N°52 - NOVEMBER 2019

European Polysaccharide Network Of Excellence



"Nature makes polysaccharides, EPNOE turns them into products"

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editorial

Dear Readers of the EPNOE Newsletter,

Time flies and soon it is 2020. However, for EPNOE, the next year will be in fact 2030. We are pleased to announce that the general assembly in Aveiro in October approved our EPNOE2030 strategy. EPNOE2030 is an ambitious project to renew the activities of the association during the next year with a strategic vision on how we will be operating in ten years from now. The year 2019 was very successful for EPNOE. We conducted a smooth transition of management after the retirement of Patrick Navard and starting in January 2020 we will have our administration in Leuven, Belgium and in Alès, France. We organized successful workshops in France, Belgium and Slovenia, a training school in Brazil and our fantastic EPNOE2019 conference in Aveiro in collaboration with Cellulose Society of Japan and American Chemical Society. We had 400 participants in Aveiro and we have received spontaneous positive feedbacks about our conference from industry, top-level scientists and many young researchers. We were also very proud to give our first time ever EPNOE Science Award to Prof. Alain Dufresne for his lifetime achievement in excellent science with polysaccharides. This award will be given from now on every two years during the EPNOE conference and only EPNOE members can nominate the candidates for the prize. We are also proud to announce that we are creating a new EPNOE Young Scientist Award to be presented during the EPNOE Junior Conference in Kortrijk, Belgium next September. EPNOE members are welcome to nominate young scientists (doctoral students and scientists with up to 7 years of experience since completion of doctoral studies). The candidates for this prize are expected to have an outstanding scientific track record in the field of polysaccharides. A call for nomination will be distributed for EPNOE members in January. This is our last newsletter of 2019 and on behalf of the executive board we would like to thank the valuable efforts of organizers and participants of workshops and conferences and all members that devoted their precious time, hearts and minds to EPNOE activities. Best wishes of a positive and happy 2020 and a warm invitation to join EPNOE as a member or as participant in our activities.

Pedro Fardim
President of EPNOE
Professor
Faculty of Engineering Science
Department of Chemical Engineering
KU Leuven (Belgium)

news

Member's info

PhD Defenses:

•At Łukasiewicz- IBWCh, Poland:

- Maria Wiśniewska-Wrona defended her PhD thesis "Research on the development of functional polymeric biocomposites for wound healing" on the 20th of September 2019

New PhD students:

• At Armines-CEMEF, France:

- Coraline Chartier, started in Cemef to work on the topic "3D printing of bio-aerogels for biomedical applications", supervised by Tatiana Budtova and Sijtze Buwalda, in collaboration with the university of Montpellier, Benjamin Nottelet and Helene Van Den Berghe.

New post-doctoral researchers:

• At KTH Royal Institute of Technology:

Barbara Rietzler, PhD from Research Institute of Textile Chemistry and Textile Physics, University of Innsbruck has started a new Postdoc position at KTH Royal Institute of Technology, Wallenberg Wood Science Center since September. Supervisor: Monica Ek
She will be working on the topic of Bark biorefinery, on preparation of multiple value-added bio-based products derived from spruce bark and to find applications for different bark components.

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The 6th EPNOE International Polysaccharide Conference

(https://epnoe2019.sciencesconf.org/) was an initiative of EPNOE, the Cellulose and Renewable Division of the American Chemistry Society (ACS), and the Cellulose Society of Japan (CSJ) and was hosted in Aveiro, Portugal.

The ambition of the EPNOE International Polysaccharides Conferences is to bring together researchers from academia and industry working or interested in polysaccharides related R&D topics, to disseminate results and to promote a networking platform for close interactions between academia and industry.

The scientific program was structured in Thematic Sessions covering different areas where polysaccharides have a relevant role:

