high-resolution microscopy - a great challenge when only very little material is available for the investigation in the atomically thin layers. The new findings are important for many areas of research: On the one hand, very fundamental phenomena can be studied in this way that are difficult to access with other methods. On the other hand, the interaction between ions and solid materials is also important for very practical applications - for example in materials analysis, where ions are used to study the properties of new types of materials in detail, or in semiconductor technology, where ion beams are used to structure circuits.

The research described was funded by the FWF, the „Innovative Projects“-Programme of TU Wien and the Doctoral College TU-D.

For publication reference see “Recent scientific publications of BioNanoNet association members” on page 18!

Contact

Institut für Angewandte Physik,
Technische Universität Wien
Anna NIGGAS
anna.niggas@tuwien.ac.at

Richard A. WILHELM
richard.wilhelm@tuwien.ac.at
www.tuwien.ac.at



CONTRIBUTION FROM VIRTUAL VEHICLE



UPSIM – Unleash Potentials in Simulation

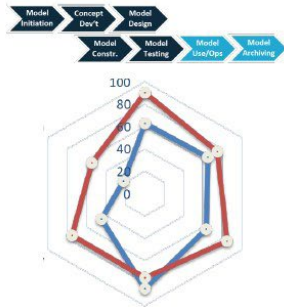


Increasing trust in system modelling and simulation is essential for enabling Digital Twin enriched system development, production, and operation. The ITEA3 UPSIM project, led by VIRTUAL VEHICLE, aims for system simulation credibility. This shall be realized by introducing a formal simulation quality management approach, encompassing collaboration and continuous integration for complex systems.

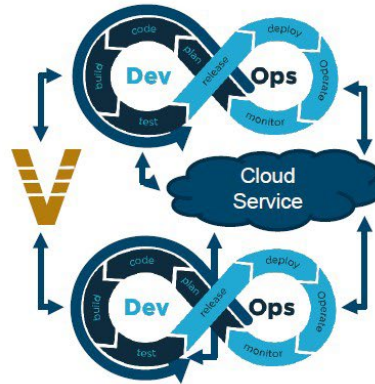
“Digital Twin” is one of the emerging technologies in almost all industrial sectors. The term

directly refers to the physical asset and allows it to be simulated, controlled and improved. But: A recent market study outlines that currently less than 1 % of physical machines and components “are modelled in a way that the models capture and mimic behaviour”! UPSIM is aiming for Credible Digital Twins and will change this situation significantly with predictive capabilities, leading to an opening and the accessibility of multi-billion markets prospected like for virtual commissioning and predictive maintenance.

1 Credible Digital Twin Readiness Levels



2 Continuous Collaboration



3 Unique Identification



UPSIM addresses the problem by the introduction of four major innovations based on the concept of Simulation Governance:

- (1) Modelling & Simulation reference processes and a metric for determining the Digital-Twin Readiness Level
- (2) collaboration patterns for efficient Digital Twin development
- (3) Artificial-Intelligence enriched Hybrid Simulations for ensuring simulation-reality convergence and finally
- (4) an infrastructure for the 'chained' identification of Credible Digital Twin simulation artefacts.

The main project outcomes shall be made available via open access and an open-source repository, for ensuring technology sustainability, a broad market-uptake and a long-term economical added value. Proposed innovations will engage additional value streams and the emergence of new business models. The provision of credible and uniquely identified Simulation Apps via domain-specific market-

places is instrumental to massive exploitation, as efficiency and speed of using Simulation is perhaps the primary factor impacting how frequently and widely simulation is conducted – Simulation Apps will allow a much broader audience of non-specialists and occasional users to safely benefit from simulation.

Comprehensive use cases

UPSIM partners covers complete value-chains within agriculture, healthcare, automotive and smart building domains for implementing UPSIM results in a multi-disciplinary and multi-domain fashion. Within the project, 3 main use cases are being targeted:

✓ Automotive Use Case: Scenario-based Testing

Testing Advanced Driver Assistance Systems (ADAS) is challenging, as the environmental conditions that appear in reality are manifold and complex. USPIM will take on the task of proper integration and configuration of complex tool-chains for scenario-based testing of (partly) automated vehicles.

