January 2021 **EPNOE Newsletter**

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Editorial

Dear Readers,

Happy New Year! We have many exciting activities in 2021 and we are glad to share them with you. In February we will have our 4th International EPNOE Junior Scientist Conference (online) where young talents will enjoy new opportunities to build their collaborations. The high-level program chaired by Wim Thielemans and his team has 48 oral presentations, 41 posters and 4 keynote presentations. The first EPNOE Young Scientist Award will be given at this event, to Dr. Yuanyuan Li from KTH, Sweden. The award had several high-level nominees and the winner was selected by international jury members from seven countries. Our VP Monica Ek will present the award to Dr. Li on February 3rd and she will give a keynote lecture.

In March we will have our first EPNOE Connect Event (online) at Tecnicelpa/Ciadicyp Conference. This event has a large number of participants from biobased industries and researchers from Portugal, Spain and Latin American countries. Our VP Carmen Freire will chair a workshop “Polysaccharides as Sweet Spot for Innovation” with excellent invited talks from our members VTT, Fraunhofer, TITK, Wageningen University and Research and BOKU.

In June, a Summer School on “Aerogel Processing Technologies for Pharmaceutical and Biomedical Applications” will be organized at KU Leuven in collaboration with COST Action AERoGELS (reserve the date June 1st-4th, more information in our March Newsletter).

In October we will have our EPNOE2021 in Nantes, France organized by five prestigious French universities and research institutions and led by Bernard Cathala from INRAe. In this event we will present our EPNOE Science Award and a new EPNOE Technology Award to be given to innovators working at industry and research institutes.

In addition to these events, we are also very active to build our EPNOE Roadmap in Research under leadership of our VP Karin Stana-Kleinschek, and EPNOE Roadmap in Education, under leadership of our VP Janusz Kapuśniak. We have invited prominent EPNOE Scientists and Educators to chair and co-chair working groups of the roadmaps and we will further invite task leaders and volunteers to support this effort. Our aim is to create strategic documents with visions for Research and Education in Europe for the next 20 years and at the same time use an online platform where our members can interact and support the creation of new joint-ventures in science, education and innovation involving polysaccharides. Our VP Avinash Manian

is working to implement this platform in March and EPNOE roadmaps will be presented at the EPNOE2021 conference.

The EPNOE SpringerBriefs on Biobased Polymers series will continue under leadership of our VP Nicolas Le-Moigne and a new editorial team is now being invited. EPNOE Talks in form of short interviews with polysaccharide scientists, educators, innovators and enthusiasts are now available in our YouTube Channel, LinkedIn and Facebook pages.

Life is happening in EPNOE and we keep our doors and hearts open to welcome you, your institution or company to join us in making meaningful change. We value the insight and feedback of our readers and we will be grateful if you can help us to improve our activities by answering the survey below.

Looking forward to seeing you in EPNOE.

Pedro Fardim
President of EPNOEd us on

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News & Announcements

Winner of the EPNOE Junior Scientist Award 2021 - Yuanyuan Li

Dr. Yuanyuan Li is an assistant professor at the Department of Fiber and Polymer Technology, KTH Royal Institute of Technology, Sweden and a PI in the Wallenberg Wood Science Center. She received her doctorate from Nanjing Forestry University in China and also visited University of Maryland, USA, as a visiting researcher during her doctoral studies. After that she moved to KTH as a postdoctoral fellow and was promoted as assistant professor in 2020.

Her work is focused on wood nanostructure control as well as polysaccharide chemistry development towards wood nanotechnology applications, including transparent wood. Her main idea is to create cellulosic nanomaterials, not by the common bottom-up approach exemplified by nanocellulosics, but by eco-friendly top-down approaches starting with wood. The existing cellulose nanofibril orientation in wood is utilized, as well as the hierarchical structure and porosity.

She creates nanostructured and mesoporous wood substrates by selective removal of lignin and hemicelluloses. The resulting cell wall can be partly (only chromophores) or completely delignified resulting in

high specific surface area, and the polysaccharide substrate is readily modified to create novel nanomaterials. A recent and illustrative example is wood aerogels. The delignified wood substrate is subjected to partial dissolution and regeneration. The resulting wood aerogel structure contains regenerated cellulose fibrils in lumen space. The specific surface area can be up to 250 m^2/g, with better mechanical properties than comparable anisotropic cellulose aerogel. A variety of functional nanomaterials was prepared to demonstrate the versatility of this polysaccharide substrate prepared by chemical treatment and tailored drying.

Examples of wood nanotechnology applications include energy-saving buildings, smart windows by inclusion of phase-change materials in the cell wall, electrochromic windows, green fire-retardancy in wood, solar cells, and electrical energy storage and conversion.

Congratulations to Yuanyuan on her outstanding work and for this important recognition!

EPNOE TALKS

EPNOE Talks will bring different personal perspectives about the science and technology of polysaccharides and their great impact for the future of sustainability and well-being. The first talk with Patrick Navard, the founding coordinator of EPNOE, is available on our YouTube channel.

More talks will follow, so subscribe to the YouTube channel of the EPNOE Association.

Recognition of EPNOE Scientists highlighted

At the end of 2020, two research professors from the Laboratory of Pulp and Paper Science and Graphic Arts (LGP2) of Institut National Polytechnique de Grenoble (Pagora, France) have been named among the most influential scientists in two international rankings.

Professors Alain Dufresne and Naceur Belgacem feature in the ranking published by a Stanford University researcher along with authors from Strategies Inc. and Elsevier B.V. (Ioannidis JPA, Boyack KW, Baas J (2020) Updated science-wide author databases of standardized citation indicators. PLoS Biol 18(10): e3000918.). It lists the top 2% most cited researchers in the world in their field

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New Department at Fraunhofer Institute for Applied Polymer Research

At the Fraunhofer Institute for Applied Polymer Research IAP in Potsdam-Golm, Germany, the groups of Lignocellulose and Microencapsulation have joined. The new department “Microencapsulation and Polysaccharide Chemistry” is tasked with developing new biobased and biodegradable materials for coatings and microencapsulation. It will be led jointly by Dr. Bert Volkert and Dr. Alexandra Latnikova.