- **Physical properties of polysaccharides**, organized by Bjorn Christensen
- **Advanced Analytical methods**, organized by Laura Nystrom and Andriy Synytsya
- **Polysaccharides based fibers and regenerated cellulose**, organized by Andre Lehmann and Michael Hummel
- **Building and Construction**, organized by Patrick Navard, Sofiane Amziane and Holmer Savastano
- **Polysaccharides for biomedical applications**, organized by Kevin Edgar and Ewa Wesolowska
- **Structure of plant cell wall polysaccharides**, Henk Schols
- **Marine Polysaccharides**, organized by Nicola Lemoigne, Jean-François Sassi and Yoshikuni Teramoto
- **Cellulose hemicellulose interactions**, organized by Bernad Cathala and Zhiming Liu
- **Surface Science and Chemical and Enzymatic Modification of polysaccharides**, organized by Veronique Bonnet, Jose Kovensky and Thomas Heinze
- **Starch – modifications and applications**, organized by Janusz Kapusniak
- **Nanoforms of polysaccharides**, organized by Julien Bras and Shinsuke Ifuku
- **Microbial polysaccharides**, organized by Pedro Fardim and Tetsuo Kondo
- **Biosynthesis and biocatalytic routes for polysaccharide synthesis and modification**, organized by Carmen Boeriu and Lorenzo Pastrana
- **Membranes, filtration and environmental applications**, organized by Joao Paulo Crespo
- **Polysaccharides in 3D printing and other additive manufacturing techniques**, organized by Karin Kleinschek and Rupert Kargl
- **Polysaccharides for drug delivery**, organized by Gary Adams and Juergen Engelhardt
- **Porous materials from polysaccharides**, organized by Tatiana Budtova and Falk Liebner
- **Food applications**, organized by Olga Martin-Belloso
- **Polysaccharides in the formulation of multiphase systems**, organized by Orlando Rojas and Stefan Spirk
- **Polysaccharide based Nanocomposites**, organized by Elisabete Frollini and Kristiina Oksman

(continued overleaf)

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The 6th EPNOE International Polysaccharide Conference

(continued)

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- **Biorefinery**, organized by Carlos Pascoal Neto and Runcang Sun
- **Polysaccharides in Smart Materials**, organized by Carmen Boeriu and Avinash Manian
- **Recycling, biodegradation and environmental assessment**, organized by Li Shen and Jan Van Dam

The event provided an opportunity for 400 delegates to discuss and share knowledge, ideas and the latest advances in the area of polysaccharides. For this, 122 posters were displayed during all conference days, 164 oral communications in four parallel sessions, 36 invited Keynote talks, and 14 Plenary invited talks were presented.

Our congratulations to Alain Dusfresne, the 1st EPNOE Awarded Scientist for his contributions in the field of polysaccharides science and applications.

Photos of the conference are available at www.epnoe.pixieset.com

We hope all participants have good memories of this event in Aveiro.

Carmen Freire and Manuel A. Coimbra



EPNOE 2019 Conference Science Award to Professor Alain Dufresne

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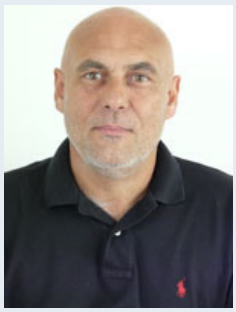

The European Polysaccharide Network of Excellence (EPNOE) Association is proud to announce its first scientific award for lifetime achievement in research in the field of polysaccharides to Prof. Alain Dufresne of the Grenoble Institute of Technology (Grenoble INP – Pagora, France).

The award was presented on October 23rd, at the 6th International Polysaccharide Conference of the EPNOE at Aveiro, Portugal, organized by the Institute of Chemistry of University of Aveiro.

Alain was one of the first researchers to investigate and characterize the exceptional properties of cellulose nanocrystals, and explore the potential for their use in diverse applications including composites, sensors, tissue engineering, films and membranes. He has published over 290 peer-reviewed papers, 51 book contributions and his works are some of the highest cited in the field with more than 40 000 citations. He is also an exceptional mentor having directed the PhD and Masters Education of over 50 young researchers.

The EPNOE Science Award will be presented from now on at every EPNOE International Conference. The next awardee will be known at the EPNOE2021 conference in Nantes, France. EPNOE members are encouraged to nominate any polysaccharide researcher they think have made significant contributions to the field. The nominees need not be EPNOE members.

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EPNOE 2021
Welcome to France, welcome to Nantes!

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After the very successful Aveiro conference, the **7th international congress of the European Polysaccharide Network of Excellence will be organized by a French consortium composed of five French laboratories** recognized for their work on polysaccharide research and their commitments in EPNOE. The consortium will pursue the tradition of EPNOE in promoting wide dissemination of research results and ideas' cross-fertilization in polysaccharides' field.

The consortium will organize the **7th EPNOE congress in Nantes, from 11th to 15th of October, 2021**. 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.

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. As the previous EPNOE congress, the ambition of Nantes edition will be to bring together researchers and companies to promote academic and applied research in polysaccharides, to disseminate results and stimulate networking activities.

