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NEWSLETTER



FOCUS TOPIC OF THIS ISSUE:

**Sustainability in Science,
Research and Development:
Challenges and Opportunities**

Table of contents

EDITORIAL	5
------------------	----------

BNN NEWS	6
-----------------	----------

BNN Office Tour	6
-----------------	---

New BioNanoNet Member	7
-----------------------	---

FOCUS TOPIC OF THIS ISSUE:

Sustainability in Science, Research and Development: Challenges and Opportunities	8
--	----------

Bio-Based Nanomaterials in an Open Innovation Test Bed	8
--	---

Circular Economy	9
------------------	---

From Waste to Renewable Diesel	12
--------------------------------	----

Most Innovative Biodiesel Production Plant in Europe – Built by BDI and Operated by Envien	15
---	----

microONE - Microplastic Particles: A Hazard For Human Health?	18
---	----

Addressing Safety and Sustainability in Research Projects	20
---	----

Enabling Sustainable Nano-Pharmaceuticals from Lab Bench to Clinical Trials with DELOS Nanoformulation Technology	23
--	----

Sustainability, Challenges and Opportunities	25
--	----

Combination of AFM and Digital Microscopy	27
---	----

Leverage the Potential of Your Data within a Sustainable Data Service Ecosystem	29
--	----

RECENT SCIENTIFIC PUBLICATIONS 31

PROJECT UPDATES 35

BIORIMA's Final Show – 4 years of BIOMaterial Risk Management Come to an End	35
BreadCell H2020 FET-OPEN Project's 1 st Year's Progress & Achievements	38
HARMLESS Presented the Project Case Studies at the OECD	41
SABYDOMA's survey – "Vision/Definition of Safe-and-Sustainable-by-Design (SSbD)"	42
STARS Survey - Boosting SMEs in the Rail Sector with Advanced Technologies	43

BIONANONET MEMBER CONTRIBUTIONS 44

Biotechnology Prize Elmer L. Gaden Award for acib-CSO Bernd Nidetzky	44
DIGI-B-CUBE: Boosting Innovation to Enhance Patient-Centered Diagnosis and Treatment	45
Multivalent Self-Assembled Platforms for the Delivery of Chemotherapeutic Drugs	47
New Graphene-Based Neural Probes Improve Detection of Epileptic Brain Signals	49
A New Lab To Better Understand Wound Healing Through Skin Models	51
Franz Feichtner is the New Director of HEALTH	53
Is Time Spent in the Environment a Key Toxicity Factor in Nanomaterials?	54
Project "Technology Development for Micromanufacturing of Sensors for Combustible Gases on Nanocomposite Hybrid Materials with TiO ₂ Nanotubes and Graphene"	56

Sensor Integrated Lab-on-Chip for Nanotoxicity Assessment	58
Dipoles Revealing Aberrations	60
Digital Health Literacy for All	62
Project TEMSESOFT “Smart Optical Device for Temperature Sensing, Based on Innovative Luminescent IV-VI Quantum Dots-Doped Complex Nano-Structured Thin Films”	65
BNN RETROSPECT	67
NanoCommons Knowledge Base & Hackathons	67
SABYDOMA’s workshop “A Stakeholder’s Perspective of Safe-and-Sustainable-by-Design (SSbD)”	70
BioNanoNet General Assembly, BNN Networking & SusChem-AT Event	73
EVENTS	76
BNN Events & Events Supported by BNN	76
Member Event Notifications	80
FINALLY	82

Editorial

CONTEMPORARY ISSUES FROM THE NETWORK

Dear Ladies and Gentlemen,

without any doubt, we have very challenging times that make it difficult to focus on the work. Consequently, the most important item is to stand together and to maximize our efforts to make our world a peaceful place, again!

Our thoughts are with all that suffer from war and we really hope and pray for peace!

Despite this, we continuously push the science, research and development work together with our partners in the BioNanoNet network, since beginning of 2022 with a special focus on “sustainability”. To this end, you will recognize lots of relevant information in this newsletter.

Also, we could perform the [Networking event on 10th March](#) physically in Graz along those lines, with a [SusChem-AT](#) focus. The experiences of the recent years have put evidence on the importance of thematic focus groups, which builds the basis for gaining trust and collaboration culture. Hence, besides the well-established and positioned SusChem-AT, the

BNN-team is underway to vitalize the technology platform [NanoMedicine-Austria](#), as well as the [Austrian Microfluidics Initiative](#) – and both will have a strong international collaboration aspect. So if you are interested to learn more about this and how to get involved, please [connect with us](#).

Andreas & the BNN-team

P.S.: Save the date for our upcoming events:

[BioNanoNet Gold Member Webinar](#), 31st May, 13:00 – 14:30

[BioNanoNet Annual Forum & BNN Networking Session](#), 27th September, Hall i.T., Austria

[→ TABLE OF CONTENTS](#)

BNN News

BNN OFFICE TOUR

Would you like to experience a typical day at BNN's headquarter in Graz?

Join us through the daily meetings, discussions and coffee breaks and watch the sun set over the rooftops of Graz in our office tour video.

We thank the whole team for participating in the video.



[Click here to watch our video](#)

[→ TABLE OF CONTENTS](#)

NEW BIONANONET MEMBER

We are happy to welcome our new extraordinary BioNanoNet member:



IVL Swedish Environmental Research Institute (Sweden)

IVL Swedish Environmental Research Institute conducts qualified research and performs targeted consulting assignments for companies that need expert help with the environment and sustainability.

www.ivl.se/en

Focus topic of this issue:

Sustainability in Science, Research and Development: Challenges and Opportunities

CONTRIBUTION FROM ACIB

Bio-Based Nanomaterials in an Open Innovation Test Bed



Replacing fossil fuels with renewable raw materials is an essential part of the strategy to combat the climate crisis. CO₂ is thereby integrated into circular processes by plants as a raw material. A broad portfolio of chemicals and materials can be produced from lignocellulosic biomass using both traditional and state-of-the-art technologies. One focus is on nanomaterials. However, it is a special challenge to produce new products in comparable quality, quantity and at competitive prices in order to be able to stand as a serious alternative to conventional materials.

The EU project „Bionanopolys“ addresses this challenge by creating a suitable environment through an „Open Innovation Test-Bed“ (OITB) to drive innovative developments in the field of bio-based nanomaterials for applications in the textile, packaging, polymer, 3D printing, cosmetics, food, or even construction industries. 14 pilot plants across Europe are ready to validate processes that produce nanofibres, crystals, lignin, dispersions or nanocapsules and block copolymers from lignocellulosic raw materials for use in bionanomaterials. The studies from the pilot plants are accompanied by supporting services, such as modeling, safety analyses, technology impact assessments, sustainability checks, etc.

Austria plays an important role in the Bionanopolys partner network: with its technology of biomass utilization from wood waste, the Austrian Centre of Industrial Biotechnology (acib) at the Graz University of Technology contributes significantly to transforming biomass into bionanomaterials.

Are you an Austria based company or scientific institute interested in cellulose-based materials? Are you looking for recycling possibilities for wood waste? Or would you like to use biomass hydrolysates or nanocellulose in your products or process them further? Perhaps you have even developed a technology yourself that would be an excellent fit for Bionanopolys? We look forward to welcoming you to our informational webinar and to discussing various solution approaches with you: [5th April 2022, 10:00 – 12:00 CET- Online Webinar](#)

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CONTRIBUTION FROM BDI

Circular Economy



Together with their customers, the experts from BDI GreenTech Solutions in Grambach, Alexander Schiffmann (left), Fabian Weinhandl (center), Andreas Toth (right) contribute to a green future.

The earth's climate is changing – but are companies fit for green business?

The Styrian company BDI-BioEnergy International GmbH is a pioneering company in green technologies and successfully realizes projects worldwide that lead to a sustainable future. BDI-BioEnergy International GmbH, based in Raaba-Grambach near Graz, is specialized in the implementation of resource-saving technologies for the valorization of residual and waste products from industry and commerce.

More than 25 years ago, the idea of obtaining biodiesel from waste-based feedstock was born. By developing the patented Multi-Feedstock technology, BDI launched the ultimate solution for converting waste fats and oils of all kinds into standard-compliant biodiesel. More than 70 plant projects have been implemented internationally since then, making the company market leader in this field. But even with this mature technology, BDI is still far from reaching its final goal – the journey continues.

Clever, sustainable solutions are necessary

Until only several years ago, industry conflicted with environmental protection. And even today, it is not easy to make industrial processes efficient and environmentally friendly – however, it is possible. Innovative ideas and clever, sustainable solutions are now more in demand than ever as they help reduce environmental pollution, revolutionize the production of raw material and generate sustainable recyclables. Besides major international projects and with more than 320 patent applications, BDI is the leading company in the field of biodiesel made from waste materials and the perfect partner to offer customer-specific, sustainable solutions.

Technologies for a green future

The company is aimed at the efficient upgrading of waste and residual materials. In addition to its current business area, BDI's GreenTech Solutions division offers full-service engineering and consulting solutions for other sectors and industries to advance ecological ideas and implement customized technologies. In this way, GreenTech Solutions supports companies seeking solutions for plastics upcycling, phosphorus recycling and other applications in making significant contributions to the circular economy and in their attempts to reduce CO₂ emissions.

GreenTech Solutions offers provisions for the latest technologies – from idea to concept to market maturity – with the aim of significantly increasing production efficiency, reducing and optimizing waste streams to achieve the best possible independence in raw material procurement. This proverbial “circular econo-

my” enables sustainable production and subsequently makes our planet more livable and environmentally friendly. But how does this work exactly?

“Technology Readiness Level”

On the way from idea to start-up, an innovation passes through different “Technology Readiness Levels”. These levels describe the customer's current state in the technology development process. Whether it is a question of conception, initial laboratory trials, testing of special process steps, upscaling to pilot scale or practical tests for green technologies – support is provided along the entire value chain to plant construction and commissioning. GreenTech Solutions offers individual plant solutions for liquid-phase-chemical processes, for example, when innovative, industrial product solutions or sustainable technologies and an expansion of capacities are required. BDI's latest milestone: the upcycling of previously non-recyclable plastic waste.

SynCycle – unwasting plastic

GreenTech Solutions' research and development successfully bring plastic waste back into the cycle. In cooperation with the Next Generation Group, a technology for chemical recycling of synthetic materials – plastics of all kinds – is currently being developed. Regarding the creation of this waste stream, nothing will change anytime soon due to technological immaturity. What must change, however, is the way this valuable resource is handled. Thus, the motto is, “From waste to value”. Through a unique chemical recycling process, plastic re-enters the value chain so that plastic waste that cannot be recycled is

kept in the cycle so that its value is retained. In so doing, added value as well as climate and environmental protection are promoted.

Jointly towards a greener future

We need different solutions and various environmentally friendly technologies to achieve the targeted climate goals. The Austrian Green Tech Valley, the region of Styria and Carinthia, is considered a special technology hotspot for climate protection and the circular economy and provides an ideal framework for BDI to exploit synergies and advance sustainable technologies. Around 260 companies and research institutions based in the south of Austria are meticulously working on solutions for the energy turnaround and are pushing on the transformation towards the ecological age. Already thinking in terms of these cycles is an important prerequisite for successfully moving towards a green future.

The prospective challenges are clear: with plenty of green, sustainable ideas and out-



Chemical processes are developed, tested and implemented on an industrial scale at BDI's in-house technical center. © BDI

standing technologies in the development of chemical processes, the experts at GreenTech Solutions are the link between sustainable process ideas and their industrial implementations. They ensure that industry and the economy are fit for a green future and help create a livable foundation for a clean planet.

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CONTRIBUTION FROM BDI

From Waste to Renewable Diesel



Example of different oils and fats. On the top shelf, the five samples on the left show already the differences in UCO.

Waste oils and fats are becoming more important in the production of renewable diesel and sustainable aviation fuel (SAF). In comparison with fresh vegetable oils, waste feedstock not only has a higher level of impurities, they are also contaminated with other elements that are not present in vegetable oils. Therefore, an advanced pre-treatment process is required when it comes to feed-stock like used cooking oil (UCO), animal fat or distillers corn oil, several waste stream from palm oil processing like palm oil mill effluent (POME), palm sludge oil (PSO) or husk oil (palm fiber oil) and feedstock like trap greases.

The critical aspect is the poisoning of the hydrogenation catalysts in the downstream pro-

cess, as they are sensitive to several impurities present in the feedstock. A simple bleaching, as used for vegetable oils, is not sufficient for waste feedstock, where the critical impurities like metals, phosphorous, chloride and other additional impurities have to be considered. Relevant impurities and average input requirements for the hydrogenation process are shown in Table 1.

Table 1

Feedstock Parameter	Refinery Requirement	Crude Feedstock		
		Vegetable Oils (fresh)	High Quality Waste Oils	Low Quality Waste Oils
Chlorides	< 5 – 10 ppm	< 10	< 30	<100
Org. Chlorides	< 1 – 5 ppm	< 5	< 10	< 10
Metals, total	< 5 – 10 ppm	< 50	< 100	100 – 600
Phosphorous	< 2 – 3 ppm	300 – 500	< 50 – 200	200 – 500
Nitrogen	< 150 ppm	< 10	< 250	< 600 – 2.500
Sulfur	< 50 ppm	< 10	< 10 – 100	< 500
Polyethylen	< 50 ppm	0	50 – 200	100 – 400
Solids	< 0,1 wt%	< 0,1	0,5 – 1	0,5 – 1,5

From the feedstock to the process

Firstly, the feedstock has to be defined. The different sources of waste feedstock have different levels and types of impurities. If fresh vegetable oils and waste feedstock are processed it makes sense to have two parallel lines, one for fresh vegetable oils and a second line for processing waste feedstock. Processing bad feedstock may require blending to achieve the required quality for all parameters. Even if the best results can be achieved, it often makes more sense to perform a blend of bad feedstock qualities after the pre-treatment instead of pre-treating them to the best level. This data is the basis for the definition of the process technology and configuration.

BDI Advanced Feedstock Pre-Treatment

The BDI Advanced Feedstock Pre-Treatment Process is a flexible and modular process system, suitable for fresh vegetable and waste oils and fats. The basis for waste oils and fats is a robust pre-purification, which has been especially developed by BDI to handle all kind of waste oils and fats. Figure 2 shows the basic unit configuration.

This process is followed by a drying step, and thereafter, an advanced adsorption process. The design and operation of the adsorption

unit is key for an efficient system. Several adsorbents can be used in the process, and it is important to find the right one for the best adsorption effect on the critical impurities, the required demand and the resulting operating costs. Based on extensive adsorbents testing, BDI has the knowledge to support the customer in the decision to find the right ones. In addition to this pre-purification set-up, other process units may be required. Using animal fats as feedstock can result in polyethylene (PE) particles in the rendered fat, depending on the rendering process and the origin of the fat source. Due to the properties of these plastic particles, it is not possible to remove them with a centrifuge or Tricanter as they are too light. They can be removed by pre-coat filtration, but this can result in the filter getting easily clogged. It is also not suitable for high PE concentration as this can result in capacity problems. BDI has developed a different removal process (patent pending), which is added upfront to the pre-purification unit and eliminates known disadvantages. If feedstock without PE particles is processed this unit can be bypassed. Other units can be added downstream if required, for example, to reduce or convert free fatty acids.

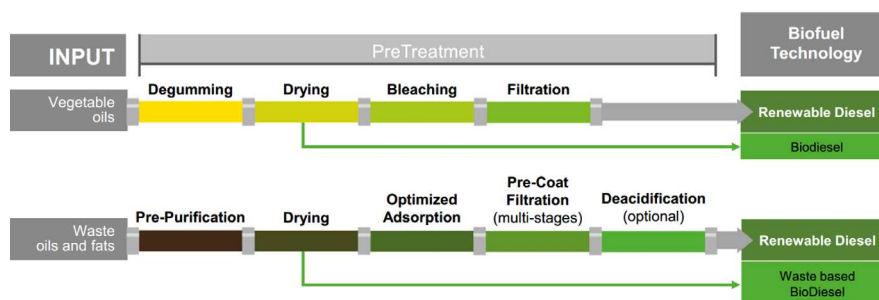


Figure 2. The BDI feedstock pre-treatment process for waste oils compared to vegetable oils

From the process to the plant

BDI not only develops technologies and builds plants, it supports the customer through all project development phases.

It begins with the discussion about feedstock quality and quantity that are expected to be processed followed by a first look at the process. The company can support this first critical phase with laboratory feedstock analysis and also pilot scale testing at its technical center to prove the concept. The next stage is detailing the process by defining the equipment. The company is not bound by a single original equipment manufacturer (OEM) and is, therefore, able to use the most suitable equipment for each process. Finally, BDI constructs and commissions turn-key pre-treatment plants worldwide, and in addition, it supports customers with aftersales services.