PROM: a visit to Jan Dlugosz University in Czestochowa (Poland)

Representatives from the University of Aveiro (Portugal)

- Sílvia Petronilho – a Postdoctoral researcher,
- Gonçalo Oliveira – a PhD student,
- Paulo Brites – a PhD candidate

participated in the PROM project – International Scholarship Exchange of Doctoral Students and Academic Staff, organized by Jan Dlugosz University in Czestochowa (Poland) which enabled them to take measurements and gather materials for the doctoral theses and/or scientific articles. The aim of the Programme, coordinated by the Polish National Agency for Academic Exchange, is to improve competencies of doctoral students and academic staff from Poland and abroad, thanks to participation in short forms of education (lasting from 5 to 30 days) of international nature. The person in charge of the internship was the Vice-President for Education of EPNOE Professor Janusz Kapuśniak, Head of Department of Dietetics and Food Studies.
Sílvia, Gonçalo and Paulo had an opportunity to spend 19 days in Częstochowa in September and October 2020. They have emphasized that the mobility developed their scientific, professional, interpersonal, technical and linguistic skills and enlarged their knowledge in chemical and biomaterial fields. During the internship they collected and made use of potato washing slurries, potato spent frying oil, and coffee byproducts (coffee silverskin, coffee husks, and spent coffee grounds).
Two approaches were studied: one related to the biochemical modification of starch, recovered from potato washing slurries, using enzyme-catalyzed synthesis, and another related to the promotion of transesterification reactions using spent frying oil, a triacylglycerides source, and KOH, an alkaline catalyst.

From left: Paulo, Silvia and Gonçalo

Guests from Portugal with members of Janusz Kapusniak’s Lab

New Equipment at TU Graz

3D Bioscaffolder: A Versatile Printing Tool for Manufacturing a Complex Structures
Tamilselvan Mohan, Melina Much, Rupert Kargl

Three-dimensional (3D) scaffolds are commonly used for reconstruction and restoration of various anatomical defects of complex organs and functional tissues. Scaffolds with all these challenging properties can be produced by combining biodegradable polymers or inorganic components and advanced 3D bioprinting technology, which is capable of producing custom scaffolds with high structural complexity and design flexibility for soft (e.g. cartilage) and hard (e.g. bone) tissue engineering applications.

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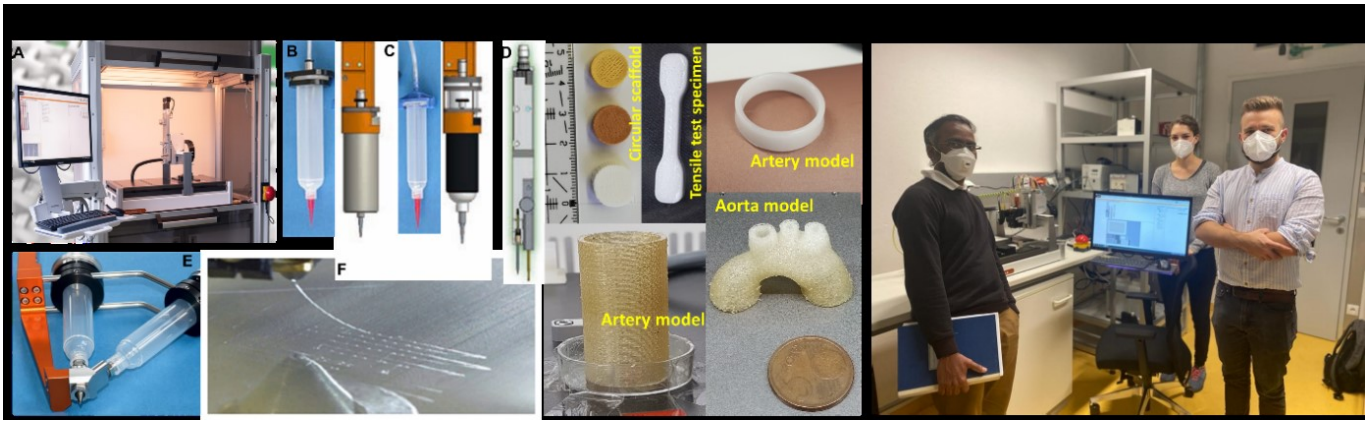

Figure 1: *Left: 3D bioscaffolder printing device and its printing or processing tools, middle: some examples of printed structures made of polysaccharide hydrogels and thermoplastic materials and right: 3D bioscaffolder in the IBioSys laboratory.*

New QCM-D techniques available at IBIOSYS
Rupert Kargl, Tadeja Katan, Tobias Alexander Steindorfer, Tamilselvan Mohan

A quartz crystal microbalance with dissipation (QCM-D) allows for the measurement of deposition and desorption of mass on solid surfaces, with a sensitivity of 20 nanograms per cm^2. IBIOSYS has upgraded its QCM-D system with humidity, electrochemistry, window, and open modules (images below). The humidity module allows for the measurement of membrane swelling and permeation, while the window module gives spectroscopic access to the surface. An attached Gamry Reference 600+ potentiostat/galvanostat provides the opportunity to measure and apply currents or potentials during surface corrosion, galvanization, electroplating, and organic redox studies on thin films.