✓ Healthcare Use Case: Medical Imaging Catheter

Virtual Design and Testing of medical imaging catheters by means of creating interacting device/human Digital Twins: This use case will lead to quantification of credibility and accuracy of these interacting digital twins for virtual testing, as well as potential workflow and business value.

✓ Agriculture Use Case: Agriculture Robot

By increasing the physics-based modelling, simulation and digital twin capabilities will provide valuable insights about the overall machine performance in the design phase as well as during field operation.

Contact

VIRTUAL VEHICLE Research GmbH
Martin BENEDIKT, Area Manager Efficient
Development, Head of Co-Simulation & Software

martin.benedikt@v2c2.at

www.v2c2.at



CONTRIBUTION FROM WOOD K PLUS



Lignin Modification and Use of the Products as a Sustainable Substitute for Phenol in Resin Production

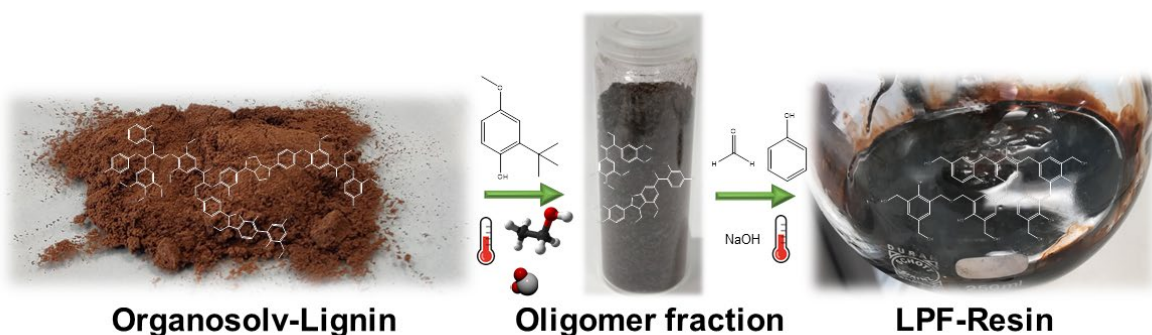
Raphaela Süss,^{a,b} Katharina Reisz,^{a,b} Franz Zeppetzauer,^a Birgit Kamm,^a Christian Paulik,^b

^a Wood K plus – Competence Center for Wood Composites & Wood Chemistry, Kompetenzzentrum Holz GmbH, Altenbergerstraße 69, A 4040 Linz, Austria, e-mail: r.suess@wood.kplus.at

^b Institute for Chemical Technology of Organic Materials, Johannes Kepler University, Altenbergerstraße 69, A 4040 Linz, Austria

The conversion of lignocellulosic biomass into value-added chemicals and biofuels has been attracting the attention of researchers in recent years. Lignin is an abundant, natural polymer and a major component of lignocellulose characterised by ether linkages, methoxy- and hydroxyl groups. Therefore, it has great potential as a sustainable source to produce basic chemical products.¹ Due to the aromatic structure and the large amount of phenolic hydroxyl groups of lignin and its degradation products, interest as a bio-based substitute for phenol in resins has increased in recent years.² In our study, depolymerization

and activation of lignin by butylhydroxyanisole (BHA) was investigated with respect to minimising coke formation and maximising the value-added oligomeric fraction. The resulting oligomer fraction was used to produce lignin-modified phenol-formaldehyde resins (LPF) containing 80 wt% lignin. The purchased organosolv lignin, oligomer fractions as well as the resins were characterized using size exclusion chromatography (SEC) to compare the molecular mass distribution. The oligomeric fractions and resins were further characterised by differential scanning calorimetry (DSC), rheometry and thermogravimetric analysis (TGA).



Schematic pathway from organosolv lignin via oligomer fraction to LPF resin

With the poster titled “Lignin modification and use of the products as a sustainable substitute for phenol in resin production”, Raphaela Süss achieved the second place in the Poster Award of the 14th Polymer Meeting (PM14) in Graz. This event addressed all major aspects of polymer science, from novel synthetic approaches, development of new functional polymers, characterization of macromolecules and polymers, innovative processing technologies, polymer testing and polymers@work in many applications, but also topics such as renewable polymers, recycling and sustainability aspects. Despite the current Corona situation, the first conference held in Live was a great success. There was a lively exchange between the participants during the coffee breaks and at the conference dinner in the “Weinschloss Koarl Thaller” near Graz. With a total of 34 invited lectures, 62 contributed lectures, 1 public lecture and 54 poster presentations the whole scientific spectrum of the conference was covered.