Process operation

Not only is the process design crucial, but the efficient operation of the process is equally important. Considering the low impurity limits in the range of a few parts per million (ppm), a change in feedstock quality requires an adaption of the operating conditions. As adsorbents, for example bleaching clay, are used in the process, the type and the required dosing amount has to be adapted to the kind and level of impurities in the feedstock. Using more does help, but this increases the operating costs. Therefore, only the minimum required amount should be used to reach an optimum between operating costs, yield and quality. The key to achieving this is through

constant and reliable feedstock analysis. Analytical management and process optimization will be passed on to the customers during the commissioning process.

Conclusion

The design and operation of the pre-treatment process is key for the reliable, efficient and economic production of renewable diesel. As for the issue of waste feedstock, an advanced pretreatment process is required to handle this consideration. A flexible process configuration is required to assess all impurities, especially if different feedstock is used. The modular BDI process allows for the processing of a broad range of feedstock, whether it be vegetable oils or waste oils and fats. The company has the expertise to design and build flexible and reliable pretreatment plants and knows which equipment works best for each process. As a full service provider, BDI assists customers with feedstock evaluation in the laboratory to the start-up of the pre-treatment plant.

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CONTRIBUTION FROM BDI

**Most Innovative Biodiesel Production Plant in Europe –
Built by BDI and Operated by Envien –
Officially Opened on March 11, 2022**



Source: MOL Group, Opening March 11, 2022

The new biodiesel plant built by Austrian process engineering company BDI-BioEnergy International GmbH and operated by Rossi Biofuel Zrt, a subsidiary of the ENVIEN Group will make an important contribution to sustainable circular economy in Hungary.

For Rossi Biofuel Zrt, building the new plant is a commitment to sustainable innovation and profitability:

- ✓ 150,000t annual CO₂ savings
- ✓ 70,000 cars to be climate neutral operated
- ✓ up to 50 new jobs in the region

The ENVIEN Group is one of the largest groups of companies in biofuels production in the CEE region and these days, it is also one of the most important agricultural group in Central Europe. ENVIEN is investing strategically in 'next generation' raw materials and in the expansion of production capacities. The new production facility at Komárom, Hungary is a multi-feedstock plant using BDI's patented Repeatable Catalyst Technology (RepCAT). With this innovative technology even the lowest-quality feedstock with high levels of impurities can be effectively processed to standards-compliant biodiesel. The use of a recyclable catalyst further underlines the environmental sustainability of the process.

Sustainable development for the biodiesel production of tomorrow

By producing biofuels from low-quality waste materials, the new plant makes a significant contribution to reaching the targets set by the Hungarian government: to produce 55% less greenhouse gases by 2030 and to be climate neutral by 2050.

The essential step forward with the RepCAT process is its outstanding robustness towards different kinds of waste materials. It can handle a great diversity of waste oils and fats, for example used cooking oil, fat from grease separators or waste from plant-based oil production.

Not only is the RepCAT technology highly innovative, it is also a highly eco-friendly biodiesel process, and was approved by the European Food Safety Authority EFSA in April 2021 as a disposal process for high-risk waste fats.

Markus Dielacher quote: *"Being able to design and build this innovative plant for one of the biggest biofuel producers in Europe is one further big success for BDI in Europe. Once again, we have demonstrated our competence in design, engineering and construction of chemical plants to make the world a little bit greener."*

Róbert Spišák quote: *"The BDI RepCAT process means we can use a high variety of feedstock, even lowest-quality materials – such as trap grease or animal fats – to produce valuable, high-quality biodiesel. With this technology we can make a valuable contribution to CO₂ reduction, and the amount of biodiesel we will produce at this site will be enough for climate neutral operation of more than 70,000 cars."*

About BDI-BioEnergy International GmbH

BDI-BioEnergy International GmbH is a technology and market leader in design and building of customized biodiesel production plants using its patented Multi-Feedstock Process. This enables highly efficient production of biodiesel from a variety of feedstock, such as plant-based oils, used cooking oil and animal fats. Based on the competence and experience that BDI has built up in the biodiesel field, the company has diversified into technology development for resource-efficient industrial conversion of all kinds of waste into useful materials. The company has a large portfolio of patents derived from its own research and development. True to the motto "develop – design – build", BDI-BioEnergy International GmbH supports its clients from initial feasibility research through all stages of process and plant development, basic, detail and authority engineering, construction, commissioning and

ongoing Customer Service. Currently, BDI-BioEnergy International GmbH has around 100 employees.

About Rossi Biofuel Zrt

Rossi Biofuel Zrt. is a joint venture of the ENVIEN Group and MOL Group where ENVIEN owns majority of shares. Rossi Biofuel Zrt. is an important player in the production of biodiesel in Hungary delivering the biofuels to the

whole region. The Rossi Biofuel Zrt. biodiesel factory is located at the site of MOL NYrt. in Komárom. The factory was built in 2006 as a greenfield investment and production began one year later. The main activity of Rossi Biofuel Zrt. is the production of biodiesel from fresh plant oil, used cooking oil and other waste oils, now together with the new RepCAT unit on the level of 210 000 ton/year.

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CONTRIBUTION FROM CBMED

microONE – Microplastic Particles: A Hazard For Human Health?



Wolfgang WADSAK (CBmed, Medical University of Vienna) & Lukas KENNER (Medical University of Vienna)

The COMET Modul project **microONE** officially started operation with the beginning of this year. Briefly, microONE was designed to fill the substantial knowledge gap regarding potential health effects of exposure to micro- and nanoplastic particles (MNP), especially regarding tumor development, growth and dissemination. Together with a large and comprehensive, multinational, multidisciplinary and cross-sectorial partner consortium, those almost completely unexplored health effects are now addressed appropriately. Hence, microONE aims to provide scientific evidence on whether – and if so, how – different particles influence tumor development and spread by

using colorectal cancer (CRC), one of the most frequent tumor entities and prone to contact with MNP in the gut, as an example. Also, MNP effects on the composition, activity and modulation of the gut microbiome will be assessed.

Within 4 sub-projects, microONE will gather scientific knowledge towards the following contents:

- ✓ interactions between MNP and primary tumor cells obtained directly from CRC patients will be explored, and a suitable medium-to-high-throughput method for the detection and characterization of MNP will be established and optimized.

- ✓ Supported by supercomputing, the MNP interactions with molecular targets (e.g. proteins) and targeted drugs (against CRC) will be simulated.
- ✓ The effects of exposure to MNP on the microbiome and possible 're-balancing' effects of probiotics to MNP-induced changes will also be explored.
- ✓ The application of labeled MNP in vitro and in vivo (specific tumor models) will help to determine the mechanisms how MNP influence cell growth, primary tumor formation and spontaneous metastasis.
- ✓ For the latter experiments, suitable primary, secondary and weathered MNP will be prepared and physico-chemically characterized.
- ✓ With the newly established analytics, tissue sections of CRC patients will be screened for MNP load in addition to standard immunohistochemical staining.

Integrating these data will allow for direct assessment of molecular events and biological risk caused by plastic particles. MNP must be seen as a public health concern and it is important to identify actionable steps, identified in the course of this project, to prevent disease. Many of the project parts are scientifically and partly also technologically uncharted territory. Without doubt, the scientific evidence generated within microONE can have far-reaching consequences for society and its future approach to the safe use of plastics.

Stay tuned for exciting results to come within the next months and years. For more information, visit our currently growing website www.microONE.at or reach out to us directly via info@microONE.at.

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CONTRIBUTION FROM ICCRAM – UNIVERSIDAD DE BURGOS



Addressing Safety and Sustainability in Research Projects



Environment and Sustainability ICCRAM Research Group

The International Research Center in Critical Raw Materials for Advanced Industrial Technologies (ICCRAM), which belongs to the University of Burgos, has been studying the safety and sustainability of innovative processes and materials from different research projects since 2014. The sustainability assessment, which includes environmental and socio-economic analyses, has become a requirement when developing innovative R&D projects, reflecting the importance that governments are giving to this field and public investments.

This fact can be observed in the EU Green Deal, which aims to achieve climate neutrality by 2050, and its Circular Economy Action Plan, which considers different critical sectors for the implementation of the circular economy, such as batteries and vehicles, packaging, plastics and construction. ICCRAM is working in different research projects related to these sectors, performing tasks related to the identification of environmental and socio-economic impacts and risk assessment in the design stages of innovative processes,

where different nanomaterials and novel metal matrix composites are involved. With this, the sustainability and safety by design (SSbD) concepts are considered, in order to prevent environmental and human risk in future stages of the products, avoiding adjustments and inefficiencies.

In the technical aspect, the sustainability is measured by the Life Cycle Sustainability Assessment (LCSA), which includes Life Cycle Assessment (LCA), Life Cycle Costing (LCC) and Social-Life Cycle Assessment (S-LCA). The main tool that provides information regarding environmental impacts is the Life Cycle Assessment (LCA), which methodology is standardized by the ISO 14040 and 14044. LCA analyses the potential impact associated with a product, process or service during its entire life cycle. To do this, the inventory of inputs (raw materials, energy, water, etc.) and outputs (finished product, emissions, etc.) involved in the life cycle of the object of study is carried out, in order to assess the environmental burdens and look for possible optimizations of the system.

The economic counterpart is LCC, a framework developed aiming to include the total costs arising from a product throughout its lifecycle, that becomes a major factor in contributing to a better decision making and one essential tool in the Life Cycle Thinking concept. To complete the sustainability assessment, the social aspects in the life cycle of a product, service or process are considered and measured through the S-LCA methodology.

ICCRAM is currently working in the integration of these concepts to identify the environ-

mental and socioeconomic hotspots that can be improved along the value chain and whole life of the product. In the different research projects involved, these assessments provide useful information to support the upscaling of pilot lines to the industrial level, providing optimization measures in the design.

One of the research projects where LCSA is performed is LightMe, which is focused on light metals development, specifically aluminium, magnesium and titanium alloys, reinforced with specific nanoparticles (TiO_2 , SiC, TiC) to create Metal Matrix Composites (MMCs) which contribute to make transport elements more resistant and lighter, reducing maintenance costs and the fuel needed to use them. For example, lighter vehicles consume less fuel, emit less harmful gases and have a higher performance. It is estimated that a quarter of the total greenhouse gas emissions emitted by EU countries come from the transport sector, therefore the sustainability assessment in this sector will be crucial to comply with the objective of climate neutrality in 2050.

On the other hand, the combination of toxicity analyses and LCSA in nanomaterials is being strengthened throughout the DIAGONAL project (2021-2024), where one of the goals is to develop tools that promote the application of the Safe and Sustainable approach to nanomaterials.

Also, within the NEFERTITI project (2021-2025), safety and LCSA of innovative systems for the transformation of CO_2 and H_2O into biofuels are being carried out, in order to empirically verify that the results produce an improvement of the current situation in envi-

ronmental, economic, social and safety terms, both human and environmental.

All of this is the continuity of a deep interest in sustainability research. The ICARUS-INAS project, ended in December, was granted thanks to the good results obtained during the

development of the ICARUS project (2016-2019), where toxicity and LCA analyses were carried out with the aim of providing advice on the creation of nanocrystalline metal alloys for the aerospace sector.

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This project has received funding under the European Union's Horizon 2020 research & Innovation programme under grant agreement No 953152.

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[→ TABLE OF CONTENTS](#)

CONTRIBUTION FROM NANOMOL



Enabling Sustainable Nano-Pharmaceuticals from Lab Bench to Clinical Trials with DELOS Nanoformulation Technology

Severe diseases demand enhanced precision medicines & new green production technologies

The prevalence of acute chronic diseases like cancer and diabetes has grown exponentially worldwide over the last decade. With the aging of the population and the current lifestyle habits, such conditions are expected to exponentially increase. Besides, there are also +7,000 rare chronic diseases, affecting 400 million of people worldwide, but with less than 400 approved treatments.

Although biological medicines - those produced from living organisms and consisting of peptides, proteins, or nucleic acids- hold promising avenues for the treatment of severe diseases, they often are extremely expensive to produce. It takes an average of €924 million and 9 years to develop and launch to the market a successful biologic medicine from scratch. A Biological medicine costs on average €10,000-€30,000 per year, the most expensive exceeding €500,000.¹ Biologic substances are delicate and therefore need tailored formulation strategies to increase their stability and efficacy.

Nanomedicines consisting of biologic drugs, formulated in nanocarriers, nanosuspensions, etc., are anticipated as the solution to treat these wide range of diseases because of their

capacity to precisely target specific molecular processes. During the last decades, notable progress on the use of nanocarriers has been made. A recent example, triggering the use of nanocarriers for biologics delivery, is the use of lipid nanoparticles in Covid19 vaccines to deliver RNA. However, the manufacturing of nanomedicines at industrial scale still presents challenges in terms of sustainability due to the lack of green technologies capable of producing them at large scale.

It is therefore of outmost importance to develop sustainable and affordable technologies to produce efficient nanomedicines. Besides, the EC has issued a common goal to achieve a sustainable Europe by 2030.^{2,3} Thus, unlocking new opportunities in nanomedicine, needs to be accompanied by advanced, sustainable and cGMP production processes implemented at large scale.

DELOS: a Pioneer Formulation Technology for the Green & Affordable GMP-production of nanomedicines

DELOS is a green (one-step, no toxic solvents) continuous manufacturing technology that uses compressed CO₂ as solvent, for the robust design, engineering, and single-step production of safe and enhanced nanomedicines, reducing in a 68% the contamination emission compared to conventional drug formulation

¹Chen, B. K., et al. (2018). Why Biologics and Biosimilars Remain So Expensive. *Drugs*. doi:10.1007/s40265-018-1009-0

²An environmental risk assessment is now mandatory for all applications for a Marketing Authorisation for human and veterinary medicinal products. 11 March 2019 the EC issued a Communication which outlines a strategic approach to pharmaceuticals in the environment. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2019:128:FIN>

³A European Green Deal. (2019) EC <https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/>

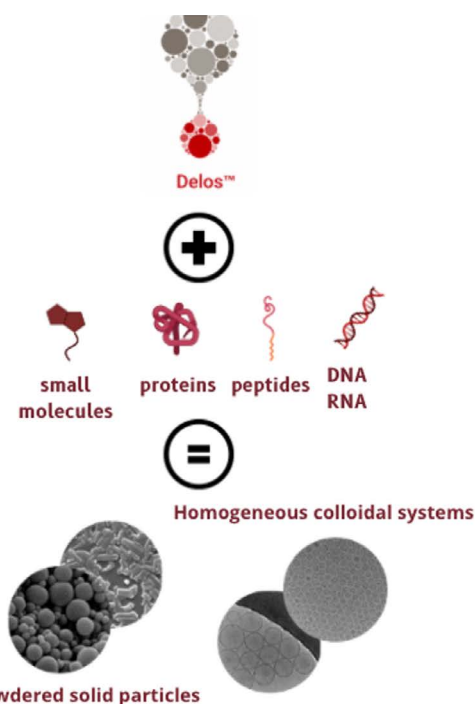
techniques. This sustainable and disruptive technology is patented and owned by the SME [Nanomol Technologies SL](#) (Bellaterra, Spain). The company, founded in 2010, is both a drug delivery and a cGMP contract particle analysis partner for the pharma, biotech and chemical industry, being one of the few cGMP specialized particle analysis suppliers in the world. They are experts in particle design and drug nano-formulation. DELOS has been proved with +50 actives, spanning from small molecules to biologics, such as peptides, proteins and nucleic acids, for different therapeutic applications, from treatment of complex chronic wounds to rare lysosomal diseases, enabling new painless routes of drug administration and bringing potential benefit to rare disease patients.⁴

Enabling Nano-pharmaceutical Innovative Products with PHOENIX-OITB

In the framework of EU project [PHOENIX-OITB](#), DELOS technology is being scaled-up and implemented under GMPs, through two nanopharmaceutical demo-cases. Thus, at the end of the project, DELOS nanomedicine candidates will be available for clinical testing, moving a step forward to bring sustainable, therapeutic solutions to the patients and contributing to a change of paradigm for a cleaner pharmaceutical industry.

Contact

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- **Green, sustainable platform**, based on compressed CO₂ as cosolvent.
- Tested with success for **+50 actives**.
- **Scale-up demonstrated** 320-fold from lab (ml) to pilot plant (L).
- **GMP manufacturing** available in Q4 2022.