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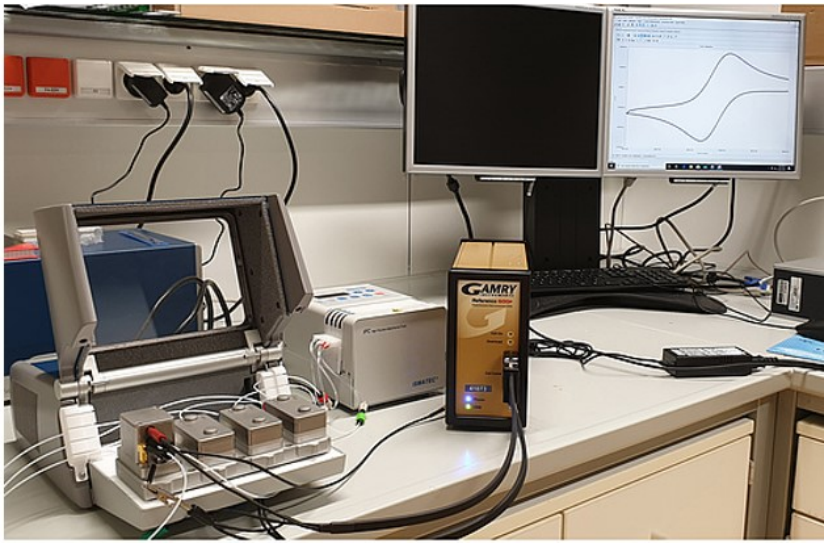

New blood protein coagulation measurements available at IBIOSYS

Control over haemostasis and coagulation analysis are essential for the assessment of blood and plasma contacting devices, and the development of anti- or procoagulant therapies. QCM-D can measure blood protein coagulation on surfaces. **Figure 2** shows the formation of thrombin, the fibrin clotting and the total coagulation time of a biodegradable polyester coated with cellulose derivatives.

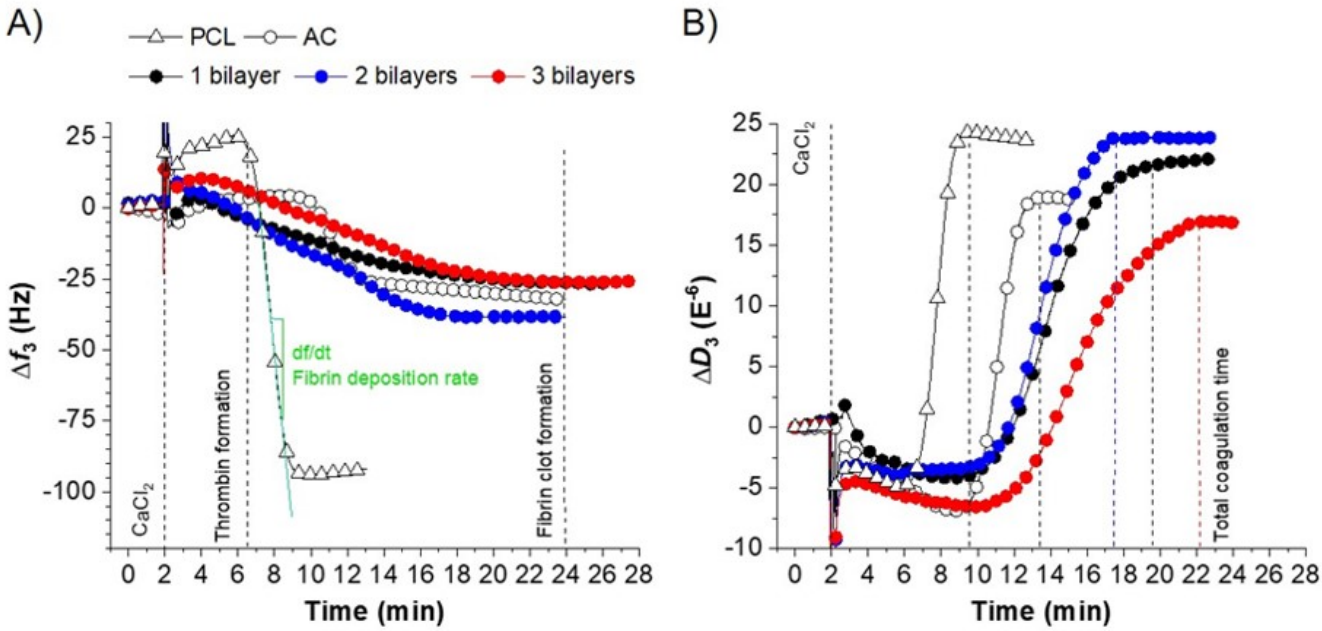

Figure 2: Measurement of blood protein coagulation – thrombin, and fibrin clot formation and total coagulation time by a QCM-D measuring frequency (A) and dissipation (D). A polyester surface was coated with different cellulose derivatives. Reproduced with permission from *Elsevier, M. Bračič et al. Carbohydrate Polymers, 254, 2021, 117437.*

IBIOSYS has acquired a **Stago Start Max coagulometer** that allows for the determination of PT, APTT, fibrinogen concentration, thrombin time and others. With these methods, newly developed medicinal materials or compounds can be evaluated with respect to their interaction with blood plasma proteins.

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New Projects

New projects at Armines – Mines Paristech, Centre for Material Forming (CEMEF), Sophia Antipolis

Structuration, Crystallization, Surface Treatments and Durability of Bio-sourced Composites
led by Pr. José-Marie Lopez-Cuesta.
Funded by CARNOT MINES Paris PSL, start 01/2021 for 2 years
It is part of the French federative **RecComBioS « Recyclability of Biosourced Composites »** project, led by Carnot M.I.N.E.S, gathers various research groups from Institut Carnot M.I.N.E.S: IMT Mines Alès with C2MA ; Mines Paris PSL with CEMEF, CMAT & PERSEE ; IMT Mines Albi with ICA ; and Sigma Clermont with ICCF.

RecComBioS project aims to assess the suitability for recycling of 100% bio-based composites comprising a biodegradable polymer matrix. Its objectives are on the one hand to study the influence of the life cycle and recycling stages on the properties of bio-based composites, with particular emphasis on the evolution of the properties of fibers, matrix and the interface; and on the other hand to propose strategies for regenerating the performance of these materials.
Two post-doc positions will be involved: on '**Structuration and crystallization of Biosourced Composites'** and on '**Surface Treatments and Durability of Biobased Composites'**.

High-added value bio-based materials via new approach of textile recycling.
started in November 2020 at CEMEF/ARMINES/MINES ParisTech, for three years:
Funded by CARNOT MINES.
We target making aerogels from waste textile. The PhD student is Marion Negrier and project leader is Tatiana Budtova. Project partners are Centre of Thermodynamics of Processes (Mines ParisTech), Ecole des Mines d'Albi and Ecole des Mines d'Ales.