Raphaela Süss presenting her poster at the PM 14 during the poster sessions.

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Contact

Kompetenzzentrum Holz GmbH

Birgit KAMM

b.kamm@kplus-wood.at

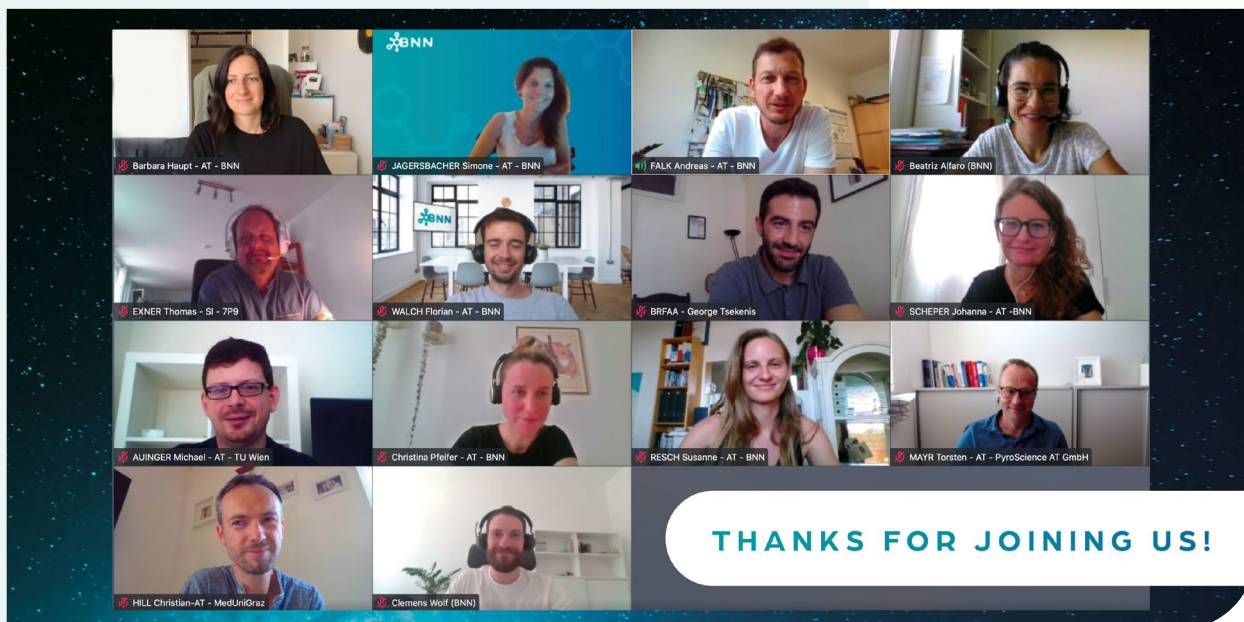
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BNN retrospect

BIONANONET MEMBER WELCOME WEBINAR

7th July 2021, online event



SEVEN PAST NINE



On 7th of July we had the pleasure to host our second BioNanoNet Member Welcome Webinar! Three organizations that recently joined the BioNanoNet association presented themselves, highlighting their expertise in the fields of biomedical research, sensor technologies, and data management:

BRFAA is the most recent addition to the Life Sciences Research organizations in Greece, which begun its activities in 2004. The found-

ing principle of BRFAA is to host both basic and clinical research, thus, providing an ideal setting for the emergence of translational activities (Medical Application). BRFAA is one of the few institutes with such character in Europe and is certainly unique for Greece. The main goal of BRFAA is to achieve excellence in the Biomedical Sciences by recruiting high quality investigators carrying out cutting-edge basic and translational research and by

training young researchers in a state-of-the-art facilities, which provide a particularly stimulating scientific environment and strong research infrastructures.