⁴L. Ferrer-Tasies et al. *Advanced Therapeutics* 2021 <https://doi.org/10.1002/adtp.202000260>; Merlo-Mas et al. *Journal of Supercritical Fluids* 2021 <https://doi.org/10.1016/j.supflu.2021.105204>; Boloix et al. *Small* 2021 <https://doi.org/10.1002/smll.202101959>



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



[SEE WEBSITE](#)

CONTRIBUTION FROM NORNER

Sustainability, Challenges and Opportunities



Design for recycling: The Circular Economy Starts Here

The vision of a circular plastics system and a pollution free environment will require extensive collaboration, innovation, system changes and significant financing to fulfil. New legislations, regulations and directives will come into force and change the current “take-make-use-dispose” economy into a net-zero and circular economy. Several directives will regulate and ensure more and more plastics to be part of the circular economy. Norner has therefore acted and joined the EU Circular Plastics Alliance, which aims to boost the EU market for recycled plastics to 10 million tons by 2025.

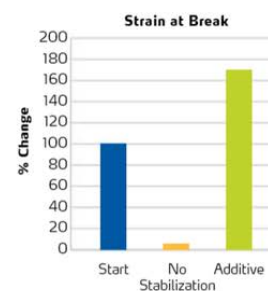
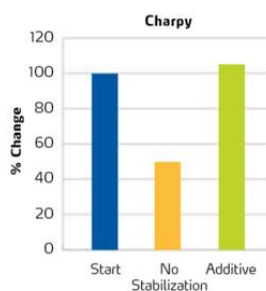
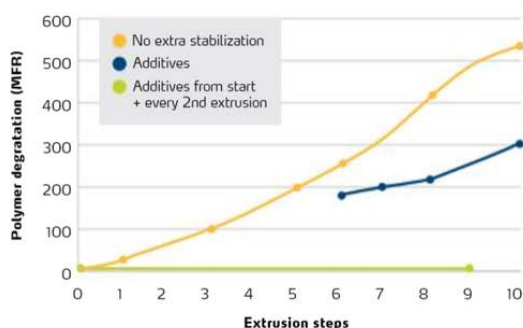
In Norner plastics recycling center we operate several different pilot facilities like plastic blow and injection molding and extrusion

equipment for films and sheet. Additionally, Norner has recently invested in a state-of-the-art pilot scale 7-layer film laboratory line. This multi-functional line can produce from 1 to 7 layers of blown and cast films of width up to 550 mm and is designed to allow production of symmetrical films consisting of a range of different material types, including barrier and tie layers.

A continuous melt filtration unit as well as feeders and degassing units have also been installed, connected to a compounder for investigating and optimizing the purification of recycled plastics for reuse in various applications.



Collin Multilayer Film & Sheet Line. Nordson continuous Melt Filtration Line



There are several ways how to create higher value recycled plastics and to facilitate for plastic waste to re-enter the circular value chain, such as additivation, use of so-called “booster” materials and devolatilization. All these, core competences in Norner.

The role of stabilization to create value for recycled plastics is visualized by multiple extrusion trials (figure above): MFR increase of PP without extra stabilization, and the effect of adding extra antioxidants added after 5 extrusions and added from start and at every recycling step. Effect of mechanical properties after 5 times extrusion without extra stabilization and mechanical properties after 4 “recycling steps” with continuous re-stabilization (1000 ppm B215) from start and at every second extrusion.

Norner’s engagement in the two Horizon 2020 projects TERMINUS and MANDALA (more info

on EU Cordis database) will with a successful implementation result in 15% improvement in economic efficiency, 55% reduction of plastics in landfills and 65% overall CO2 footprint.

Norner, with its new Polymer Exploration Centre has been approved as a RecyClass certification body and recommended laboratory. The center has more than 4500 sqm of plastic laboratories for advanced testing and analysis as well as a high-tech plastic processing, mechanical and chemical recycling, and application center. The recycling pilot center is key to deliver the RecyClass laboratory protocol testing.

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CONTRIBUTION FROM WOOD KPLUS – KOMPETENZZENTRUM HOLZ GMBH



Combination of AFM and Digital Microscopy

At Wood K plus at the site in St. Veit an der Glan (Carinthia, Austria) the main research focus lies on wood and paper surface technologies. For the development and characterization of high-performance products based on wood and natural fibre materials, analysis in the physical and chemical domain from the raw material to the final product is of high importance.

To obtain information from the macroscopic to the nanoscopic scale, technologies such as atomic force microscopy are needed, which are part of the equipment at Wood K plus since 2019. The novelty of our measurement setup

is the integration of AFSEM[®] from GETec Microscopy (now QD-Microscopy) on our digital microscope. In comparison to traditional atomic force microscopes, the AFSEM[®] does not rely on laser adjustment due to self-sensing cantilever technology. Although it was invented for the integration in a scanning electron microscope, our setup has the advantage of non-vacuum operation. Hence, sample changes and adjustments of sample position can be easily handled. The nanometer resolution images of the AFSEM[®] are a perfect addition to the microscopic observation with the digital microscope. Thus, sample features from macroscopic up to nanoscopic structure can be obtained at the same time. The measurement range is limited to 30 x 30 µm, but thanks to stepwise recording, also larger areas like



Illustration 1: AFSEM[®] installed on the Keyence Digital microscope



Keyence Digital microscope VHX 950F

AFSEM[®] from GETec Microscopy

Vibration damping plate

cross-sections of coated wood-based materials can be examined with our measurement setup.

Different samples from coated wood-based materials, papers, foils up to bio-based composites from the surface as well as cross-sections with previous sample preparation and ultramicrotomy, were analyzed during running projects. Exemplary, AFM measurements of a coated wood-based material surface are shown in the following illustrations.

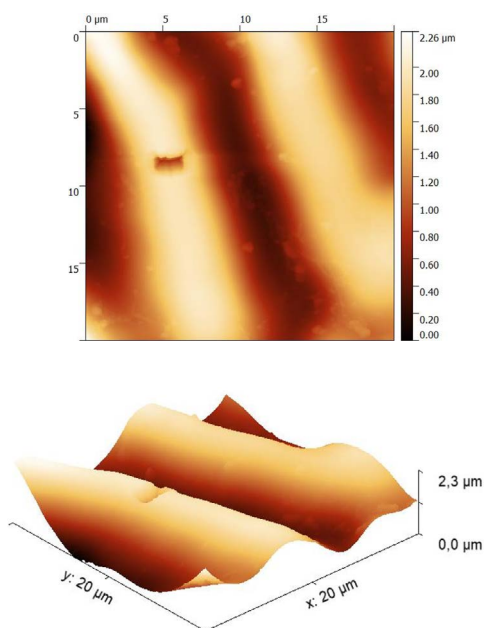


Illustration 2: Topography of a coated wood-based material surface in 2D- and 3D- presentation

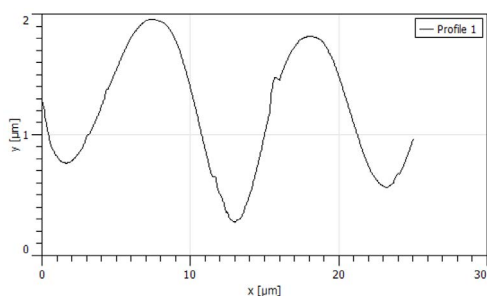


Illustration 3: Height profile of the coated wood-based material surface, extracted from the 2D-topographic picture

In addition to the topographic image, the phase signal of the AFSEM®- measurements can be used to capture the material contrast. A high contrast in phase signal indicates a high material contrast. The following illustration shows such a contrast image, whereas lighter colors indicate harder material structures.

In general, there is a wide range of further possible applications for AFSEM®- measurements, ranging from particle characterization and nanoscale investigation of polymer materials up to highly functional material surfaces in semiconductor technology and microelectronics as well as in the medical field.

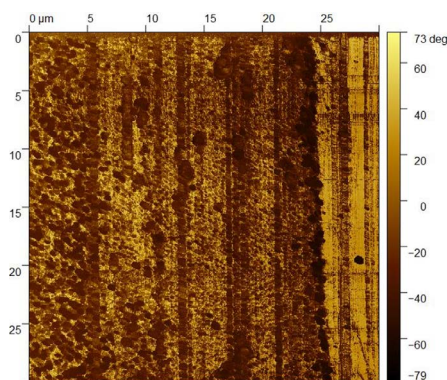


Illustration 4: Phase image of the Cross-section of a coated wood-based material surface

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CONTRIBUTION FROM DIO & BNN

Leverage the Potential of Your Data within a Sustainable Data Service Ecosystem

 **DIO**
Data Intelligence
Offensive



The Data Intelligence Initiative (DIO) and Bio-NanoNet Forschungsgesellschaft mbH (BNN) have partnered up to mutually advance the digital competencies of their network partners and boost digital transformation with a special focus on innovation-driven sustainable technology. BNN builds the bridge between Bio-NanoNet Association members, DIO and the Green Data Hub (GDH) implemented by DIO to support the creation of a sustainable European data economy.

DIO aims to push and promote the (green) data economy

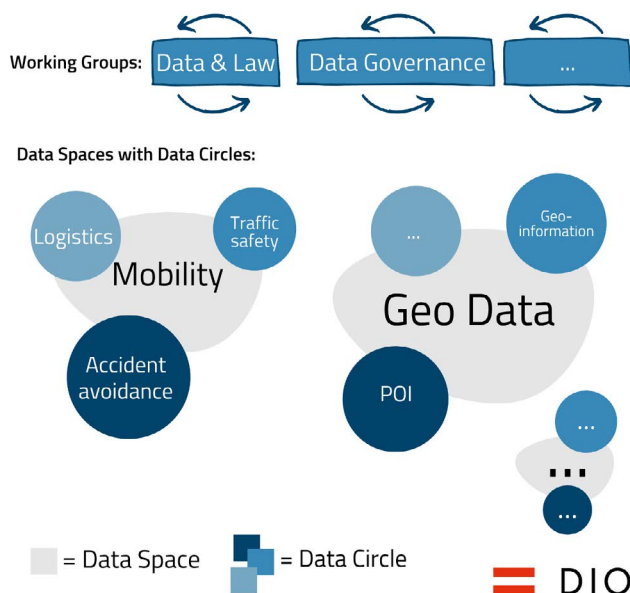
DIO is a non-profit association and cooperation platform that aims to push and promote the data economy and the optimized use of technologies, primarily Artificial Intelligence (AI). It connects stakeholders along the data value chain to collectively establish an open, transparent, and sustainable data service ecosystem. Here, the Green Data Hub is an important platform to ensure the transition to a „green economy“ in the best possible way. DIO supports its network by developing working groups, data spaces and data circles in order to analyze data challenges in a concrete and domain-specific way and address industry-specific topics.

Working groups, data spaces and data circles

DIO Working groups foster the exchange of experts on relevant topics and the preparation of statements. The topics of working groups

are oriented on the demand of the participating stakeholders, i.e. data & law, data governance, etc.

DIO Data spaces are a secure and sovereign system for data sharing in which all actors can realize the full value of their data. Data spaces are focused specifically on higher-level domains (i.e., economic areas and sectors such as energy, health, and agriculture and forestry), from which data circles can evolve.



DIO Data circles are concrete use cases within the data spaces and where the exchange, use and trading of data sets in a clearly delimited sub-area happens. The added value is identified, barriers are diminished, and demons-

trators are created. Data circles can also be integrated in several data spaces. Some examples of data circles are traffic safety, geoinformation or POI.



A sustainable and green data service ecosystem

The Green Data Hub (GDH) was established to realize the opportunities emerging from the collaboration within a data service ecosystem on a socio-ecologically sustainable level. It has a mandate from the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) to create a sustainable European data economy that enables the implementation of the climate goals. For this purpose, its data spaces focus on the four areas of (i) energy transition (i.e., clean energy through decarbonization of the energy system), (ii) mobility transition (i.e., through more environmentally friendly forms of transport), (iii) circular economy (i.e., through the reduction of resource consumption and waste), and (iv) climate change & risk mitigation (i.e., mapping of a digital climate twin).

The GDH connects stakeholders to Austrian and European actors in their respective domain, to experts in the field of data management and technical infrastructures and supports the implementation of sustainable use cases. Within this sustainable European data

service ecosystem, the emergence of innovation is encouraged with the objective of resulting in new business models, innovative products and services, and higher value creation and competitiveness.

How to participate?

A data service ecosystem thrives on the greatest possible diversity of different stakeholders and data assets. Therefore, the whole network of BNN and especially the innovation-driven sustainable technology platforms (e.g., SusChem-AT, EURO-NanoTox, NanoMedicine-Austria, and Austrian Microfluidics Initiative) are encouraged to take advantage of the added value that this generates for the general society and for themselves. BNN builds the bridge between BioNanoNet Association members, DIO and the GDH to enable mutual advantages. Let's join forces and create a sustainable, green European data ecosystem!

Contact

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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 DECEMBER 2021 - FEBRUARY 2022

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Project updates

BIORIMA'S FINAL SHOW – 4 YEARS OF

BIOMATERIAL RISK MANAGEMENT COME TO AN END



With January 2022, the H2020 research and innovation action BIORIMA entered into the very final month of its project runtime. Therefore, BIORIMA organized a couple of meetings and events early this year, beginning with the final Consortium Meeting, followed by a dedicated stakeholder meeting and public event which was strongly linked to the EU NanoSafety Cluster.

A large audience of wide-ranging stakeholders logged on to take part in BIORIMA's final public event, held on 19th January 2022. Organised by Lisa Bregoli and Stefania Melandri, Warrant Hub, the event comprised three

distinct and engaging sessions: 1) Presentation of BIORIMA Final Results, 2) Nanosafety projects response to real-world needs, and 3) EU NanoSafety Cluster community activity on “Brainstorming of future collaboration for nanobiomaterials risk assessment”.

Presentation of BIORIMA Final Results

With a full morning dedicated to focusing on technical outcomes of the project and its case studies, Lang Tran (IOM), the BIORIMA Project Coordinator, launched the event to welcome everyone and introduce the proceedings. The first presenter, Magda Blosi (CNR-IS-

TEC), then took to the virtual platform to present highlights of BIORIMA's final results and achievements of WP2 materials studies. In the next presentation, the outcomes from the WP3 exposure studies were delivered by Bernd Nowack (EMPA), in which he highlighted the identified release and exposure scenarios for nano-biomaterials. Bengt Fadeel (Karolinska Institutet) and Janeck Scott-Fordsmand (Aarhus University) followed in a presentation of the WP4 outcomes from hazard studies. This WP sought to develop reliable and robust test methods for identification of potential adverse health effects of nano-biomaterial enabled medical devices (MDs) and advanced therapy medicinal products (ATMPs) and to evaluate schemes to assess their potential environmental effects. It was concluded that WP4 has generated a wealth of data in relation to the hazard assessment of these materials using a range of in vitro and in vivo model systems relevant for human health and the environment. The Standard Operating Procedures (SOPs) and collected data are available for other users. Based on this work, modifications to existing test guidelines are suggested, and selected tests may be developed into standards, pending further validation through ISO/CEN. After that, a short coffee break was taken, before the meeting resumed with WP5 speakers – Danail Hristozov, Alex Zabeo, and Virginia Cazzagon (Greendecision Srl) – who gave the audience a valuable insight into the workings of the BIORIMA Decision Support System (DSS) for risk assessment and management of nano-biomaterials. The DSS aims at supporting stakeholders in the assessment and management of occupational and environmental risks of nano-biomaterials used in medical

applications. The DSS is the software implementation of the BIORIMA Risk Management Framework. The presentations of the project's final results concluded with WP6 outcomes from case studies, presented by Carlos Fito (ITENE). His overview included a report on the local validation and remote validation case studies involving Key Performance Indicators (KPIs), direct consultation using tailored surveys, and webinars with voting.

Nanosafety projects response to real-world needs

When BIORIMA kicked-off over four years ago, no-one predicted that the world would succumb to a pandemic in the way that it has. Despite lockdown constraints, the BIORIMA project responded quickly and addressed key issues by forming an expert Task Force, whose work was the focus of the next session: "COVID-19 Task Force of BIORIMA: Addressing the Needs of the Pandemic", chaired by Bengt Fadeel (Karolinska Institutet) and Lang Tran (IOM).

"Brainstorming of future collaboration for nanobiomaterials risk assessment"

In the final session of the event, the EU Nano-Safety Cluster took the lead under the aegis of BNN (BioNanoNet Forschungsgesellschaft mbH) representatives Andreas Falk and Susanne Resch, who tag-teamed in a prominent session that, as Lang explained, was designed to inform future EC calls through the voice of the EU NanoSafety Cluster. Using Mural software, participants took part in a brainstorm to find out what expertise there is available in the immediate community and what participants can 'bring to the table' to address na-

NSC Community Activity "Brainstorming of future collaboration for nanobiomaterials risk assessment"



nanosafety issues as well as ongoing and future challenges, including the current pandemic. Addressing a final question, audience members expressed their keen interest in contributing to an EU NanoSafety Cluster activity on public communication. This topic will be re-addressed in the next months in future EU NanoSafety Cluster activities.