New Project at IBWCh, Lodz, Poland

Establishing and launching the BIO-MAS Research and Development Center.
Funding agency- European Regional Development Fund.
Project start date - February 2021, follow up till 2026.
We are pleased to inform that Łukasiewicz Research Network- Institute of Biopolymers and Chemical Fibres, Lodz, Poland obtained funding for realisation of the project : **"Establishing and launching the BIO-MAS Research and Development Center".** The project is the result of cooperation between two Łukasiewicz institutes: the Institute of Biopolymers and Chemical Fibers (coordinator) and the Institute of Leather Industry as a partner. Scientists from the Cellulose and Biotechnology Team, the Biomaterials and Nanotechnology Team, the Polymers and Synthetic Fibers Team and the Biodegradation and Microbiological Analyzes Laboratory at Łukasiewicz - IBWCh, are involved in the the project.
The main goal of the planned research and development work is the manufacture of biodegradable composites from waste biomass products of the leather, agro-wood, and textile industries for use in the agri-food, packaging, horticulture and other economic areas.

The developed new composites based on renewable raw materials derived from biomass will support EU activities by introducing friendly technologies in the agri-food, packaging and horticulture sectors. The project will provide the opportunity to present the results obtained to the business sector, but also enable their active participation in the process of designing innovative solutions.

New Project at JENA

Development of biodegradable composite materials for the packaging industry from biogenic waste materials and development of a recycling process for these materials with the aim of mono-fermentation to methane
Principal investigator: Prof. Dr. Thomas Heinze
Funding agency: Federal Ministry for Economic Affairs and Energy
duration: 01/2021 - 09/2023
The project deals with the fabrication of composite materials prepared from starch esters as thermoplatic matrix material and waste materials from landscaping. It is planned to combine them to solid and foamed products, whose intended application is the single use in the packaging field. After use, the composites are subjected to fermentation in a biogas plant. Project partners from academia, research institutions and SMEs are included in the consortium.

New Project at BOKU

Lower Austria Science Call for PhD Students 2019 (PI Potthast, A.; Duration: 2020/11/01–2023/10/31)
the funding organisation is: NÖ Forschungs- und Bildungsges.m.b.H. (NFB)
Lignin is the most common renewable aromatic biopolymer, obtained from various industrial conversion processes of wood or annual plants in the pulp and paper industry in the form of "technical lignin". At present, the annual production is believed to be approx. 70 million tons worldwide. Over 95% of the lignin obtained is

used to produce energy for the pulp and paper industry. However, in recent times, lignin has gained new momentum as a source of raw materials and is considered a "key player" in the substitution of petroleum-based by renewable raw materials, and this project contributes to the same goal.
More information on the project:
www.nfb.at/forschung/foerderung/life-science-calls/

New Project at Warwick University

Breaking frontiers for advanced engineering of bespoke, functional biopolymer composite materials (FROBCO), principle Investigator / Fellow: Fengwei (David) Xie (from Jan 2021 to Dec 2025)
Funding agency is the Engineering and Physical Sciences Research Council (EPSRC).

This five-year fellowship aims at unlocking the huge potential of biopolymers such as cellulose, chitin/chitosan, starch, alginate, and protein. It will focus on the smart design of materials formulation and engineering process to develop next-generation biopolymer composites with achieve tailored structure, properties, and functionality. Postdoc and PhD student positions will be open soon.
News about this fellowship: https://warwick.ac.uk/fac/sci/wmg/mediacentre/wmgnews/?newsItem=8a17841a76619ff10176665f81da1bf8
More information about the project: https://gtr.ukri.org/projects?ref=EP%2FV002236%2F1

New Projects at TU Graz

Austrian Science Fund (FWF) project; Austria-Czech Republic International Project: New glycomimetics for managing of age-related neurodegenerative diseases - *Arnold Stütz, from 2021 to 2023*

Strong evidence has been accumulating for still poorly understood metabolic connections between lysosomal disorders and the development of Parkinson's and Alzheimer's. Based on our experience with inhibitors as enzyme stabilizers and activity enhancers for GM1-gangliosidosis and Morquio B related mutants of human lysosomal beta-galactosidase, we now want to investigate some of the complex catabolic feed-forward and feed-back cycles which may be involved in the early stages of various forms of dementia and their roots in chemical biology of the brain. Various substance classes will be evaluated emphasizing their blood-brain-barrier permeability, which is a vital prerequisite for viable drugability and medication in the context under consideration.

TU Graz initial starting program 14th call: ChemModCarbs; Chemical Modifications of Carbohydrates for Technical Applications - *Tanja Wrodnigg, 2021,*
funded TU Graz

The main goal of this project is to foster the fusion of the two main research topics of the Institute of Chemistry and Technology of Biobased Systems (IBioSys) namely ‘Chemistry’ and ‘Technology’. Carbohydrate chemistry is very well established at the institute, with expertise in synthesis of biological active carbohydrate structures. Carbohydrate technology of oligo- and polysaccharides with respect to the fabrication of carbohydrate surfaces by spin coating as well as the development of novel advanced materials for 3D printing on the basis of carbohydrates as renewable resources is very well established. For the fusion of the two topics, customised monosaccharides will be synthesised which will be used for the modification of oligo and polysaccharides for their use e.g. to fabricate biological active surfaces, to generate glycopeptides on surfaces, to create novel ink additives for 3D printing, by employing technologies available at the institute.