Save the date 11th to 15th of October, 2021

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



EPNOE – Workshop

"Modern analytical approaches in biopolymer characterization"

When: February 26th 2020: 9 am - 5 pm; February 27th 2020: 9 - 12 am
Where: BOKU Vienna, UFT Tulln, Konrad-Lorenz-Str. 24; A-3430 Tulln

The University of Natural Resources and Life Sciences, Vienna and EPNOE would like to announce the workshop "Modern analytical approaches in biopolymer characterization". The course focuses on state-of-the-art analytical tools for the characterization of natural polymers, in particular polysaccharides and lignin.

A modern view on biorefineries implies the smart use of biopolymers, with industrial applications going beyond the simple use as a food and/or energy feedstock. For this scenario to be realized, analytical approaches revealing the structural peculiarities of these biopolymers in a rapid and reliable way are an absolute prerequisite. An efficient chemical and physical analysis is challenging for most biopolymers due to their complex composition and structural organization. A comprehensive characterization of such a sample requires a combination of different analytical methods. These analytical challenges will be addressed within the two days of the workshop.

The lectures will provide an overview of different biorefinery process streams and discuss the current challenges hindering the direct analysis of the contained biopolymers. The principles, conventional and advanced applications of different analytical methods will be explained, supported by examples of their use in cellulose, hemicelluloses and lignin characterization. The course will cover a wide range of techniques, from NMR in liquid and solid states, over chromatography with different hyphenation methods, to microscopy and infrared / Raman spectroscopy. High performance thin layer chromatography (HPTLC) and field flow fractionation methods for monitoring process flows and biorefinery streams are presented, as well as rapid methods for the characterization of technical lignin samples.

Lecturers and topics (selection):

Prof. Dr. Paul Kosma: Applications of NMR

Dr. Irina Sulaeva: SEC and FFF-MALLS

Assoc. Prof. Dr. Notburga Gierlinger: FTIR and RAMAN

Ass. Prof. Dr. Stefan Böhmdorfer: HPTLC

Prof. Dr. Thomas Rosenau: Chromophores in cellulosics

Prof. Dr. Antje Potthast: Speed analysis of lignins

Venue:

The workshop is held at the University and Research Center Tulln (UFT). There is a frequent train connection from Vienna to Tulln (20 min.): https://fahrplan.oebb.at/bin/query.exe/en. A wide choice of Hotels is available both in Vienna and Tulln. Nearby Vienna International Airport is a major hub that can be easily reached from all European countries and major cities.

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We warmly welcome you to the **EPNOE Junior Scientist Meeting** held in Kortrijk, Belgium on 15-16 September 2020. The meeting theme is *Polysaccharide Research - Fundamentals and Beyond*, and in addition to the scientific discussions, we aim at helping you to network with your peers. The abstract submission will start on 9 December 2019. More info on the meeting can be found on the meeting web-site: www.epnoejunior2020.org.

The Junior Scientists meetings are held once every two years, alternating with the international conference. They are designed to offer young researchers (MSc, PhD students and early-stage postdocs) the opportunity to present their work via lectures and posters, and also network with each other. Senior staff from academia and industry are welcome to attend and offer the benefit of their knowledge and experience. The meetings also serve as a platform for senior staff to identify potential recruits among the emerging talent.

Local organizing committee

Reeta Salminen, KU Leuven
Gertrude Kignelman, KU Leuven
Wim Thielemans, KU Leuven

Highlights of EPNOE-ENBA Workshop

New Frontiers in Biofabrication: From Biomolecules to Tissues and Organs

September 17th and 18th, 2019
KU Leuven, Belgium

EPNOE and European Network of Bioadhesion Expertise (ENBA) - Cost Action CA 15216 joined efforts to organize a workshop in Biofabrication in Leuven, Belgium. Biofabrication is a rapidly growing multidisciplinary field combining engineering, chemistry, physics, medicine, life sciences and including regenerative medicine and tissue engineering. The workshop had contribution of experts working with tissue engineering, mechanobiology, biomaterials, scaffolds, biocarriers, organs on a chip and cell-surface interactions. It was a unique opportunity to discover and exploit the new frontiers of this exciting field and highlight the relevance of polysaccharides and bioadhesion expertise to advance the state of the art of biomaterials.

The workshop program had four sessions with 21 oral presentations and three invited key-note lectures: Prof. Nádya P. da Silveira (Institute of Chemistry, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil) opened the workshop with a lecture about polysaccharides as advanced hydrogels and scaffolds; Prof. Hans Van Oosterwyck (Biomechanics Section, KU Leuven, Leuven, Belgium) talked about quantitative tools to investigate nutrient transport and mechanics of cells and Prof. Lorenzo Moroni (Institute for Technology-Inspired Regenerative Medicine, Maastricht University, The Netherlands) presented his work about bio-printing with emphasis on mastering the complexity of combining biology and material sciences for biofabrication. The other oral communications covered fundamental and applied scientific topics related to cell-material interactions, mimetics of organs, biofabrication of soft and hard tissues, porous soft-materials and molecular and macromolecular aspects of bioadhesion.