Did you miss BIOIRMA's Final Public Event? Here is the link to the recordings: <https://youtu.be/90rO3MQqu0Y>

Role of BNN

Organization of Training Schools, interprofessional education and industrial case study development.

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This project has received funding from the European Union's HORIZON 2020 research and innovation programme under grant agreement n° 760928.

Get connected with BIOIRMA on:



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→ TABLE OF CONTENTS

BREADCELL H2020 FET-OPEN PROJECT'S 1ST YEAR'S PROGRESS & ACHIEVEMENTS



BreadCell Hybrid Meeting- February 2022, Gothenburg, Sweden.

BreadCell partners show great progress during their 1st Annual Meeting held in February 2022

The H2020 FET OPEN BreadCell project reviewed the Project Progress of the first 10 months. The representatives from Bionanonet, Tecnalia, Graz University of Technology and University of Vienna visited Chalmers University of Technology in Sweden online and on campus.

BreadCell, develops a radically new technology to produce porous lightweight low-density materials which are currently used in

large scale industries and mainly consist of synthetic non-degradable polymers. BreadCell technology comprises a foaming process to create products relying on existing and new raw materials from pulping (cellulose, xylan), and to convert them to high value, lightweight, energy-absorbing and load-transferring composites, with application in sports and safety components of cars among others.

BreadCell's process chain is guided by the principles of safety and sustainability to ensure the production of sustainable and inherently safe products. The Sustainable-by-de-

sign approach aims to deliver a major change in sustainable and healthy products and materials integrating safety, circularity and functionality of products and processes through their lifecycle from the design to end of life (also considering recycling, reuse or repurposing them) contributing to the European Green Deal.

BreadCell's sustainable foams will be based on:

- ✓ Lightweight constructions based on forest and biological biomass
- ✓ Safety and sustainability by design considerations to make the right decisions early in the project
- ✓ Revolutionary foaming technology based on renewable biomass and a process with design flexibility
- ✓ For sustainable sports and mobility

The challenge of sustainable foams:

- ✓ Materials such as balsa wood have already very good properties
- ✓ Relying on other than cultivated wood is an opportunity
- ✓ Starch and wood fiber foams are established but still have shortcomings
- ✓ Reproducibility, foaming and control of pore geometry, size and size distribution are challenging to control
- ✓ Sustainable raw materials = sustainable foams?

The BreadCell Interdisciplinary Team:

BreadCell counts with high-level experts from different countries including research organizations that ensure the implementation of cutting-edge research. Taking a closer look at the research organizations participating in BreadCell, their specific expertise fields are:

- ✓ CHALMERS UNIVERSITY OF TECHNOLOGY (Project Coordinator, Sweden): cellulose technology, biotechnology
- ✓ GRAZ UNIVERSITY OF TECHNOLOGY (Austria): Paper and pulp technology and automotive
- ✓ UNIVERSITY OF VIENNA (Austria): Polymer Technology
- ✓ FUNDACION TECNALIA RESEARCH & INNOVATION (Spain): Prototyping
- ✓ BIONANONET FORSCHUNGSGESELLSCHAFT MBH (Austria): Safe and Sustainable-by-design





BreadCell materials exhibition at Chalmers University- February 2022, Gothenburg, Sweden.

Role of BNN

BNN will conceptualize and review the safety and sustainability assessments of the developed BreadCell technology. Safety aspects will be evaluated regarding the manufacturing process and the resulting foam, while sustainability-related considerations will cover the environmental, social and economic dimension. Moreover, BNN will actively support Dissemination and Exploitation activities.

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This project has received funding from the European Union's HORIZON 2020 research and innovation programme under grant agreement n° 964430.

Get connected with BreadCell on:



[SEE WEBSITE](#)

HARMLESS PRESENTED THE PROJECT CASE STUDIES AT THE OECD

HARMLESS

Since the end of 2021, the HARMLESS project has been collaborating with the Organization for Economic Co-operation and Development (OECD), concretely with the OECD Working Party on Manufactured Nanomaterials (WPMN).

The safety of Manufactured Nanomaterials is an important concern impacting regulatory bodies throughout the world. Due to their size, Manufactured Nanomaterials may require additional testing beyond the standard suite of tests used for other chemicals, to ensure that the impact on human health and the environment is fully understood. To ensure that the tests used to address the safety of Manufactured Nanomaterials are consistent and defensible; the OECD's Working Party on Manufactured Nanomaterials (WPMN) launched the Sponsorship Program for the Testing of Manufactured Nanomaterials (Testing Program) in November 2007. This Testing Program verifies the testing methods used on Manufactured Nanomaterials by pooling the expertise of OECD member countries, some non-member countries and other stakeholders to fund the safety testing of specific Manufactured Nanomaterials.

Within the OECD Working Party on Manufactured Nanomaterials (WPMN) two new Steering

Groups (SGs) have been established that will work together closely, one is going to focus on Advanced Materials (AdMa) and the other one on the Safer Innovation Approach (SIA). During the last meeting in February 2022 HARMLESS presented an overview on the industrial case studies within the SG AdMa. This presentation was very well taken. Currently, details are worked out on how to continue the collaboration between HARMLESS and the OECD. More news will follow soon.

Role of BNN

Safe Innovation Approach, Stakeholder engagement, Graphic Design, Communication & Dissemination



HARMLESS



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

Get connected with HARMLESS on:



[SEE WEBSITE](#)

SABYDOMA'S SURVEY – "VISION/DEFINITION OF SAFE-AND-SUSTAINABLE-BY-DESIGN (SSbD)"



Based on the online workshop “A Stakeholder’s Perspective of Safe-and-Sustainable-by-Design (SSbD)” organised by SABYDOMA on 18th February 2022, we have prepared an anonymous survey with the „visions“ and „definitions“ of SSbD given by the workshop speakers.

Please, look through them and choose those definitions you mostly agree / feel most comfortable with. You can find the survey [here](#).

You can read more about the workshop on the [project website](#).

Role of BNN

Safety-by-Design, graphic design, dissemination & exploitation and stakeholder engagement.

Contact

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

Get connected with SABYDOMA on:



[SEE WEBSITE](#)

STARS SURVEY – BOOSTING SMES IN THE RAIL SECTOR WITH ADVANCED TECHNOLOGIES

Boosting SMEs in the rail sector with Advanced Technologies

The EU project STARS is currently conducting a survey among SMEs from the rail and mobility industry to determine the “digital maturity level” of their needs with regard to the application of advanced technologies. The results of the survey support the content focus of the strategic collaborations.

As a small and medium-sized enterprise, you are cordially invited to participate in this survey: ec.europa.eu/eusurvey/runner/STARSProjectSurvey

Role of BNN

BNN joined the project in its role as DIH, contributing with Alliances & Clustering activities with SME's, stakeholder engagement including work with focus groups, and will be supporting with strategic alliancing mainly on European level.

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This project has received funding from the European Union's Competitiveness of Small and Medium-Sized Enterprises (COSME) programme under grant agreement n° 101037897 – STARS – COS-STRAT-2020-3-05

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[SEE WEBSITE](#)

[→ TABLE OF CONTENTS](#)

BioNanoNet Member Contributions

CONTRIBUTION FROM ACIB

Biotechnology Prize Elmer L. Gaden Award for acib-CSO Bernd Nidetzky



Biotechnologist Bernd Nidetzky of TU Graz is one of only a few European researchers to receive the Elmer L. Gaden Award. The top international biotechnology research prize is awarded by the US journal Biotechnology and Bioengineering.

The Elmer L. Gaden Award has been presented annually since 1999 for scientifically particularly influential, innovative, creative and original research work. Up to now, the prize has gone mainly to US researchers. Now, Bernd Nidetzky, CSO of the Austrian Centre of Industrial Biotechnology (acib) and head of the Institute of Biotechnology and Biochemical Engineering at TU GRAZ is the fourth European to receive this award.

Bernd Nidetzky conducts basic and applied research on enzymes related to biocatalytic synthesis, synthetic biology and reaction engineering. The focus is on carbohydrate-active enzymes as well as enzymes that work at solid interfaces. He has been awarded, among other prizes, the Research Prize of the State of Styria and the University Research Prize of Industry (Styrian Federation of Austrian Industries).

For more information, [see the original article from TU Graz press department.](#)



Bernd Nidetzky awarded with Biotechnology PRIZE
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[→ TABLE OF CONTENTS](#)

CONTRIBUTION FROM MEDIZINTECHNIK-CLUSTER BUSINESS UPPER AUSTRIA



DIGI-B-CUBE: Boosting Innovation to Enhance Patient-Centered Diagnosis and Treatment



DIGI-B-CUBE is a project funded by the European Union's Horizon 2020 Research and Innovation Program that aims to unlock the cross-sectoral collaborative potential of SMEs by combining Artificial Intelligence (AI), Cognitive Computing Digital Technologies (CCDT) with the Bioimaging-Biosensing-Biobanking (B-CUBE) industries. The objective is to deliver market-sensitive disruptive technologies and to generate innovative solutions that enhance patient-centered diagnostic work-flows, delivered through the improved algorithms for Medical Diagnostics' efficiency and accuracy. By integrating innovations in IT into the Bioimaging, Biosensing and Biobanking industries, this project accelerates the goal of personalized medicine that can eventually provide patients with a fast and efficient diagnosis-treatment healthcare system.

Since its beginning in May 2019, DIGI-B-CUBE has already funded a total of 31 projects, 16 during the first phase of its open call and 15 during the second phase. Among them, 14 projects received a Prototype Voucher to be used for the development of a prototype or the conceptualization of a solution for a digitalization challenge in Medical Diagnostics and related value chains, while 17 projects received a customized Solution Innovation Voucher aimed at fostering the joint development of a novel product/service based on an existing proven concept that tackles digital demands in the same domain. The projects that received DIGI-B-CUBE support came from 73 different companies from 14 different European countries (Norway, Greece, Germany, Italy, Netherlands, Portugal, Romania, Switzerland, Spain, Austria, Ireland, Denmark, France and Estonia).

Nevertheless, DIGI-B-CUBE support was not limited to funding. Its Consortium disseminated webinars and matchmaking events of interest for both the project network and beneficiaries about topics such as innovation, medical diagnostics, medical data, clinical research and treatment, among others. Furthermore, DIGI-B-CUBE partners organized workshops during events such as the Health Tech Hub Styria in Austria and the MEDICA fair in Germany, where beneficiaries had the opportunity to present their projects, gain visibility and network with relevant stakeholders. Similarly, DIGI-B-CUBE

financed travel vouchers and missions to the GITEX 2021 Technological Week in Dubai and to the SLAS2022 International Conference and Exhibition in Boston. In these occasions, the participating beneficiaries had the opportunity to showcase their products, meet some promising industry contacts and be surrounded by the latest technologies and innovations to get inspired.

The “OSQAM: Online Service for quality monitoring of 3D-brain-on-chip and Alzheimer’s Disease Model Challenge” project from KML Vision GmbH and NORGANOID, two beneficiaries from the Styrian region of Austria, is one of the success stories DIGI B CUBE is delighted to promote. Their goal is to improve the efficiency of drug research and development to treat Dementia and Alzheimer’s Disease (AD), which are the most prevalent neurodegenerative diseases. Recent advances in stem cell technology allow to generate sophisticated 3D structures (organoids) that recapitulate the structure of human organs such as the brain but the visual inspections necessary to engineer organoids are performed manually, a task that is tedious, heavily relies on trained staff and is therefore expensive.

KML Vision GmbH and NORGANOID’s solution for this problem is to support and automate this visual inspection task by developing a digital, worldwide available service to monitor the quality of human organoids at different stages of the engineering process on a novel 3D-brain-on-chip device. The 3D-brain-on-chip serves as an in vitro modelling tool for efficient drug R&D. It is applicable when targeting a particular pharmaceutical agent and for confirming compounds in upscaled candidate screenings.

Thanks to DIGI-B-CUBE, sixteen 3D-brain-on-chip devices were produced. On these devices, organoids were cultivated and several thousand microscopic images were taken to develop and evaluate a fully-automated image analysis AI algorithm. This algorithm is provided via the online platform [IKOSA](#) in order to offer a worldwide available service for quality monitoring for the organoids.

DIGI-B-CUBE is proud of its contribution to the reconfiguration of patient-centered diagnostics towards a Health Economy 4.0 and for the successful stories it helped to build.

More information about DIGI-B-CUBE activities and sponsored inspiring projects is available on the [project website](#) and social media.



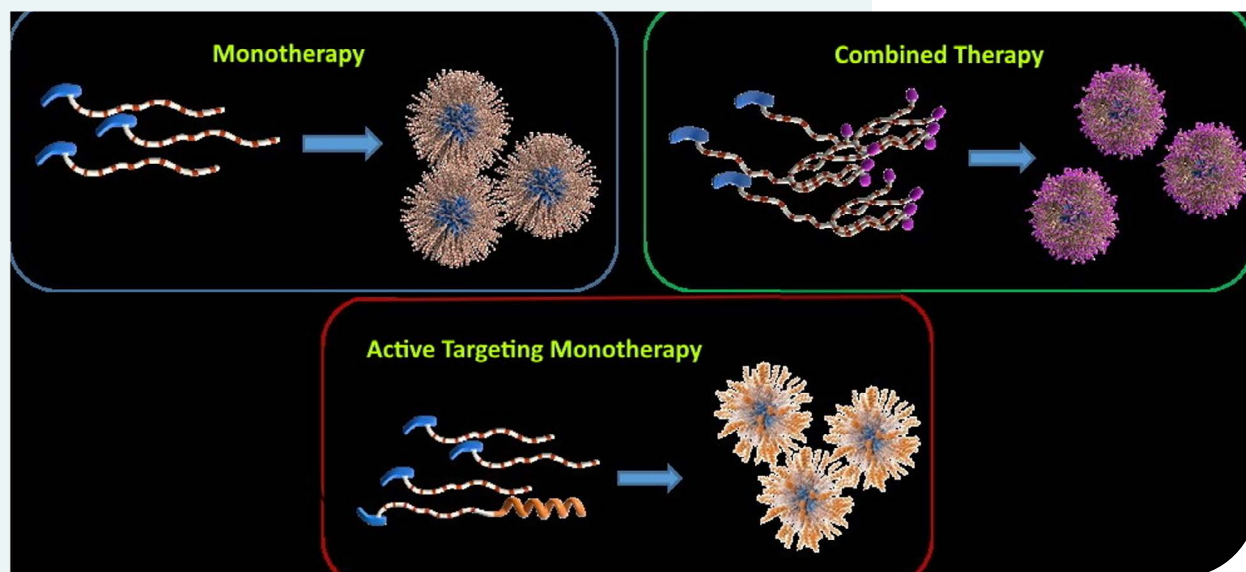
This project has received funding from the European Union’s Horizon 2020 Research and Innovation program, under Grant Agreement n° 824920.

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CONTRIBUTION FROM CIBER-BBN

Multivalent Self-Assembled Platforms for the Delivery of Chemotherapeutic Drugs
ciber-bbn *isci*


Every year on days like the 4th of February, the International Day of Cancer, the lights turn to the advances of the biomedical research in the fight against cancer. CIBER-BBN and NANBIOSIS develop a wide range of projects to this end, among which distinguishes the project titled “Multivalent Nanomedicine Systems” led by Dr. Miriam Royo, head of the [NANBIOSIS unit 3](#).

The improvement of solubility and stability of clinically approved chemotherapeutic drugs represent a big challenge in cancer therapy. In fact, many of these drugs have low water solubility, which leads to the administration of larger doses to achieve the desired biolo-

gical effect, with unavoidable side effects for the patients. The active principle can be chemically modified to increase the solubility, and administered as prodrug which, however, has to be enzymatically metabolized to have therapeutic effect and only a low percentage of the free drug finally reaches its target. Moreover, some of the chemotherapeutic drugs are unstable at physiological conditions due to their chemical structure, and rapidly degrades before reaching the tumor tissue, further reducing the effectiveness of the treatment. Drugs commonly used in clinical chemotherapy treatments for advanced colorectal cancer and triple negative breast cancer, such

as SN38, 5-fluorouracil (5-FU) and paclitaxel (PTX), have presented these problems, which affect their efficacy and tolerance to treatment by patients.

Drug delivery nanosystems based on biocompatible polyethylene glycol (PEG)-based multivalent platforms conjugated to hydrophobic drugs (SN38, PTX among others) are developed by the Peptide Synthesis group of CIBER-BBN at the Catalan Institute for Advanced Chemistry (IQAC-CSIC). The resulting water-soluble conjugates have the ability to self-assemble in aqueous media in nanoscale micellar structures improving the pharmacokinetic profile of drugs. In these systems, the intact active principle can be released in a controlled manner thanks to the presence of degradable bonds, between the drug and the polymer, which are sensitive to chemical or biological stimuli, favoring its accumulation in tumor.