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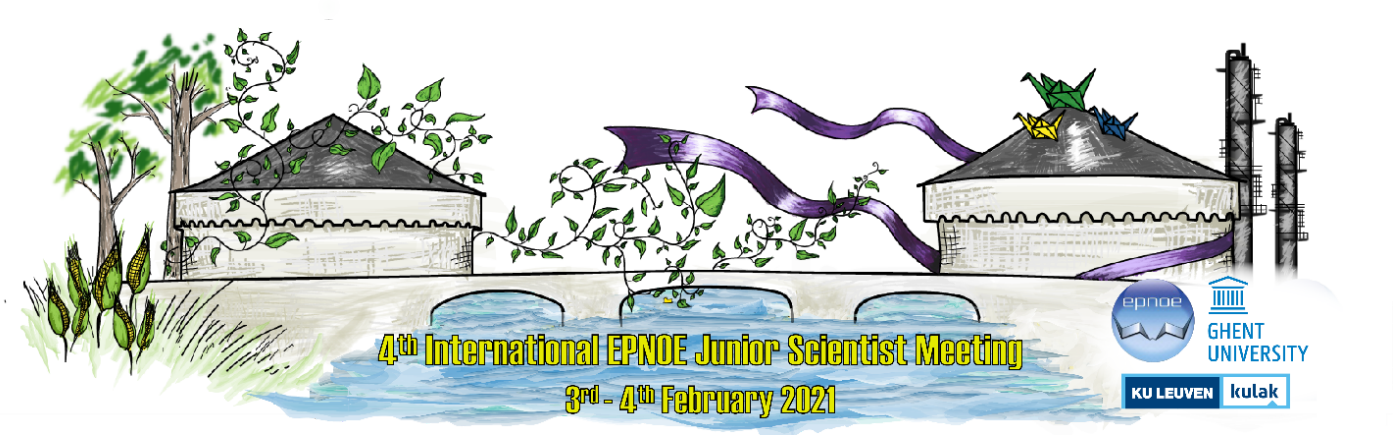
Events



View programme

EPNOE Connect Event at TECNICELPA INTERNATIONAL FOREST PULP & PAPER /CIADICYP CONFERENCE

EPNOE is organizing a session at the online XXV TECNICELPA/ XI CIADICYP Conference that will take place between 9th and 12th March 2021.
The session organized by EPNOE will be about “Polysaccharides as sweet spots for Innovation” and will have five invited talks from EPNOE members:

- Katariina Torvinen, VTT (Finland), “New ERA of sustainable bio-based electronics and photonics”
- Thomas Rosenau, Institute of Chemistry of Renewable Resources, BOKU (Austria), “Some recent news about aging and chromophores in cellulosic pulp”
- Maurice Essers, Wageningen University & Research (Netherlands), “Superheated steam treatment of Wheat Bran”
- Birgit Kosan, Marcus Krieg, Frank Meister, Thüringisches Institut für Textil und Kunststoff- TITK (Germany), “Cellulose Gap - Challenges and Methods of resolutionin cellulose man-made fibre production”
- Kay Hettrich, Bert Volkert, Fraunhofer-Institut für Angewandte Polymerforschung IAP (Germany), “The formation of cellulose particles and their applications”

More details about this Event will be soon available at https://www.tecnicelpa.com/tecnicelpa.ciadicyp2020/.

EPNOE 2021
Abstract submission is now open!

The 7th international congress of the European Polysaccharide Network of Excellence will be held in Nantes **from 11th to 15th of October, 2021**. This conference is jointly organized with the Cellulose and Renewable Materials (CELL) Division of the American Chemical Society and the Cellulose Society of Japan. The conference will cover a wide range of topics proposed by recognized researchers in the field of polysaccharides. The 7th EPNOE congress will pursue the organization launched in Aveiro by proposing thematic sessions organized by leading researchers in the field and covering as broadest scopes as possible to debate about the recent results in polysaccharides research. All sessions topics are visible at:
https://symposium.inrae.fr/epnoe2021

Abstract submissions are now open and more than 170 oral presentations slots are available as well as 150 poster spaces. Submission can be processed until Wednesday 31 March 2021 at :
https://symposium.inrae.fr/epnoe2021/Submission

Nantes is an attractive touristic, eco-friendly and comfortable-sized city, easily accessible from all over Europe. Nantes is an industrially active city in many fields using polysaccharides such food and agro-industries. The EPNOE congress will be held in “La cité” of Nantes, a large infrastructure dedicated to the reception of international events, located in the heart of the city, close to the train station and connected to the “Nantes Atlantique” airport by shuttle bus. “La Cité” location also allows easy access to hotels, restaurants and city sites.

Welcome to France, welcome to Nantes!

The hosting consortium

- Bernard Cathala and Johnny Beaugrand, INRA BIA, Nantes
- Tatiana Budtova, CEMEF/MINES ParisTech, Sophia Antipolis
- Alain Dufresne, LGP2-PAGORA, Grenoble
- Etienne Fleury, IMP-INSA, Lyon
- Nicolas Le Moigne and Stéphane Corn, C2MA / IMT Mines, Alès

Workshop for members about

Horizon Europe

THE NEXT EU RESEARCH & INNOVATION FUNDING PROGRAMME (2021 – 2027)

more details to follow

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Research

Top-Down Approach Making Anisotropic Cellulose Aerogels as Universal Substrates for Multifunctionalization

Jonas Garemark[1], Xuan Yang[1], Xia Sheng[2], Ocean Cheung[3], Licheng Sun[2], Lars Berglund[1], Yuanyuan Li[1]*

[1]Wallenberg Wood Science Center, Department of Fiber and Polymer Technology, KTH Royal Institute of Technology, SE-10044 Stockholm, Sweden

[2]Department of Chemistry, School of Engineering Sciences in Chemistry, Biotechnology and Health, KTH Royal Institute of Technology, 10044 Stockholm, Sweden

[3]Department of Engineering Sciences, Nanotechnology and Functional Materials, Uppsala University, 75121 Uppsala, Sweden

Highly porous, strong aerogels with anisotropic structural properties are of great interest for multifunctional materials for applications including insulators in buildings, filters for oil cleanup, electrical storage devices, etc. Contemporary aerogels are mostly extracted from fossil resources and synthesized from bottom-up techniques, often requiring additional strategies to obtain high anisotropy. In this work, a universal approach to prepare porous, strong, anisotropic aerogels is presented through exploiting the natural hierarchical and anisotropic structure of wood. The preparation comprises nanoscale removal of lignin, followed by dissolution–regeneration of nanofibers, leading to enhanced cell wall porosity with nanofibrillated networks occupying the pore space in the cellular wood structure. The aerogels retain structural anisotropy of natural wood, exhibit specific surface areas up to 247 m^2/g, and show high compression strength at 95% porosity. This is a record specific surface area value for wood aerogels/foams and even higher than most cellulose-

based aerogels for its assigned strength. The aerogel can serve as a platform for multifunctional composites including scaffolds for catalysis, gas separation, or liquid purification due to its porous matrix or as binder-free electrodes in electronics.