PyroScience is one of the world's leading manufacturers of state-of-the-art optical pH, oxygen, and temperature sensor technology for industrial and scientific applications. We offer plug-and-play solutions for laboratory and underwater usage. Furthermore, PyroScience provides smart OEM solutions for industrial customers.

Seven Past Nine develops data and information solutions for academic and commercial research. We are experts in designing, collec-

ting, organizing and presenting data and offer a unique combination of technical and scientific expertise to build data management solutions that don't compromise on project requirements.

The presentations can be watched on the [BNN-YouTube-channel](#). Additionally, the slides can be found on our [website](#).

Looking forward to webmeeting you at our next Webinar which will be held on November 16th, 2021, 13:00 -14:30 p.m. (CET)! More details coming soon.

BIONANONET ANNUAL FORUM & BNN NETWORKING SESSION

BIO
NANONET
— ASSOCIATION

OPERATED BY



16th September, 2021, hybrid event



Participants of BioNanoNet Annual Forum & Networking Session in our new BNN office

This year, the BioNanoNet Annual Forum & BNN Networking Session took place on 16th of September, 2021 as hybrid event. We were happy to welcome about 20 members in our brand-new BNN office as well as around 30 members as virtual participants.

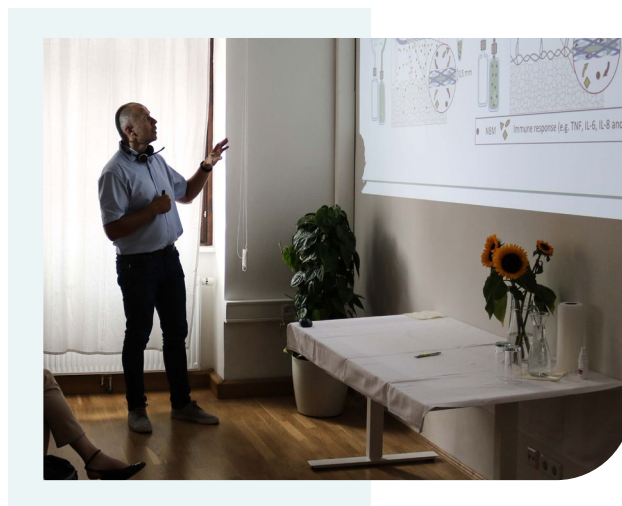
The BioNanoNet Annual Forum started with the presentation and discussion on the strategic development of the organization including an outlook on activities planned. The scientific part of the event with the theme “Horizon Europe – how to stand out in the crowd” was kicked off with the key note presentation from

Jana DRBOHLAVOVA, Seconded National Expert from European Commission about “the role of nanomaterials in achieving circular and toxic-free environment”. This presentation was followed by a talk from **Mar GONZALEZ** from the OECD Environment Directorate, Division Environment, Health and Safety about “the role of OECD and what could be contributed to their work, supporting harmonization of safety assessment and SSbD”. Then **Adrienne SIPS**, Research coordinator nanotechnology and advanced materials from the National Institute for Public Health and the Environment

(RIVM/NL) gave an interesting presentation on “SSbD in PARC and the need for collaboration and co-creation”. **Thomas BIRNGRUBER**, Head of Research Group from the JOANNEUM RESEARCH Institute HEALTH talked about “standard testing PK/PD - skin penetration and physiological skin reaction after exposure to nanoparticles” and presented related results within the BIORIMA project. Last but not least, the key note presentations ended with a presentation about “scientific excellence in biomaterials research – Biomaterials Risk Management (BIORIMA)” given by **Adriele PRINA-MELLO**, Assistant Professor in Translational Nanomedicine, Trinity College Dublin.

Furthermore, the key note presentations were followed by our BNN Networking Session with the theme “Horizon Europe – build our crowd”. Our members had the opportunity to identify potential collaborators with complementary expertise for specific call topics. All participants could learn more about other members’ call interest, extend their contacts and concretize their project ideas while thinking about potential consortia.

The Annual Forum ended up with a nice get-together at our new BNN premises in Graz at



Thomas BIRNGRUBER during his presentation

Kaiser-Josef-Platz. Our members who participated physically enjoyed the lively discussions and the atmosphere of relaxed cooperation.

The continuous growth of the network enables expanding the thematic horizon of BioNanoNet to the benefit of our members and thus supports research and development activities in different branches.