Systems containing only one drug (SN38 or PTX) for monotherapy and two different drugs (as SN38 and 5-FU) for combined therapy treatments are developed to improve the therapeutic efficacy of the free drugs and decrease their secondary effects. The multivalence nature of these systems also allows the possibility to add targeting agents, such as tumor specific peptide ligands thus increasing the specificity of the platforms towards the cancer cells.

This project (RTI2018-093831-B-I00) is funded by MICIN/AEI/10.13039/501100011033 and by “ERDF A way to of making Europe” and developed in collaboration with Dr. Ibane Abasolo head of the Drug Delivery and Targeting research group at Vall d’Hebron Research Institute (VHIR) and of the [In Vivo Experimental Platform \(U20\) of NANBIOSIS](#).

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CONTRIBUTION FROM CIBER-BBN

New Graphene-Based Neural Probes Improve Detection of Epileptic Brain Signals

ciber-bbn *isci*


The ability to record and map the full range of brain signals using electrophysiological probes will greatly advance our understanding of brain diseases and aid the clinical management of patients with diverse neurological disorders. However, current technologies are limited in their ability to accurately obtain with high spatial fidelity ultraslow brain signals. In a paper published in *Nature Nanotechnology*, an international team of researchers from the Institute of Microelectronics of Barcelona (IMB-CNM-CSIC), the Catalan Institute of Nanoscience and Nanotechnology (ICN2) and the University College London Queen Square Institute of Neurology (UK) report a flexible neural probe made of graphene-based field-

effect transistors capable of recording the full spectrum of brain signals, including infraslow; and demonstrate the ability of these devices to detect with high fidelity electrographic signatures of the epileptic brain.

Epilepsy is the most common serious brain disorder worldwide, with up to 30% of people unable to control their seizures using traditional anti-epileptic drugs. For drug-refractory patients, epilepsy surgery may be a viable option. Surgical removal of the area of the brain where the seizures first start can result in seizure freedom; however, the success of surgery relies on accurately identifying the seizure onset zone (SOZ). Epileptic signals span over a wide range of frequencies –much larger than the band monitored in conventional EEG. Electrographic biomarkers of a SOZ include very fast oscillations as well as infraslow activity and direct-current (DC) shifts. The latter, in particular, can provide very relevant information associated with seizure onset but are seldom used due to the poor performance of current probes to record these types of slow brain signals. Application of this technology will allow researchers to investigate the role infraslow oscillations play in promoting susceptibility windows for the transition to seizure, as well as improving detection of clinically relevant electrophysiological biomarkers associated with epilepsy.

The graphene depth neural probe (gDNP) developed by the authors of this research consists of a millimeter-long linear array of micro-transistors imbedded in a micrometer-thin polymeric flexible substrate. The flexible gDNP devices were chronically implanted in small animal models of seizures and epilepsy. The implanted devices provided outstanding spatial resolution and very rich wide bandwidth recording of epileptic brain signals over weeks. In addition, extensive chronic biocompatibility tests confirmed no significant tissue damage and neuro-inflammation, attributed to the biocompatibility of the used materials, including graphene, and the flexible nature of the gDNP device.

Future clinical translation of this technology offers the possibility to identify and confine much more precisely the zones of the brain responsible for seizure onset before surgery, leading to less extensive resections and better outcomes. Ultimately, this technology can also be applied to improve our understanding of other neurological diseases associated with ultraslow brain signals, such as traumatic brain injury, stroke and migraine.

“The development of this graphene-based neurotechnology was possible thanks to the microfabrication capacities of the Micro and Nanofabrication Clean Room”, explains Anton Guimerà about the Unique Science and Technology Infrastructure (ICTS) recognized by the Ministry of Science and Innovation.

This study was led by ICREA Prof. Jose A Garrido, head of the ICN2 Advanced Electronic Materials and Devices Group, Dr. Anton Guimerà-Brunet, from the Institute of Microelectronics of Barcelona (IMB-CNM-CSIC) and CIBER-BBN

and researcher of [NANBIOSIS Unit 8 Micro-nanotechnology unit](#), and Dr. Rob Wykes, from the University College London Queen Square Institute of Neurology (UK) & the Nanomedicine Lab of the University of Manchester (UK). First author of the paper is Dr. Andrea Bonaccini Calia, a former member of Prof. Garrido’s group. This study was conducted in the frame of the EU project Graphene Flagship. It benefited from multidisciplinary collaborations and received valuable contributions from researchers at the Nanomedicine Lab of the University of Manchester (UK), the Universitat Autònoma de Barcelona (Spain) and g.tec medical engineering GmbH (Austria).

Reference article:

Andrea Bonaccini Calia, Eduard Masvidal-Codina, Trevor M. Smith, Nathan Schäfer, Daman Rathore, Elisa Rodríguez-Lucas, Xavi Illa, Jose M. De la Cruz, Elena Del Corro, Elisabet Prats-Alfonso, Damià Viana, Jessica Bousquet, Clement Hébert, Javier Martínez-Aguilar, Justin R. Sperling, Matthew Drummond, Arnab Halder, Abbie Dodd, Katharine Barr, Sinead Savage, Jordina Fornell, Jordi Sort, Christoph Guger, Rosa Villa, Kostas Kostarelos, Rob Wykes, Anton Guimerà-Brunet, and Jose A. Garrido, Full bandwidth electrophysiology of seizures and epileptiform activity enabled by flexible graphene micro-transistor depth neural probes. *Nature Nanotechnology*, 2021. <https://www.nature.com/articles/s41565-021-01041-9>

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CONTRIBUTION FROM JOANNEUM RESEARCH – HEALTH



A New Lab To Better Understand Wound Healing Through Skin Models

Since 2019, Elisabeth Hofmann has been working with the team at COREMED, JOANNEUM RESEARCH's Cooperative Centre for Regenerative Medicine, to establish its own laboratory. The molecular biologist managed the conversion and implementation of the infrastructure. Now the COREMED team can offer an expanded research spectrum for questions related to wound healing. This is interesting for the pharmaceutical and med-tech industry. COREMED offers preclinical and clinical research as well as interdisciplinary R&D services.

Currently, about 1 to 4 % of people in the western world suffer from chronic wounds. In Austria, it is estimated that between 200,000 and 300,000 people suffer from chronic wounds. It is expected that the number will increase significantly in the coming years, which is why COREMED is researching various approaches to better heal chronic wounds. Elisabeth Hofmann is a molecular biologist and has been working at JOANNEUM RESEARCH for 3 years. Since 2019, in addition to her daily research agendas, the laboratory manager and deputy research group leader has been busy expanding the research center's infrastructure to provide a space for new methods for researching wound healing. „The necessary renovation work had just begun, everything was going according to plan, when ‚Corona‘ threw everything into disarray. Deliveries of

laboratory equipment and consumables suddenly slowed down or stopped altogether. There were a few hurdles to overcome due to the pandemic, but now we can offer a top-equipped research laboratory,“ Hofmann says happily. Research is being conducted on healing processes of wounds caused by burns, for example, and especially on chronic wounds caused by various factors, such as poor blood circulation, diabetes mellitus or high blood pressure.

The processes of wound healing and the efficacy of substances are researched using models, which were as well developed at the center tailored to the research question. On the one hand, it is possible to investigate processes of skin reactions in fresh explants (ex vivo). On the other hand, experiments can be carried out in three-dimensional in vitro models, which consist of at least a dermal and epidermal part. „In the cell culture laboratory, in addition to cultivating ex vivo tissue, we can grow 3-dimensional skin models. This is of great advantage because it means we are not dependent on tissue donations,“ explains Hofmann.

The infrastructure offers:

Cell culture laboratory: In addition to classical cell culture, 3-dimensional skin models can also be grown and ex vivo tissue cultivated.

Imaging-System: Fluorescence staining of cells, cell counts, live cell imaging, migration assays („autoscratcher“ for standardized scratch assays in 96-well format) Multimode-Platereader: ELISAs, Enzym-Assays, Lumineszenz-Assays und Fluoreszenz-Assays

Real-time qPCR: Analyses (e.g. gene expression analyses) in 384-well format

JOANNEUM RESEARCH develops solutions and technologies for a broad range of industries and public agencies and is engaged in top applied research at an international level. Optimally embedded in the national and international innovation network our staff develops innovations in the three thematic areas of information and production technologies, human technology and medicine, society and sustainability.

COREMED – Cooperative Centre for Regenerative Medicine incorporates basic medical research as well as pre-clinical and clinical research in regenerative medicine, in particular in skin regeneration and acts in close coordination and cooperation with the Medical University of Graz.

Contact

JOANNEUM RESEARCH Forschungsgesellschaft mbH

COREMED – Cooperative Centre for Regenerative Medicine

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[→ TABLE OF CONTENTS](#)

CONTRIBUTION FROM JOANNEUM RESEARCH - HEALTH



Franz Feichtner is the New Director of HEALTH



Director of JOANNEUM RESEARCH Institute HEALTH, Franz Feichtner © JOANNEUM RESEARCH/Schwarzl

As of January 2022, Franz Feichtner, previously Deputy Director, has replaced Frank Sinner, who until now successfully led the HEALTH Institute together with Thomas Pieber. The position of deputy director has now been taken over by Thomas Birngruber, who will perform this function in addition to heading the Biomedical Tissue Monitoring research group. Thomas Pieber, who also holds senior positions at the Medical University of Graz and CBmed GmbH, will remain scientific director of the Institute alongside Franz Feichtner. Frank Sinner will greatly reduce his working hours for personal reasons, but will remain associated with HEALTH and will be available for selected strategic topics.

Franz Feichtner wants to continue to actively strengthen and develop HEALTH's positioning in the field of pharmaceutical research.

Contact

JOANNEUM RESEARCH Forschungsgesellschaft mbH

Franz FEICHTNER

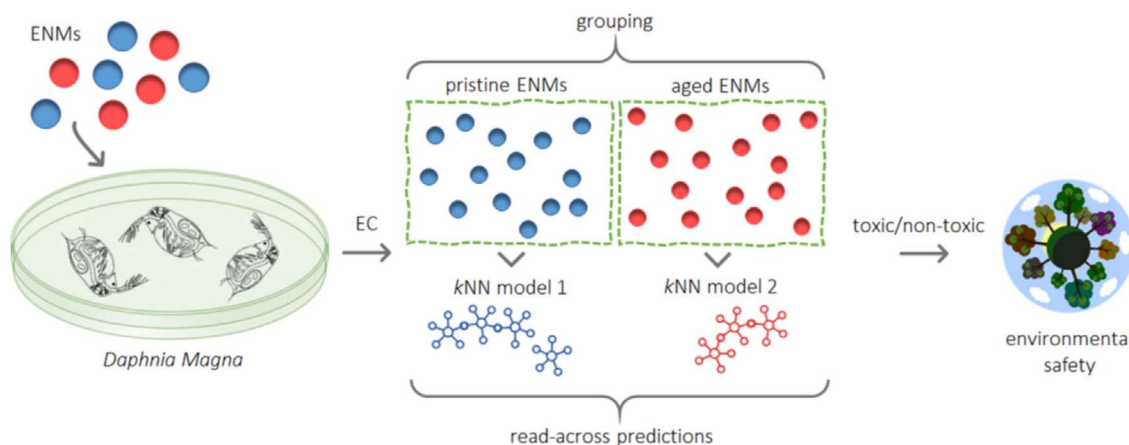
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CONTRIBUTION FROM NOVAMECHANICS

Is Time Spent in the Environment a Key Toxicity Factor in Nanomaterials?



It is almost 20 years since the commercialization of nanomaterials (NMs) started but there is still a long way to go to fully unravel their interactions with living organisms. A recent paper, [published in Elsevier's Chemosphere](#) compares the toxicity of freshly dispersed NMs with the same NMs stored for 2 years in artificial river waters of different composition (environmentally aged NMs) to the water flea *Daphnia magna*. Researchers assumed that the aged NMs might have different toxicity and they were proved right: NMs aged in both salt-only artificial river water and river water containing both salts and natural organic matter caused much less toxicity to the daphnids than the freshly dispersed NMs due to passivation of the surface reactivity over time.

Researchers from NovaMechanics Ltd and the University of Birmingham developed ecotoxicological read-across models for predic-

ting NMs acute toxicity, following the strategy recommended by the European Chemicals Agency for NMs grouping. The computational modeling procedure was performed by combining widely accepted and accurate informatics tools including the Isalos & KNIME Analytics Platforms with the Enalos Cloud Platform, which facilitate the manipulation of big data. The predictive power of the proposed Quantitative Structure-Activity Relationship (QSAR) models has been evaluated according to the criteria prescribed by the Organization for Economic Cooperation and Development, and a QSAR Model Reporting Format (QMRF) report has been produced and made available in the supplementary information of the paper to support regulatory acceptance and uptake. An additional important outcome of this study was the creation of Findable, Accessible, Interoperable and Reusable (FAIR) datasets that

will help other scientists to further investigate and predict the toxicity of freshly dispersed and environmentally aged NMs.

Iseult Lynch, Professor of Environmental Nanosciences at the University of Birmingham notes that “The need to build reliable prediction models for NMs is often highlighted as a significant regulatory challenge, since it is not possible to experimentally assess all variants of NMs due to time, cost and ethical restrictions, and thus computational models utilizing regulatory-relevant species such as *D. magna* that can predict the toxicity of data-poor NMs are urgently needed.”

The newly developed nanoinformatics models, which help researchers to explore in silico the effects of a panel of freshly dispersed versus environmentally aged NMs, is an important

advance. Antreas Afantitis, Managing Director of [NovaMechanics](#) Ltd and [NanoSolveIT](#) Project Coordinator highlights that “Nanoinformatics is an evolving field of research that includes the development of in silico models and tools that could be an alternative to the experimental evaluation of nanomaterials (NMs) environmental health and safety (exposure and toxicity) and thus contribute to NMs hazard and risk assessment.”

The machine learning read across model is available through [NanoSolveIT Cloud Platform](#) and the full dataset is available through the [nanoPharos \(2021\) database](#) developed under the H2020 NanoSolveIT and NanoCommons projects, in compliance with the FAIR data principles and is ready for further computational analysis.

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CONTRIBUTION FROM SITEX 45 S.R.L.

Project "Technology Development for Micromanufacturing of Sensors for Combustible Gases on Nanocomposite Hybrid Materials with TiO₂ Nanotubes and Graphene"

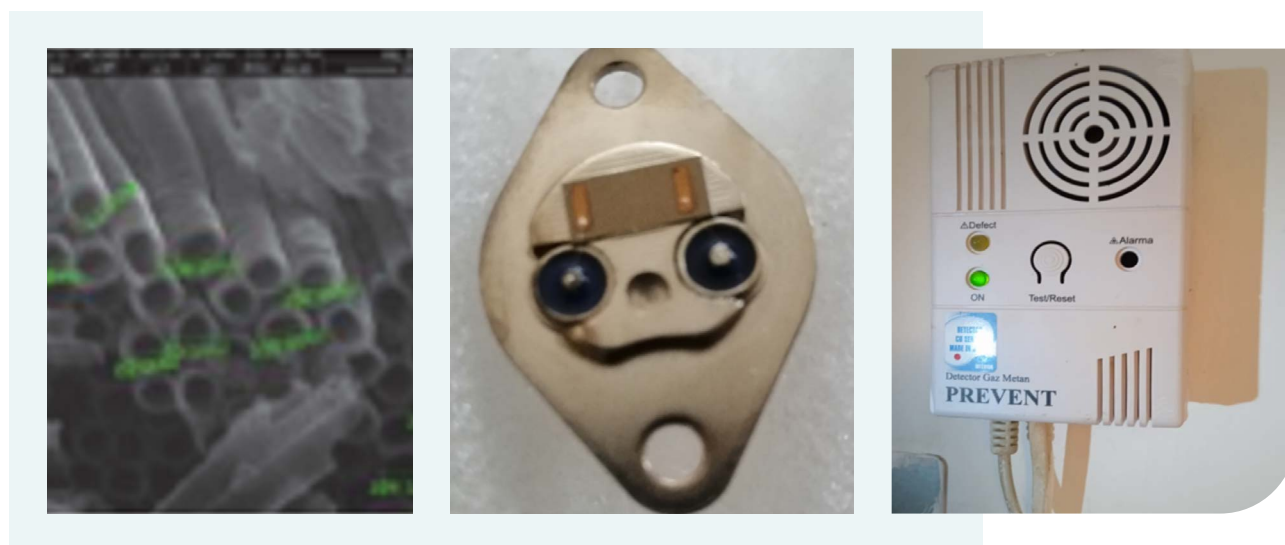


Figure 1 a) SEM image of NT's TiO₂ b) Picture of combustibile gas sensors c) Monitoring instrumentation integrated with ThnEx sensor

The project referred at innovative and complex technologies new for Romania with support of which the industrial company to produce a new sensing product.