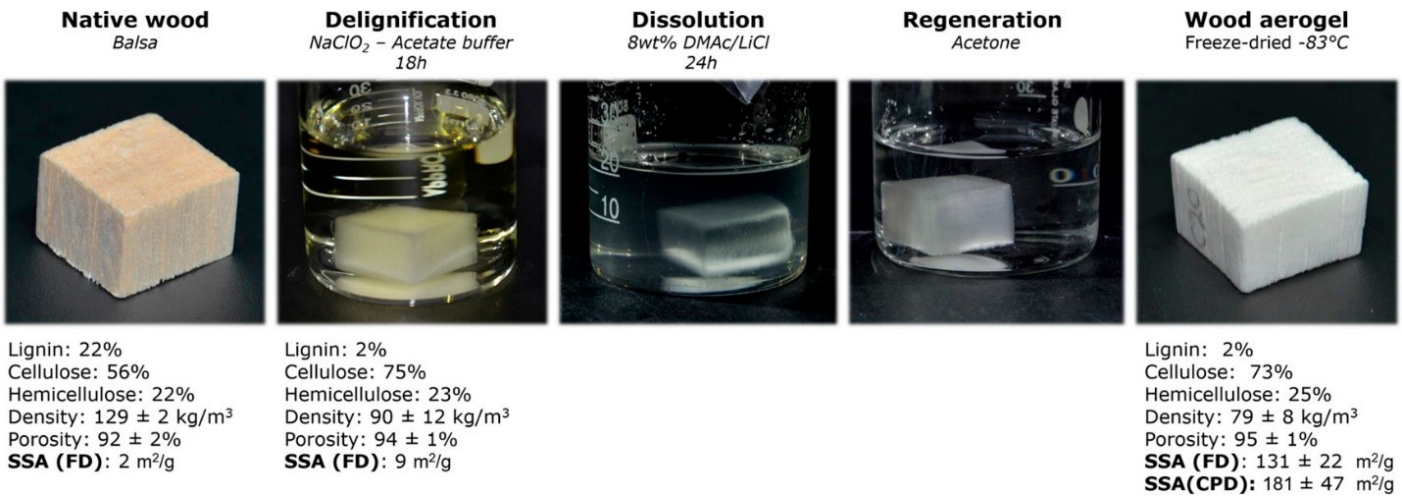

Figure 1. Experimental procedure (upper row), SEM images (lower row left and middle) accentuating the generation of nanofibrils in the before empty fibre lumen and yield strength against specific surface area (lower row right) for the obtain wood aerogel.

BIO-ACTIVE NANOSTRUCTURED FIBROUS MEMBRANES FOR EXTENDING OF FRESH FRUITS POSTHARVEST SHELF LIFE

Manja Kurečič[1,2], Mitja Kolar[3], Nataša Poklar Ulrih[4] and Silvo Hribernik[1,2]

[1] *Institute of Automation, Faculty of Electrical Engineering and Computer Science, University of Maribor, Maribor, Slovenia*

[2] *Institute of Engineering Materials and Design, Faculty of Mechanical Engineering, University of Maribor, Maribor, Slovenia*

[3] *Faculty of Chemistry and Chemical Technology, University of Ljubljana, Večna pot 113, Slovenia*

[4] *Biotechnical Faculty, University of Ljubljana, Jamnikarjeva ulica 101, 1000 Ljubljana, Slovenia*

Horticultural products such as fresh fruits and vegetables are very perishable by nature and susceptible to spoilage due to fungi and bacteria infection. The ability of fruit industry to provide a “fresh” product for the consumer throughout the year is highly dependent on the storage environment conditions and various post-harvest chemical treatments. It has been estimated that from 20 to 25 % of fruit and vegetables leaving the farm gate is never consumed, but has to be thrown away, due to poor storage facilities and lack of infrastructure[1].

The current potential solutions are based on biological control and physical methods such as irradiation with high-energy electrons, heat treatment, storage in a controlled and modified atmosphere or gaseous treatments, the application of supplementary chemical treatments as fungicides and bactericides[2]. In response to consumers' preference for natural preservatives over the synthetic counterparts, the use of naturally occurring compounds to extend the shelf-life of fresh products has been increasing in the food industry over the past decade. Lately, there has been an increase in the recognition of volatile organic compounds (VOCs), synthesized by plants including aldehydes such as acetaldehyde, hexanal and benzaldehyde, alcohols such as ethanol and acetic acid, that have been shown to suppress the growth of

plant pathogenic microorganisms, indicating that these compounds could be one of the important mechanisms for biological control of plant diseases[3].
In the latest interdisciplinary project, funded by Slovenian Research Agency (No. J7-2593, duration 1.9.2020 – 31.8.2023), we are combining the knowledge of complementary research groups from University of Maribor (Faculty of Mechanical Engineering and Faculty of Electrical Engineering and Computer Science) and University of Ljubljana (Faculty of Chemistry and Chemical Technology and Biotechnical Faculty), with the key objective to **develop biodegradable and bioactive membranes for the protection of fresh fruits, using polysaccharide based emulsion electrospun nanofibers providing (i) protection from mold and bacteria attack and (ii) optimal microenvironment for preserving nutritional quality during the defined storage shelf life**.

Acknowledgement: Project J7-2593 and research core program group for Textile Chemistry P2-0118 financed by the Slovenian Research Agency (ARRS).