If you are interested to become a BioNanoNet member, please contact us at office@bnn.at.



FUNDING BY

Federal Ministry
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Events

BNN EVENTS & BNN CO-ORGANIZED EVENTS

19th nanoNET–Austria Meeting & 2nd NanoSyn2–Joint Meeting

When? 29th September 2021, 12:00 – 17:30 CET

Where? hybrid

[More information](#)

NanoSyn²

FUNDED BY

 Federal Ministry
Republic of Austria
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology

BioNanoNet Member Webinar

When? 16th November 2021, 13:00 – 14:30 CET

Where? online

[More information](#)

BIO
NANONET
— ASSOCIATION

OPERATED BY



BNN PARTICIPATES

NanoPAT interactive workshop @ EuroPACT 2021

When? 14th – 17th November 2021,

Where? online

[More information](#)



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MEMBER EVENTS

Webinar Healthcare & Ethics in AI

When? started on 22nd September 2021, 7 dates, each from 17:00 – 18:30 CET

Where? online

Is artificial intelligence (AI) changing the healthcare sector? What skill sets will be demanded by AI's world of tomorrow? How do we create ethically responsible AI solutions?

In the „Healthcare & Ethics in AI“ webinar series, during 90-minute online sessions experts from the fields of medicine, technology and ethics provide compact and easy-to-understand insights into the current developments and challenges of artificial intelligence in healthcare. The goal is to openly discuss various AI applications, fears and visions in an inclusive and interdisciplinary setting.

The event series address people working in the healthcare sector, students and interested parties who want to learn more about AI in healthcare. The event series were jointly launched by FH Joanneum, Know-Center GmbH, Graz University of Technology, Medical University of Graz, Medical University of Vienna, Human Technology Styria, JOANNEUM RESEARCH, Varian and Canon Medical Systems.

[Registration here](#). Participation is free of charge.

Life Science Experts Consultation Hour on Demand

When? on demand



Get valuable feedback and crucial information for the further development of your company, your products or services. As a cluster partner, you now have the opportunity to discuss key questions about your company in an exclusive group of experts, in a timely and needs-based manner and „on demand“. At this event, the individual company has a team of experts from the areas of quality management, product approval, clinical evaluation, sales & marketing, financing & funding as well as patent and commercial law available.

Contact: Julia Pirkenau, julia.pirkenau@human.technology.at

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Innovation.Day: WILD**When?** 14th October 2021, 10:00 – 15:00 CET**Where?** online

How can Virtual or Augmented Reality change the sector?

For more details [click here!](#)

**AICI Forum Velden****When?** 5th – 6th November 2021**Where?** Velden, Austria

With 250 participants in its first year and about 400 registrations for last year's virtual edition, the Artificial Intelligence in Clinical Imaging Forum has been a success from the start. In 2021, this interdisciplinary single-track event is going to focus on the translation of AI research and software solutions into clinical practice. AICI Forum attendees span all areas of the healthcare system. They shape the conversation on the future of diagnostic imaging in several medical disciplines.

For more details [click here!](#)

**M3d+IT****When?** 2nd – 3rd December 2021**Where?** online

The M3d+it (Medical 3d-printing and Innovative Technologies) is a platform that promotes 3d-printing in medicine and brings together health professionals, doctors, researchers, and companies in the field.

For more details [click here!](#)



Finally



We hope you enjoyed our BNN NEWSLETTER! Please do not hesitate to contact us if you would like to give us any suggestions or feedback! Our next BNN NEWSLETTER will be published in December 2021. BioNanoNet members are welcome to send their contributions until 6th December 2021!

Contact:

BioNanoNet Forschungsgesellschaft mbH
 Simone Jagersbacher-Uhl
simone.jagersbacher@bnn.at
 Phone: +43 699 155 266 02
www.bnn.at

Impressum:

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Connect with us!



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The background is a solid teal color. Overlaid on the right side is a large, faint, light-blue graphic of a molecular structure. It consists of several interconnected circles and hexagons, resembling a chemical or biological network. The text is centered horizontally and vertically in the left half of the image.

**INNOVATION IS THE KEY.
SUSTAINABILITY LEADS THE WAY.**

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