The project developed technological processes to realize sensitive structures for combustibile gas sensors and hybrid nanocomposite materials with tailored properties. It has studied and developed technologies for production of hybrid nanocomposites with content of TiO₂ NT's and CNT/rGO as well as their optimization to obtain the sensitive materials with the specific properties for detection of combustibile gases (great rapport of size/volume). The sensors to be performed are designed for the protection against of self-ignition risk into

different environment which need high degree of safety. The results of project allow the increasing of company capacity of research and development as well as innovation of company by transfer of knowledges between the academic area and industry by development of new and innovative products and services.

Objectives

The objective of the project is the development of complex technology, innovative and new on Romanian market with the support of which the company will be able to realize a new product as "Sensors for combustibile gases". Based on these sensors, the industrial partner developed and manufactured a prototype of portable detection instrumentation for

on site and real time concentration measurement of combustible gases into industrial and residential environment and leakage monitoring of equipment and distribution networks against of explosions, fire damages for working and life safety reasons.

Methodology

The project duration for 18 months. The action plan consists in 5 sub activities WP's of which 3 are for activities of industrial research works to realize the experimental model of micro-manufacturing technology for hybrid nanocomposite materials and 2 activities related to experimental development and prototype development for demo of functionality and utility of sensors for combustible gases. The industrial partner will develop also the integrated monitoring and detection instrumentation for portable on-site operation concept. For technology optimization of nanostructured materials and hybrid nanocomposites SITEX partner used design technics like for design of experiment (Design of Experiment-DOE) and modelling of response surface (Response Surface Modelling-RSM), graphic design programs available at commercial level.

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National Institute for Research and Development for Microtechnologies IMT Bucharest, Romania

Acknowledgement

The project partners thanks for financial support of project works of The Romanian Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) under of project frame TGE-PLAT (2017-2021) "The partnership on exploitation of Essential Generic Technologies (TGE) based on the PLATform of interaction with competitive companies" (TGE-PLAT)", co-financed by European Fund for Regional Development by Operational Program Competitivity 2014 – 2020, Axe 1: research, Technological development and Innovation (CDI) on support of economic competitiveness and businesses development.

Project: ThnEx C77.8D/09.08.2020

CONTRIBUTION FROM GRAZ UNIVERSITY OF TECHNOLOGY



Sensor Integrated Lab-on-Chip for Nanotoxicity Assessment

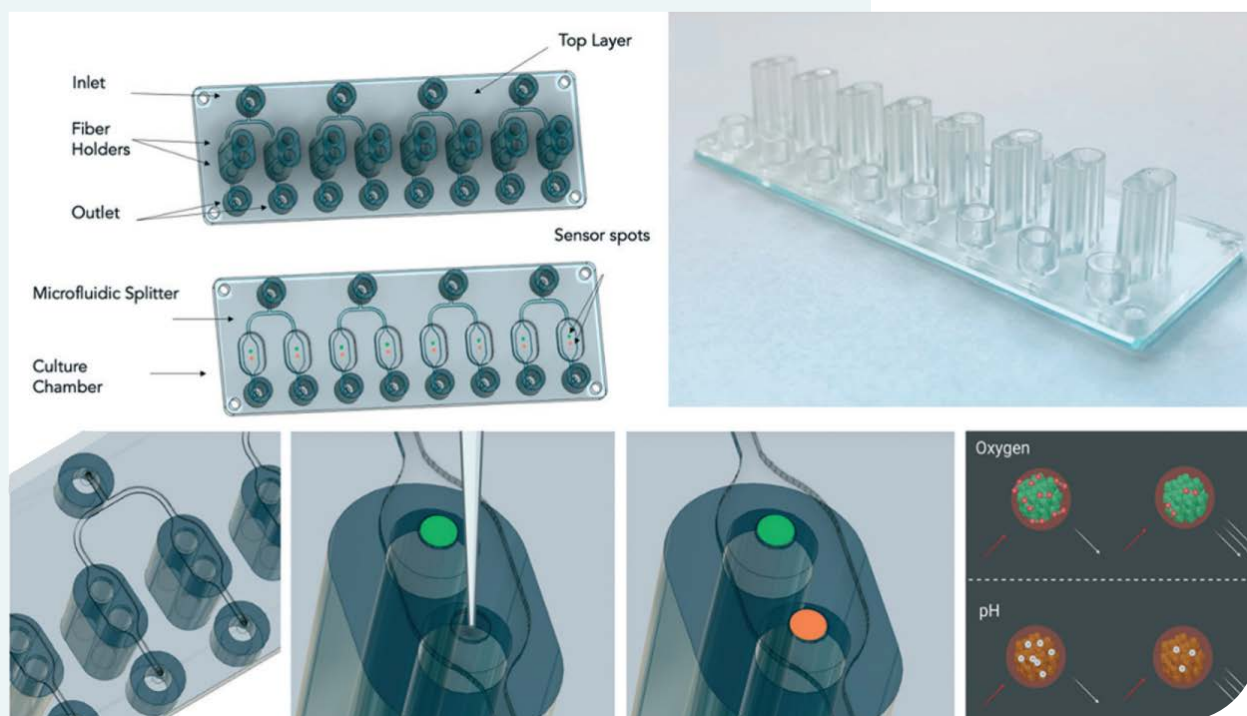


Figure 1: Microfluidic chip for nanotoxicity screening. Integrated oxygen and pH sensors enable to monitor the metabolic activity of cultured cells on the exposure to nanomaterials

The Austrian-Chinese Cooperative RTD Project FastNanoToxTest funded by the FFG and CAS is aiming to significantly enhance nanotoxicity assessment efforts by developing a multi-sensor-integrated, biofilm containing screening platform. The consortium has recently published a microfluidic chip that is suitable for nanomaterial risk assessment.

The research groups from TU Wien and TU Graz and the injection molding manufacturer kdg Opticom GmbH have demonstrated the

manufacturability and application of the microfluidic cell cultures using industrial specifications, materials, and fabrication methods. The groups developed a dual-sensor integrated microfluidic cell analysis platform to conduct risk assessment studies of engineered nanoparticles. Within their study, the groups demonstrated the ability to non-invasively monitor cellular metabolic activities, including oxygen consumption and acidification rates, in real-time using industrial-relevant

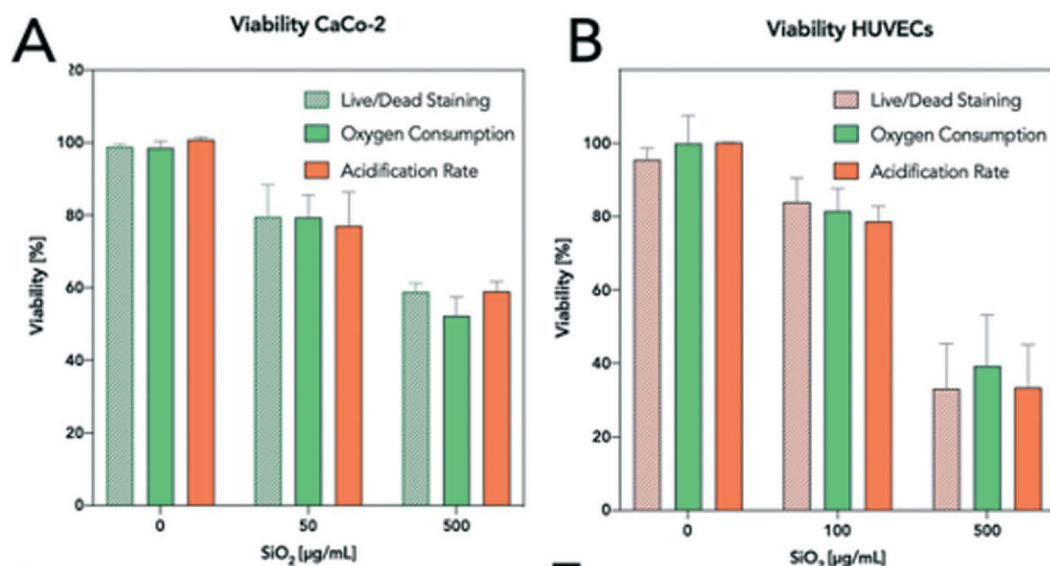


Figure 2: Nanotoxicity assessment after three h perfusion in microfluidic cell culture chambers with different validation methods. A) Cell viability of Caco-2 cells calculated with live/dead staining, oxygen consumption, and acidification rates. B) Cell viability of HUVECs calculated with live/dead staining, oxygen consumption, and acidification rate

prototypes. The results show that oxygen consumption and extracellular acidification rates linearly depend on increasing cell densities but significantly differ between cell types featuring higher (e.g., cancer cells) or lower (e.g., primary cells) metabolic activities. In a final practical application, the dual-sensing microfluidic platform was used to reliably and reproducibly determine the cytotoxicity of SiO₂ nanoparticles on epithelial (Caco-2) and endothelial (HUVEC) cells. Results of the microfluidic nanotoxicological screening study further revealed that rapid, non-invasive monitoring of nanomaterial-biology interactions provides similar outcomes than recommended endpoint cell-based assays using dye-exclusion principles, while significantly reducing assay times by a factor of 90–720×. In summary, the developed chip system is ready to be directly translated into mass production due to the fast and time-efficient prototyping

strategy, manufacturability of the industrial-relevant prototypes combined with the easy operation and integration of sensors spots.

Publication:

Zirath, H.; Spitz, S.; Roth, D.; Schellhorn, T.; Rothbauer, M.; Müller, B.; Walch, M.; Kaur, J.; Wörle, A.; Kohl, Y.; Mayr, T.; Ertl, P. Bridging the Academic-Industrial Gap: Application of an Oxygen and PH Sensor-Integrated Lab-on-a-Chip in Nanotoxicology. *Lab Chip* 2021. <https://doi.org/10.1039/D1LC00528F>.

Contact

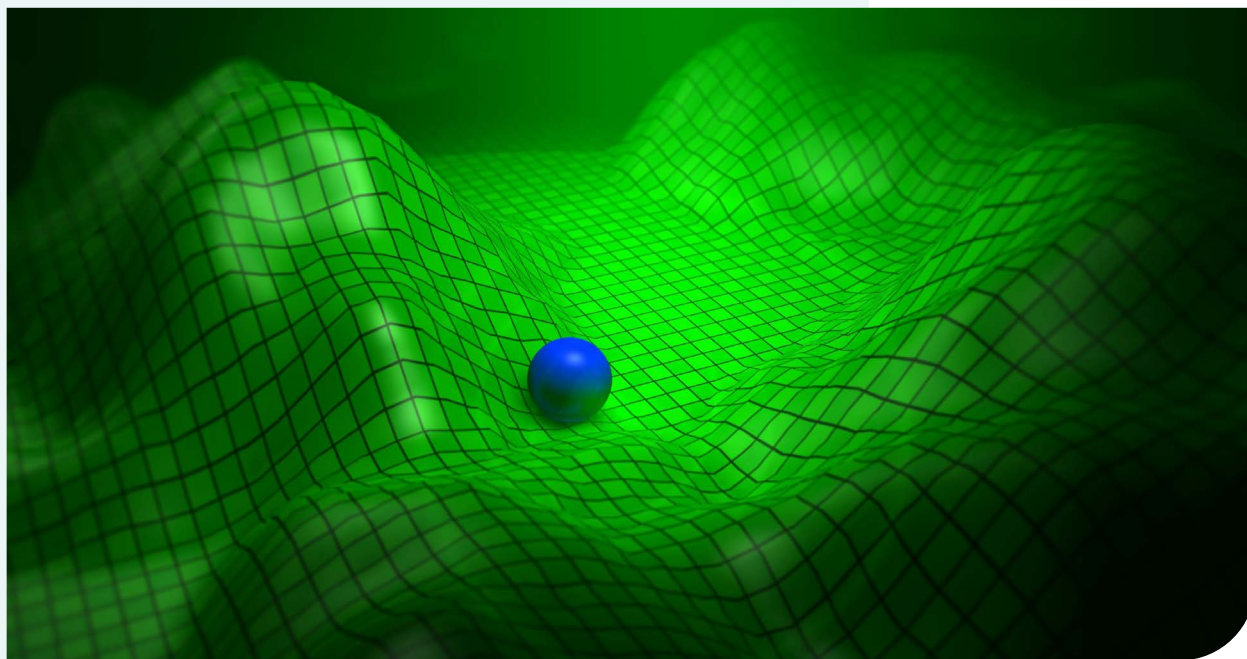
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CONTRIBUTION FROM UNIVERSITY OF GRAZ,
INSTITUTE OF PHYSICS



Dipoles Revealing Aberrations



A dipolar particle placed in an electromagnetic field distorted by aberrations

A team of scientists led by Peter Banzer from the University of Graz found a novel way for the absolute characterization of focusing elements. Their results were now published in Springer-Nature's Light: Science & Applications.

When reflecting on science and research, it is hard to find a technology that is as important as microscopy. Microscopy is not only of utmost importance as a tool for conducting research, there is also a whole community and industry focusing on the development of novel microscopy systems and techniques. In the

development of such systems, characterizing and measuring the aberrations of the involved optical elements, like microscope objectives, is a crucial and essential step. Typically, such measurements are comparative in nature, requiring a calibrated device acting as a benchmark to gain information about the optical element under investigation. In optics, such a calibration usually happens by means of interferometry, where optical reference objects, e.g., a mirror and a beam splitter, are utilized to create a reference wave. Consequently, the quality of these elements and their calibrat-

ion set an upper limit for the measurement accuracy, as their imperfections and calibration errors translate directly into the measured wavefront of the device under study.

Recently, a team of scientists from the University of Graz, Austria, and the Max Planck Institute for the Science of light in Germany found a way to circumvent this fundamental problem. Their results were now published in *Light: Science & Applications*. Led by Professor Peter Banzer, they propose and implement a novel technique for an absolute characterization of high numerical aperture microscope objectives, working without an aberration-less or known optical reference element. To achieve this, the reference wave is created by an object smaller than the wavelength, i.e., a nano-particle. The emission of such a nanoscale scatterer can be calculated analytically and enables the utilization of scattered light as a nearly-perfect reference wave, resulting in an outstanding performance of the reported technique.

When doing microscopy of almost any kind, the microscope objective is without any doubt the key element to define both the resolution and the quality of the created images. This renders our presented method highly relevant for the development of cutting-edge high-quality optics and microscopy systems. Nevertheless, measuring the aberrations of microscope objectives is not only important during their de-

velopment. Working with a pre-characterized microscope objective and knowing its errors precisely also enables the implementation of far reaching error correction strategies and allows for quantitative data collection. Consequently, the published study is of great interest and relevance for a very broad audience, from epidemiologists, biologists, chemists, and physicists to virtually everyone working with imaging systems.

Publication:

J. S. Eismann, M. Neugebauer, K. Mantel, P. Banzer, Absolute characterization of high numerical aperture microscope objectives utilizing a dipole scatterer, Light: Science and Applications 10, article number: 223 (2021); <https://doi.org/10.1038/s41377-021-00663-x>

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CONTRIBUTION FROM KNOW-CENTER

Digital Health Literacy for All



The two leading senior researchers behind the winner concept: Dr. Katharina Maitz (left) and Dr. Angela Fessler (right)

The [Know-Center](#) research area “Data-Driven Business” led by Assoc.-Prof. Dr. Viktoria Pammer-Schindler won the innovation award of Health Tech Hub Styria Pitch & Partner 2022 Corporate Call 3 „Digital health literacy for all“ by [Lebenshilfen Soziale Dienste](#). The aim of the call was to find ways to enable the active participation of all people in the health system. This also includes providing

targeted support to people with the most diverse starting conditions to develop digital health literacy.

Know-Center GmbH is a leading European research center for data-driven business and artificial intelligence located in Graz. The Know-Center conducts applied and interdisciplinary computer science research in the fields of data-driven business, artificial in-

telligence, big data and cognitive computing. At Know-Center's research area "Data-Driven-Business" led by Assoc.-Prof. Dr. Viktoria Pammer-Schindler, we understand and design socio-technical interventions from the perspectives of business models, technology-enhanced (organizational) learning, and knowledge management. We are researchers in human-computer interaction, inclusive and educational technology, and information systems and we develop solutions that are tailored to the needs of specific target groups.

The **Health Tech Hub Styria (HTH Styria)** is an initiative of 6 leading stakeholders in the Styrian innovation system ([Human.technology Styria](#), [JOANNEUM RESEARCH](#), [Medical University of Graz](#), [SFG](#), [Science Park Graz](#) and [City of Graz](#)). At the Health Tech Hub on January 27th, 2022 in Graz selected members of Human.technology Styria GmbH announced the winners of the Corporate Call 2022 for 6 individual topics. Around 60 companies from 16 European countries submitted their ideas, prototypes or already realized projects. A team of Know-Center's research area "Data-Driven Business" (Dr. Katharina Maitz and Dr. Angela Fessler) won the innovation award of Corporate Call topic 3 „Digital health literacy for all“ by [Lebenshilfen Soziale Dienste](#).