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3. Mari, M.; Bautista-Baños, S.; Sivakumar, D., Decay control in the postharvest system: Role of microbial and plant volatile organic compounds. 2016, 122, 70-81.

Development of innovative polysaccharide-based formulation for the delivery of bioactive compounds

Antonio Di Martino - *Tomsk Polytechnic University, Russia*

Researchers from the Research School of Chemistry & Biomedical Sciences, Tomsk Polytechnic University, Russia, established a research group, in collaboration with researchers from Antonio Narino University, Colombia, and Tomas Bata University in Zlin, Czech Republic, to develop polysaccharides based delivery systems to allocate bioactive compounds for application in various fields including biomedical and agricultural. The main aims are i) develop biodegradable delivery systems based only on natural biomacromolecules, ii) environment-friendly methodologies and iii) encapsulation of bioactive compounds having different chemical and biological properties; iv) high versatility.
The delivery systems, in the form of superabsorbent hydrogels and thin film, are obtained by a combination of polysaccharides, like alginic acid and chitosan, and a combination of polysaccharide-protein, like chitosan-whey protein or collagen.
Up to now, the research group from Tomsk has developed two hydrogel formulations based on alginic acid; the first in combination with chitosan and the second in with whey protein. The alginate-chitosan hydrogel was prepared to allocate and release simultaneously a combination of antibiotics [1]. The second formulation, the alginate-whey protein, was developed to have a duplex function in agriculture; for sustained release of fertilizers and soil control [2].
Besides the hydrogels, a third formulation in the form of thin film has been developed, combining chitosan and collagen to deliver a combination of short-life anesthetics [3]. The results demonstrate a prolonged release of the drugs with the possibility to reduce the frequency of administration.

Figure 1 Examples of polysaccharides hydrogels developed. A) Alginate – whey protein; B) Chitosan-Alginate-Soil C) Alginate-casein

References

[1] *Journal of Drug Delivery Science and Technology*, 2020, 102126
[2] *Journal of Cleaner Production*, 2020, 124848
[3] *International Journal of Biological Macromolecules*, 2019, 140, pp. 1183–1193

Bacterial nanocellulose: carrying stem cells from the lab to the ocular surface

DOI of the referenced publication on the newsletter: 10.1002/smll.202003937
Summary
One of the research interests of the Nanoparticles and Nanocomposites Group (https://nn.icmab.es/) from the Institute of Materials Science of Barcelona (ICMAB-CSIC) is the exploitation of Bacterial Nanocellulose (**BNC**) in the biomedical domain. We strongly believe that this natural biopolymer could be of great value in the design of novel cell carriers which are in great demand for the large-scale implantation of cell transplantation therapies.
In our most recent work, plasma activated-BNC has been coated with human extracellular matrix proteins enabling the culture of human limbal stem cells (**LSC**). LSC are tissue-specific stem cells of the cornea and hold enormous therapeutical potential in the management of ocular surface pathologies.

Read More

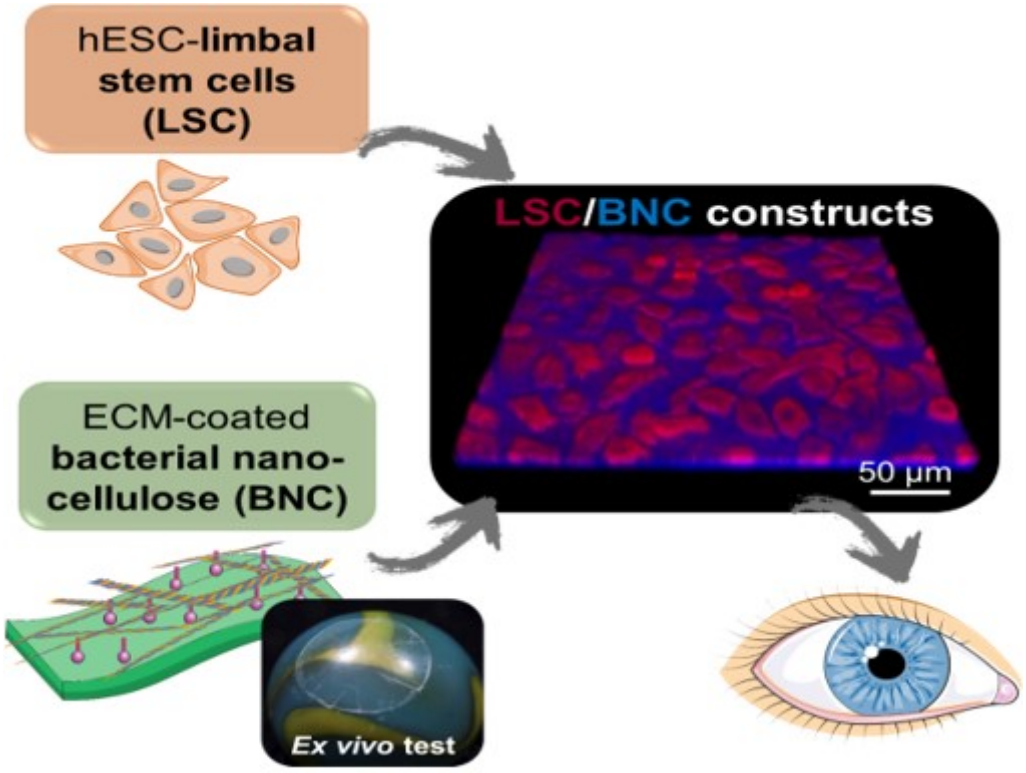

Figure: Graphical abstract of our most recent work using BNC as an LSC carrier: Anton-Sales, I., Koivusalo, L., Skottman, H., Laromaine, A. & Roig, A. Limbal stem cells on bacterial nanocellulose carriers for ocular surface regeneration. Small. Accepted, (2020).

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Education

Welcome to new students and researchers

Åbo Akademi University, Laboratory of Natural Materials Technology

New project researcher: Dr. Wenyang Xu
Name of the supervisor: Dr. Xiaoju Wang and Prof. Chunlin Xu
Topic: Conductive hydrogel scaffolds of cellulosic nanomaterials and polysaccharide biopolymers for delivery of bioactive cues in soft tissue engineering (Funding source: Jane and Aatos Erkko Foundation)
New master students

- New master student: Alfred Holmqvist
  Name of supervisor: Chunlin Xu
  Topic: Nanocellulose for abrasives (Funding source: Mirka Ltd)

- New master student: Oskar Backman
  Name of supervisor: Chunlin Xu
  Topic: Bio-based 3D scaffolds (Funding source: Bayer)

PhD defenses

Łukasiewicz Research Network- Institute of Biopolymers and Chemical Fibres:

Klaudia Piekarska defended her PhD thesis on 14 December 2020 entitled “Composite materials with polylactide matrix”; Supervisor- Prof. dr hab. Ewa Piórkowska-Gałęska, Polish Academy of Sciences, Poland

LGP2 - Ph.D. theses defended in 2020
The Laboratory of Pulp and Paper Science and Graphic Arts (LGP2) is a joint research unit (UMR 5518) run by the CNRS, Grenoble INP and the AGEFPI. It conducts its scientific activities in conjunction with the academic community of Grenoble Alpes University.
LGP2 comprises three teams: Biorefinery: chemistry and eco-processes – Multiscale biobased materials – Surface functionalization through printing processes.
Their research strives to meet society's expectations when it comes to sustainable development (green chemistry, clean processes, recycling, biobased materials, renewable energy) and traceability & safety (functional materials, smart paper and packaging).
You can consult information on the Ph.D. theses defended by LGP2 doctoral students in 2020 on the following web page.
https://pagora.grenoble-inp.fr/en/research/lgp2-ph-d-thesis-defended-in-2020

Diploma / Master theses

BOKU

- **Nadine Kohlhuber**, Preparation of Thermally Super-Insulating Cellulose I Aerogels: Up-Scaling and Optimization. Supervisor: Falk Liebner.
- **Elisabeth Schaubmayr**, Nanocellulose Composites. Supervisors: Marco Beaumont, Thomas Rosenau.

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Open Positions

- **PhD student position in bio-based materials**, Chalmers University of Technology, (apply by Jan. 31st), click here for more info
- **Internship proposal: Temperature monitoring and energetic analysis of the ultrasonic welding applied to papers and paperboards**, laboratoires LGP2 et 3SR à Grenoble, click here for more info
- **Researcher in Fibre and Cellulose Technology** (apply by Feb. 22nd), Rise (Research Institutes of Sweden), click here for more info

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Member in highlight

The Faculty of Food Technology of the University of Agriculture in Krakow

Faculty of Food Technology is an institution dedicated to the broadest possible food-related issues. As food scientists, we deal with polysaccharides at every step of our research. Therefore we are specialists in the field of their obtaining, analysis and modification as well as in finding practical applications for the results of our research. We are very enthusiastic to join various initiatives - not only scientific ones.

Read more

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Recent Scientific Publications of EPNOE Members

View List of Publications

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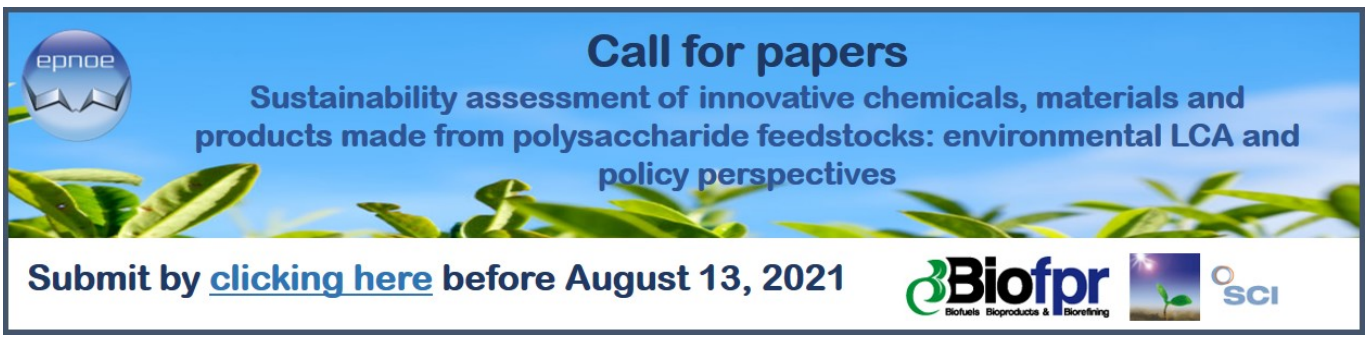
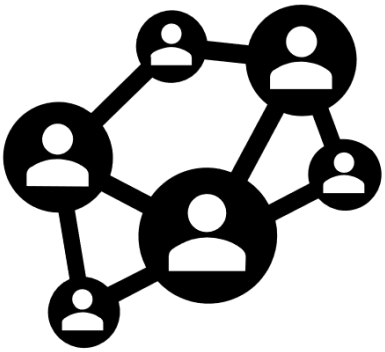
Call for Papers

MDPI Coatings | Special Issue "Green Polymer Coatings and Films for Food and Health Applications" (open till 12 May 2021)
MDPI Polysaccharides II | A special issue of Polymers, dedicated to research in different biomedical as well as technical fields for focused and increased application of the polysaccharides (open till 31st of January, 2021)
MDPI | Modification of Starch – from Structure, through Functionalization to Special Applications (open till February 28th, 2021)
MDPI Polymers | Cellulose and Lignin Feedstock for Renewable Materials (open till March 31st, 2021)
MDPI | A Special Issue “Polysaccharide Chemistry – A Tool for Novel, Sustainable and advanced Products and Materials: A Themed Issue in Honor of Prof. Dr. Thomas Heinze (open till March 31st, 2021)
MDPI | From Plant Cells to Bio-Based Materials: Processing and Biotechnological Routes for the Building of Functional Bio-Assemblies and Composite Structures (open till January 21st, 2022)





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