Inclusive learning

How do you make health literacy easily accessible to people with disabilities, people with a migration background or older people who have little or no access to the usual information platforms? Pammer-Schindler's research group has been working for years on socio-technical design and technology-supported

learning in different application contexts, such as in companies, in the university context or in the health-related sector. What counts here is not only what people know, but what they can do - in other words, what competences they possess. Thus, learning solutions must focus on sustainable teaching and training of competences and thereby especially take the learners' individual spectrum of action into account. The research group draws on broad expertise from research and industry-related projects and specifically accompanies organizations on their way to comprehensive solutions for competence-oriented education and training for a wide range of target groups. A broad repertoire of established and innovative concepts (e.g., reflective learning), methods (e.g., adaptive, digital training) and tools (e.g., learning objectives widget) are used and can be successfully applied in the corresponding contexts.

Health Literacy for All

Our solution on how to make health literacy accessible to all are based on three fundamental approaches:

- ✓ **Clearly communicated learning goals are key to competence-based learning.**

Communicating learning goals and desired learning outcomes, respectively, in a transparent and easy understandable way helps to guide the learning experience and make clear what results can be expected from a learning activity.

✓ **Learning materials and opportunities must adapt to the users' needs.**

Not all learners need the content presented in the same way. Learning content can be delivered according to the learners' individual needs and preferences. For example, learning content in text form can be tailored to the learners' individual reading abilities.

✓ **Health and health literacy encompass mental and social health in addition to physical health.**

Mental health (literacy) is an important component of overall health and wellbeing. For example, the ability to recognize when one needs support – be it just someone to talk to and share feelings or professional help – and active help-seeking are core characteristics of mental-health-literate individuals.

Using these three approaches in combination, Know-Center will work together with Lebenshilfen Soziale Dienste in the future to make society more equitable for all and to enable the greatest possible health participation for people with the most diverse starting conditions.

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[→ TABLE OF CONTENTS](#)

CONTRIBUTION FROM SITEX 45 S.R.L.

Project TEMSESOFT “Smart Optical Device for Temperature Sensing, Based on Innovative Luminescent IV–VI Quantum Dots–Doped Complex Nano–Structured Thin Films”



Abstract

The recent developments in temperature sensor technology resulted in a great progress in the field, being dominated by contact type sensors. On the other side, noncontact type sensors research is focused on infrared sensors, including optical sensors, which are promising devices for industrial applications (oil refineries, mines, thermal and hydropower stations, etc). The project deals with nanostructured thin films based on PbS and PbSe quantum dots (QDs) embedded in a phosphate-silicate matrix with complex composition, prepared by sol-gel method and spin/dip coating technique. These materials are used as luminescence based temperature noncontact sensors for NIR (Near Infrared) range. The

main objectives of the project are: i) technology validation for synthesis of optical materials based on IV-VI QDs-doped phosphate-silicate thin films with temperature-dependent luminescence; (ii) achieving a temperature sensing device that incorporates the synthesized materials. High luminescence efficiency, based on quantum confinement effect, causes QDs to become useful low cost optical indicators for luminescence-based temperature sensing systems operating up to 400oC.

Project Objectives

The general objectives of this project are: (1) elaboration, performing and validation of the technology for the synthesis of innovative nanostructured optical materials having efficient

temperature sensing properties based on luminescence in NIR (Near Infrared) domain and (2) achieving an experimental demonstrative set-up followed by a smart prototype device, which incorporate the nanostructured optical materials with performing temperature sensing properties. The specific objectives of the project are the following:

(i) to develop a laboratory solgel technology for the preparation of innovative PbS and PbSe QDs-doped phosphate-silicate thin films deposited by: a) spin coating technique on planar substrates (silicon/glass/quartz), and, as an alternative route, by b) dip coating technique in which the deposition occurs on optical fibers;

(ii) to investigate the luminescence properties in dependence on temperature (up to 400oC), correlated with the quantum confinement effect of PbS and PbSe QDs embedded in phosphate-silicate thin films with complex composition (Al_2O_3 , TiO_2 , ZnO , ZrO_2 are added to improve chemical and thermal properties);

(iii) to perform an experimental demonstrative set-up followed by the prototype device that incorporate the innovative PbS and PbSe QDs-doped phosphate-silicate thin films with complex composition, showing the performant sensitivity to measure the environmental temperature changes, based on NIR luminescence variation.

Innovation regarding current state of the art

1. Achievement of complex nanostructured materials based on innovative PbS and PbSe, QDs-doped phosphate-silicate thin films having enhanced luminescence and temperatu-

re sensitivity properties (high luminescence quantum efficiency, fast response, reproducibility under thermal cycling by temperature raising and cooling) for NIR domain as well as improved chemical and thermal stability by adding Al_2O_3 , TiO_2 , ZnO , ZrO_2 . According to the knowledge of the present proposal authors, PbS and PbSe QDs-doped phosphate-silicate solgel thin films with complex composition (by adding the upmentioned oxides) was not reported so far. These materials could be considered as novel and promising candidates, applied in temperature sensing devices.

2. Achievement of an integrated prototype device based on innovative PbS/PbSe QDs-doped phosphate-silicate thin films having performing NIR luminescence efficiency and temperature sensitivity, simplicity, reliability and reproducibility, short response time, for real time noncontact temperature measurements applied for industrial environment protection.

Acknowledgement

The authors would like to acknowledge with special thanks for financial support of European Commission by MANUNET Program under Project MNET20/NMCS3732-MANUNET 2021-2023

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BNN retrospect

NANOCOMMONS KNOWLEDGE BASE & HACKATHONS



The NanoCommons Knowledge Base: how to find all data for one nanomaterial across multiple data sources

2nd December 2021, online

On Thursday, 2nd December 2021, the H2020 project [NanoCommons](#), in a joint initiative with the [NanoSafety Cluster](#), offered an online demo of the [NanoCommons Knowledge base](#) (NC KB).

The webinar presenters were Dieter Maier (Biomax, Munich, GE), Lee Walker (UKCEH, Wallingford, UK), [Martin Himly](#) (PLUS, AT), Christine Balmer (UKCEH, Wallingford, UK) and [Thomas Exner](#) (Sevenpastnine, Cerknica, SI).

Data retrievals & uploads were showcased using the features of the NC KB interlinking the results from several large projects' real

data sets and corresponding metadata sufficing the need for data FAIRness (Findability, Accessibility, Interoperability, Reusability). Its diverse functionalities were presented in an interactive manner, thus, been tested for fitness-for-purpose by the attendees' demands. Attendees were able to get hands-on experience during this 2 h workshop/hackathon.

The webinar presentation slides and the recordings (recorded for educational purposes) are available in the [NanoCommons Infrastructure](#), at [Zenodo](#), [YouTube](#) and in the [NanoCommons' Elixir TeSS channel](#).

NanoCommons Knowledge Base and Electronic Laboratory Notebook Hackathons

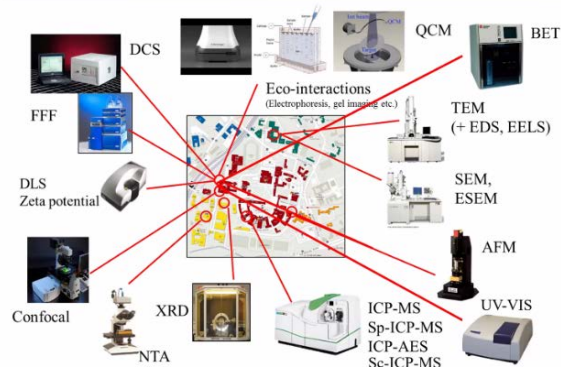
13th January 2022, online

On Thursday, 13th January 2022, NanoCommons, in a joint initiative with the NanoSafety Cluster, offered an online demo on the use of the new features of Electronic Laboratory Notebooks (ELNs) powered thru NanoCommons. Webinar presenter was (UoB, UK).

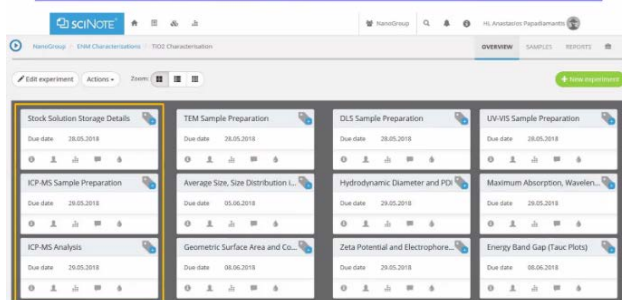
It started with an introduction to the NanoCommons-powered features on how to manage, modify, create, and import protocols for assays. Tasks can be defined and assigned to different users and/or groups. Finally, data (incl. all relevant metadata) can be exported resulting in reports that facilitate data FAIR-

ness. The two screenshots below display the distribution of assays on a typical campus vs. the ELN-captured workflow:

From a Local Network...



Experimental Workflow



- Multiple-branch experimental workflows

Technology advancement, the emergence of nanoinformatics and FAIR data principles implementation have increased the need for high-quality datasets. To achieve this, the data produced through academia, industry and regulatory bodies needs to be properly curated, to contain sufficient metadata and to be semantically annotated. In this way, data can be accessible and readable from both humans and machines, making it possible to be queried and mined using appropriate systems.

One of the main objectives of NanoCommons is to promote the FAIR data principles, cross-project collaboration and data interoperability. This will make possible to offer the nanosafety community high quality data that can be combined to produce big datasets and be used in novel modelling, machine learning, deep learning and AI techniques. We aim to achieve this by implementing data management processes covering the entire data lifecycle, and by moving the data curation process to the data generators, in line with the concept of Data Shepherd. Capturing the data and metadata as they are produced will save substantial time and resources, while resulting in higher quality datasets. ELNs can be implemented, through cloud services or locally, into everyday experimental practice streamlining and simplifying experimental and computational workflows, practices and data capturing.

In summary, a number of advantages can be identified for using ELN in your everyday research practice, as depicted below:

Electronic laboratory notebooks

Keep in mind

- ELNs are better than paper notebooks
- ELNs are not a complete data management solution
- ELNs should be part of a data management ecosystem
- ELNs are to be used in conjunction with knowledge bases, semantic annotation etc.
- More work is needed to integrate all the different parts and create a fully functional working environment

It was a well-attended webinar, with active and very interested participants, who communicated their appreciation during and at the end of the hackathon in form of Q&A, where the respective experts provided further details and insights.

The webinar presentation slides and the recordings are available in the [NanoCommons Infrastructure](#), at [Zenodo](#), [YouTube](#) and in the [NanoCommons' Elixir TeSS channel](#).

Contact

Martin HIMLY, PLUS, Salzburg, AT, (martin.himly@sbg.ac.at) takes care of all Training issues within NanoCommons and is the chair of the EU NanoSafety Cluster - Work Group A on Education, Training, and Communication.

Get connected with NanoCommons on:



[SEE WEBSITE](#)



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731032.

[→ TABLE OF CONTENTS](#)

SABYDOMA'S WORKSHOP "A STAKEHOLDER'S PERSPECTIVE OF SAFE-AND-SUSTAINABLE-BY-DESIGN (SSBD)"



18th February, 2022, online

On Friday 18th February 2022, the EU H2020 project SABYDOMA organized the virtual workshop – **A Stakeholder's Perspective of Safe-and-Sustainable-by-Design (SSbD)**.

The main objective of the Workshop was to present a myriad of SSbD concepts, approaches, and understandings. And it has raised more questions than answers. But this is increasingly the case in a world becoming more and more sophisticated thanks to technological development and where responsibility and reflexivity require complex thinking, broad analysis and forecasting of consequences. In addition, the Workshop also showed a growing transdisciplinary SSbD community of actors, demonstrating the importance of such a concept and strategy that will be required in the (near) future within the governance of nanomaterials in the EU.

There was a well, gender-balanced attendance of around 100 participants from all over the world (Asia, America, Africa, Europe) and from a wide range of stakeholders (scientists, industry, consultants, market researchers, NGO representatives, regulators, policy makers/advisors, lawyers, trade associations, etc.), joined the workshop (See Figure 1).

SABYDOMA's coordinator, Prof. Andrew Nelson (University of Leeds) gave a short project presentation, followed by Anthony Bochon (Gil Robles – San Bartolome & Partners) and who presented the output of the [1st Legal Workshop on Safe-by-Design](#) organized by SABYDOMA in January 2021. After that, the invited speakers gave a short presentation of their [visions/definitions of SSbD](#).

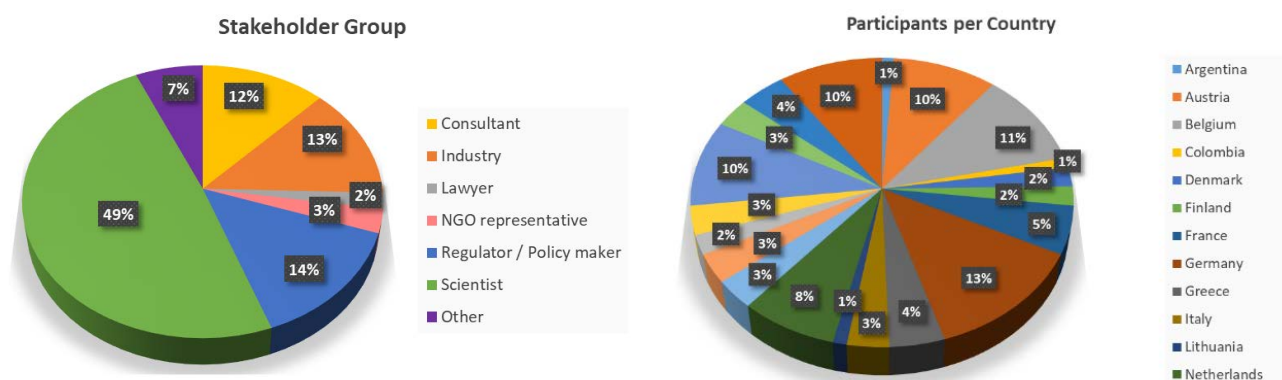


Figure 1. Workshop Global Outreach – Stakeholder groups among the workshop participants.



Figure 2. Word cloud with the words the workshop participants mostly associate with SSbD.

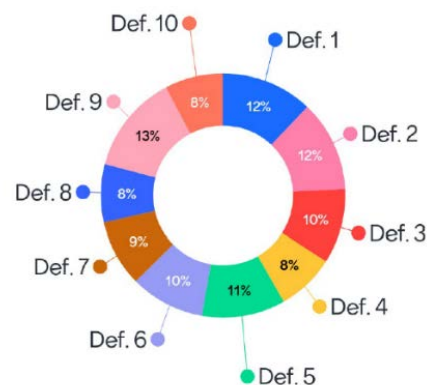


Figure 3. Results of the life survey on SSbD.

The workshop continued with a ‘live’ survey, moderated by Beatriz Alfaro (BioNanoNet Forschungsgesellschaft GmbH), where the workshop participants were anonymously invited to choose, based on the [definitions given by the workshop speakers](#), those they mostly agreed / felt most comfortable with (Figure 2).

As can be seen Figure 3, the most popular “[visions/definitions of SSbD](#)” were no 1, no 2 and no 9, with 12%, 12% and 13% of the votes, respectively.

The workshop ended with a very interactive Round Table, where panel lists were interviewed by the moderator of the session Mr Ignasi Gispert Pi (from Applied Nanoparticles S.L.) discussing different aspects of SSbD.

Some of the workshop’s key statements included:

✓ SSbD is a holistic approach that takes many aspects into account.

- ✓ SSbD principles must be adhered to throughout the life cycle of chemicals, materials and products, taking into account their entire life cycle.
- ✓ Design practices that cause load shifting to other domains or compartments should be avoided (e.g., from health to climate change or from water to sludge).
- ✓ ‘Safe’ should always mean ‘safe’. Substances of Concern (SoC) should never be labelled as safe.
- ✓ SSbD criteria should drive substitution.
- ✓ Companies should strive for SSbD, and SSbD should not be a minimum requirement.
- ✓ Economic growth should be decoupled from sustainability, as economic growth leads to environmental degradation.

The SSbD survey that was conducted ‘live’ during the workshop, has been now extended to the whole interested community in order to investigate which are the most agreed definitions of SSbD. [You can take the survey here.](#)

Relevant publications suggested by the workshop speakers can be found here.

The presentations and recordings of the workshop are available on the [project website](#).

Role of BNN

Safety-by-Design, graphic design, dissemination & exploitation and stakeholder engagement.

Contact

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Get connected with SABYDOMA on:



[SEE WEBSITE](#)



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

[→ TABLE OF CONTENTS](#)

BIONANONET GENERAL ASSEMBLY, BNN NETWORKING & SUSCHEM-AT EVENT

BIO
NANONET
ASSOCIATION

SUSCHEM^{AT}
European Technology Platform
For Sustainable Chemistry

OPERATED BY


10th of March, 2022, Graz, Austria



The BioNanoNet General Assembly, BNN Networking & SusChem-AT Event took place on 10th of March 2022, at the premises of BNN in Graz. Fortunately, it was possible to meet face-to-face, which enabled the participants to intensively interact with the speakers (all of them have been present) and colleagues in the audience. The event day started with the BioNanoNet Association's General Assembly, organised in hybrid format to update all members from 14 European countries about the performed work, the actual status and the future activities.

After a short break and welcoming further participants, the BNN Networking started

with the key-notes session related to the topic "Sustainability in Science, Research and Development: Challenges and Opportunities". Christian Seitz ([BASF](#), GER) opened the session with his presentation about „Sustainability in Industry – Examples from BASF“. He gave insights about sustainability measures of one of the largest chemicals industry in the world. Emma Strömberg from IVL ([Swedish Environmental Research Institute](#)), who recently became member of BioNanoNet association, presented ideas, collaboration opportunities and forthcoming activities that will support connectivity between the NanoSafety- and the SusChem-Community. Her talk was ent-

itled „The Communities of Sustainable Chemistry, Materials and NanoSafety Join Forces – What You Can Expect from this Global Collaboration“. The session concluded with the intervention by Veronica Bocci ([DITECFER](#), IT), coordinator of the EU-project STARS (see project presentation in our [BNN NEWSLETTER 04/2021](#) on page 24). She presented the strategy and objectives that are pursued in the project towards „Driving Green Transition in European Value Chains: Growth Opportunities, Challenges and Obstacles, Actors and Tools“.



The speakers of the first session f.l.t.r.: Christian Seitz, Veronica Bocci, Emma Strömberg and Andreas Falk

The second part of the event was dedicated to the field of sustainable chemistry, organized by the SusChem-AT platform, which is the Austrian national technology platform - your gateway for collaboration towards Sustainable Development. The chair of [SusChem-AT](#), Bettina Mihalyi-Schneider from [TU Wien](#) prepared with her talk the field, introducing the key elements of sustainability, how this is and will be addressed in science and research,

and to what extent SusChem-AT aims to contribute to the urgently needed “change of mindset”. The following talks highlighted the strength of the Austrian community, featuring two role models how to change incrementally the way of processing/production: firstly, Martin Miltner, CEO of [Lignovations](#), a Spin-off from TU Wien showed „Colloidal Lignin – a Sustainable Platform Material for Cosmetics & Chemistry“ as this has the potential to reduce the dependency on global supply chains. Secondly, Andreas Hackl ([Next Generation Elements](#)) together with Fabian Weinhandl ([BDI-Bioenergy International](#)) presented „Chemical Recycling of Plastic Waste – ‘SynCycle’ is Closing the Loop“, their joint project, paving the way towards a pilot facility with the potential of up-scaling of recycling technologies. Finally Stefanie Prenner ([BRIMATECH](#)) presented aspects of the business model “Chemicals as a service” (CaaS), and announced their event on the topic of „Advanced Digital Technologies for Sustainable Business Models in the Chemical Industry“.



SusChem-AT event speakers f.l.t.r.: Andreas Hackl, Bettina Mihaly-Schneider, Fabian Weinhandl, Stefanie Prenner, Martin Miltner, Melanie Mayr and Andreas Falk



Finally, the BNN Networking & SusChem-AT Event offered the opportunity for a physical networking, which was used by the participants for lively discussions, gaining new contacts and creating ideas for future collaboration. Once more, we like to thank all the speakers for their great talks and the participants, for making the event a great success.

Stay tuned for our next regular meeting: the [BioNanoNet Annual Forum & BNN Networking session](#) will take place in Hall i.T., Austria, 27th September, back-to-back with the [BMT2022-conference](#), and offering thematic lectures as well as a matchmaking for the forthcoming Horizon Europe calls.

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→ [TABLE OF CONTENTS](#)

Events

BNN EVENTS & EVENTS SUPPORTED BY BNN

Instance maps: Breaking up your experiments into logical blocks

When? 7th April 2022, 13:00 – 15:00

Where? online



[NanoCommons](#) team, in a joint initiative with the NanoSafety Cluster, is offering an interactive online workshop on implementing Instance Maps for linking SOPs and data to Electronic Laboratory Notebooks (ELNs) for nanosafety assessment.

Instance maps have been designed to represent nanomaterial fate and transformations across their life cycle and to structure data curated from literature for the CEINT NanoInformatics Knowledge Commons (NIKC) database. In line with NanoCommons's overall goal of embedding data management activities much earlier in the experimental process, integrating the instance maps directly into the study design, protocol development and on-the-fly (meta)data recording can bring additional advantages, e.g., when presenting complex studies to others, as part of (meta)data completeness, and for reporting or retrieving specific information from one part of a study. The training workshop presents how this is possible by:

- ✓ Presenting a prototype of a [new graphical user interface](#) for the easy generation of instance maps and to provide more detailed views on the individual experiments for characterization of the materials, their surroundings and the organisms being tested.
- ✓ Show first approaches to link these maps to study design documentation and protocols generated and stored in the [SciNote electronic lab notebook](#) or just as separate text document and (meta)data in any format and how to generate complete datasets including all this information.
- ✓ Present approaches for collaborative development of SOPs based in the instance maps especially concentrating on quality assurance measures. (Martin Himly, Iseult Lynch)
- ✓ Present future work for improving guidance based on reporting standards and curation templates replacing the simple approaches of 2).
- ✓ Demonstration / hands-on

Target audience: Bench and computational scientists looking into automated ways to capture and retrieve data and making them available to the community.

Feel free to join and [register here](#) asap so we can tailor the workshop for your needs. You will find updates with more information about NanoCommons and training materials [here](#).

Nanosafety Training School:

Towards Safe and Sustainable by Design Advanced (Nano)Materials

When? 15th – 20th May 2022

Where? Venice, Italy

The School aims to transfer state-of-the-art knowledge on a variety of topics from key experts to the new generation of professionals working in the areas of safety and sustainability of advanced (nano)materials. To this end, the School will deliver keynote lectures and will engage the participants in interprofessional training by means of roleplay and hands-on training exercises. The program will balance experimental and modelling approaches in each of the School topics listed below. A draft version of the agenda is available [here](#).

It is hosted by the company GreenDecision in the frame of the EU Horizon 2020 project SUNSHINE and is co-organized and substantially contributed by the Horizon 2020 projects ASINA, SbD4Nano, SABYDOMA, SAbyNA, DIAGONAL, HARMLESS, NanoInformaTIX, NanoSolveIT, Gov4Nano, NanoRIGO, RiskGONE, NanoCommons, CHARISMA and the US Duke-led INFRAMES initiative.

Topics

- ✓ Transition from Safe-by-Design to Safe-and-Sustainable-by-Design of advanced (nano)materials: a historical perspective and current policy landscape
- ✓ What they are: Physicochemical identity - Intrinsic and extrinsic properties affecting release, biodistribution, environmental fate, exposure, human and environmental toxicity

- ✓ What they are: Lifecycle release and transformations
- ✓ Where they go: Environmental fate, human biodistribution and exposure
- ✓ What they do: Human and environmental toxicity
- ✓ Similarity assessment, grouping and read-across approaches
- ✓ Risk assessment and management & Risk governance
- ✓ FAIR (Findable, Accessible, Interoperable, and Reusable) data management and data quality assessment

To register, please fill in the [registration form](#). The School attendance is free of charge. The number of attendees to be accepted is limited to 70. Registration Deadline: 15th April 2022.

[More information](#)



These projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 952924 (SUNSHINE), n° 862444 (ASINA), n° 952921 (CHARISMA), n° 953152 (DIAGONAL), n° 953183 (HARMLESS), n° 814426 (NanoInformaTIX), n° 862296 (SABYDOMA), n° 862419 (SAbyNA), n° 862195 (SbD4Nano), n° 814401 (Gov4Nano), n° 731032 (NanoCommons), n° 814530 (NANORIGO), n° 814572 (NanoSolveIT), n° 814425 (RISKGONE).

BioNanoNet Gold Member Webinar

When? 31st May 2022, 13:00 – 14:30

Where? online

Our Gold Members will present their expertise and the following projects:

- ✓ [FastNanoTox](#) presented by Peter ERTL, Technische Universität Wien
- ✓ [NanoPAT](#) presented by Christian HILL, Medical University of Graz
- ✓ [SixthSense](#) presented by Lucas PALETTA, JOANNEUM RESEARCH
- ✓ [BreadCell](#) presented by Stefan SPIRK, Graz University of Technology
- ✓ [SABATLE](#) presented by Claudia MAIR-BAUERNFEIND, University of Graz

Registration is not necessary. Here is the [meeting link](#).

We are looking forward to your participation.

[More information](#)

Nanoweeek 2022

When? 20th – 24th June 2022

Where? Cyprus

[NanoCommons](#), in collaboration with the [EU NanoSafety Cluster](#) projects, organises the “Nano-week” and NanoCommons Final Conference, in Limassol, Cyprus. The theme of the conference is “**Evolution of Nanosafety and materials sustainability as we transition into Horizon Europe**”.

The conference and associated events (e.g., Young NanoSafety Researchers event, Training events, EU-US CoRs meeting, NanoInChi meeting, NSC meeting) will take place between 20th – 24th June 2022.

- ✓ 20th April 2022: Early bird registration deadline
- ✓ 31st May 2022: Deadline for POSTER abstract submission

[More information](#)

BioNanoNet Annual Forum & BNN Networking Session

When? 27th September 2022

Where? Hall in Tirol, Austria

Save the date for our BioNanoNet Annual Forum & BNN Networking Session (including Match-making-session) in September.

[More information coming soon!](#)

BNN's focus session "Nanotechnologies for Safe & Sustainable Biomedical Applications" @BMT2022

When? 28th – 30th September 2022

Where? Innsbruck, Austria

The Joint Annual Conference of the Austrian, German and Swiss Societies for Biomedical Engineering will be held at Congress Innsbruck in Innsbruck (Austria) from 28 to 30 Sep 2022. The biomedical engineering community will come together again in the heart of the alps. Innsbruck with its unique combination of urban flair and impressive mountain scenery will provide an inspiring atmosphere to meet colleagues and friends, exchange scientific ideas, discuss current trends, initiate new research and make new contacts.

BNN has the focus session "**Nanotechnologies for Safe & Sustainable Biomedical Applications**":

Chairs: Andreas FALK, Susanne RESCH, Clemens WOLF (BNN, AT)

Abstract: Bio- and nanotechnologies, key technologies of the 21st century, are used in many areas. The use of nanotechnology in the medical field paves the way for completely new

applications, by offering for example improved methods for imaging techniques and diagnostic tools. Nanomedicine/pharmaceutics and microfluidics for biomedical applications have the potential to improve current therapies and diagnostics as well as regenerative medicine approaches, and become future-proof by following and adopting Safe-and-Sustainable-by-Design (SSbD) strategies for chemicals used in the healthcare sector.

[See all sessions & topics](#)

Important dates:

- ✓ 31st March: Submission Deadline of abstracts and full papers
- ✓ 31st May: Abstract Acceptance Notification
- ✓ 15th July: Early-bird Registration Deadline

Submit your abstract and full paper [here](#).

Contact

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MEMBER EVENT NOTIFICATIONS

Webinar “Bio-based nanomaterials in an open innovation test bed”



When? 5th April 2022, 10:00 – 12:00 CET

Where? online

Are you an Austria based company or scientific institute interested in cellulose-based materials? Are you looking for recycling possibilities for wood waste? Or you would like to use biomass hydrolysates or nanocellulose in your products or process them further? Perhaps you have even developed a technology yourself that would be an excellent fit for Bionanopolys? ACIB looks forward to welcoming you to their informational webinar and to discussing various solution approaches with you!

[Registration link](#)

Contact

Austrian Centre of Industrial Biotechnology (acib)

Martin WALPOT

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www.acib.at

[→ TABLE OF CONTENTS](#)

Networking Event: Advanced Digital Technologies for Sustainable Business Models in the Chemical Industry



When? 30th May 2022, 10:00-13:00 CET

Where? WKÖ (Wiedner Hauptstraße 63, 1045 Wien, Austria)

You are working for an organization in the chemical value chain (from plant manufacturers to chemical users) or for an organization dealing with advanced digital technologies? You already use sustainable business models such as “Chemicals as a Service” (CaaS)? You want to enlarge your network, profit from others expertise or share your knowledge? Join our physical networking event on “Advanced Digital Technologies for Sustainable Business Models in the Chemical Industry”!

The study „Positioning CaaS in the technology environment“ (12/2020 - 12/2021), funded by BMK and supported by FCIO⁵, was able to demonstrate the relevance of advanced digital technologies for the implementation of sustainable CaaS business models on the basis of 28 actual use cases in 7 different technology areas - sensor technologies, automation, digital twins, artificial intelligence, analytics, encryption & tracking and mixed reality. However, some of these use cases are not yet being implemented broadly by the experts interviewed. Reasons for this can be found in the barriers identified during the study, such as lack of data quality, lack of expertise, concerns about data security or lack of knowledge about existing possibilities. In order to overcome these existing barriers and drive a more sustainable chemical industry that enables more sustainable business models, this networking event will be held for stakeholders from the advanced digital technologies and chemical industry sectors.

[Further information and registration](#)

Contact

BRIMATECH Services GmbH

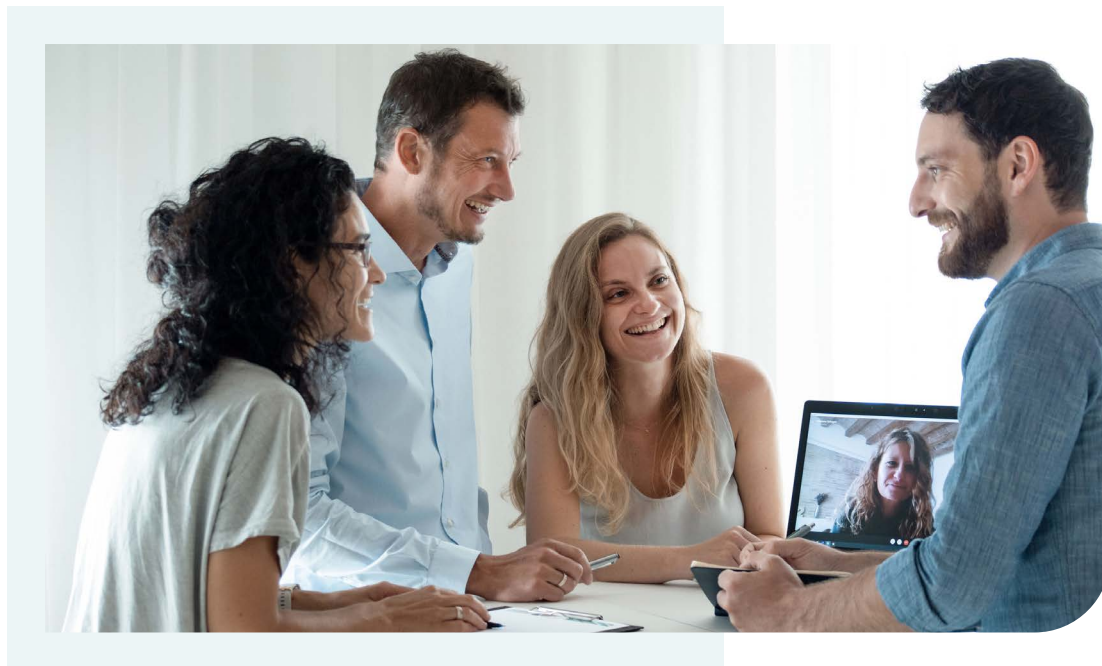
Stefanie PRENNER

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⁵Funded by the Austrian Federal Ministry for Climate Policy, Environment, Energy, Mobility, Innovation and Technology (BMK) and supported by the Austrian Chemical Industry Association (FCIO).

Finally



We hope you enjoyed reading the 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 June 2022. BioNanoNet members are welcome to send their contributions until 7th of June 2022!

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Connect with us!**Impressum:**

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[→ TABLE OF CONTENTS](#)

The background is a solid teal color. On the right side, there is a large, faint, light-blue graphic that resembles a molecular structure or a network diagram. It consists of several interconnected circles and lines, with some circles having concentric inner rings. The graphic is positioned on the right side, extending from the top to the bottom of the frame.

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

WWW.BNN.AT