The workshop was very successful with 45 participants from 11 countries including a large number of doctoral students and post-docs and participants from industry. The members of the organizing committee at KU Leuven were Armen Tchobanian, Hans Van Oosterwyck, Veerle Bloemen, Annabel Braem and Pedro Fardim.

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International scholarship exchange of PhD students and researchers between Portugal and Poland

PROM program aims to contribute for the improvement of accessibility of international education programs and increase the mobility of the personnel both in the field of visits of representatives of Polish universities and scientific institutions abroad as well as arrivals of scholarship holders to Poland, including people from outside the EU. From 21st June to 15th July of 2019, Dr. Kamila Kapusniak, an assistant professor at the Jan Dlugosz University in Czestochowa, in Poland, had the opportunity to visit the University of Aveiro, in Portugal, and start a scientific collaboration with Professor Manuel A. Coimbra in the structural characterization of polysaccharides field. During this traineeship, Dr. Kamila Kapusniak was able to characterize some modified starch samples concerning their derivatization as alditol acetates and quantification by gas chromatography (GC), as well as performing their derivatization as partially methylated alditol acetates, and analysis by GC-mass spectrometry.

In turn, from 8th to 27th September of 2019, Dr. Idalina Gonçalves, a researcher at the University of Aveiro and her PhD students, Jéssica Santos and Joana Lopes, conducted research with Professor Janusz Kapusniak and Dr. Kamila Kapusniak at Jan Dlugosz University in Czestochowa focused on the bioesterification of starch and the effect of microwave irradiation on the physicochemical and morphological properties of polysaccharides and calcium carbonate/polysaccharide conjugates. During their stay, Dr. Idalina Gonçalves, Joana Lopes, and Jéssica Santos were able to synthetize starch-esters as well as modify the morphology of polysaccharides and calcium carbonate/polysaccharide conjugates and characterize all the obtained materials through FTIR, degree of substitution, XRD, and SEM analysis. Furthermore, together with the Professor Janusz Kapusniak and Dr. Kamila Kapusniak research team, they were able to have fruitful discussions about the results obtained and the future scientific publications that may result from this collaboration. Besides the scientific work, this exchange allowed the coexistence with other professors and students of Jan Dlugosz University in Czestochowa as well as contact with the lifestyle of Polish community.

This article was proposed by Manuel Coimbra and Idalina Gonçalves (University of Aveiro, Portugal), and Janusz Kapusniak and Kamila Kapusniak (Jan Dlugosz University in Czestochowa, Poland)

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NONWOVEN CHITOSAN - PREPARATION AND PROPERTIES

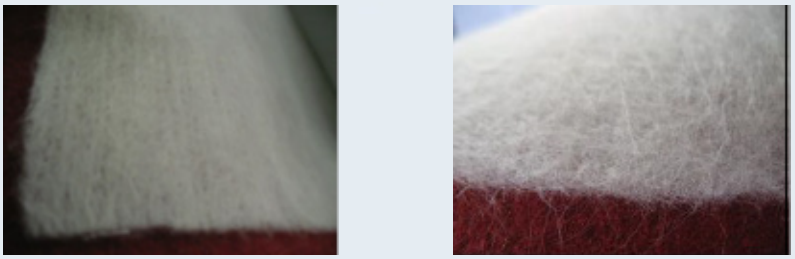
Dariusz Wawro[1], Włodzimierz Stęplewski[1], Wiesław Marcol[2], Ewa Skrzetuska[3], Izabella Krucińska[3]*

[1] – ŁUKASIEWICZ- Institute of Biopolymers and Chemical Fibres, Lodz, Poland e-mail: dariusz.wawro@ibwch.lodz.pl ; [2] - Department of Physiology, Medical University of Silesia, Katowice, Poland; [3] - Faculty of Material Technologies and Textile Design, Lodz University of Technology

Fibrous forms of chitosan, such as nano- and microfibers, staple fibres, and yarns, have been used widely in several application, especially medicine. These fibrous forms are frequently modified or functionalized by the addition of multi-wall carbon nanotubes, nanoparticles of various metals, calcium phosphate, collagen, fibroin, or keratin [1-7]. The main objective of this work were preliminary investigations of the manufacture of nonwoven chitosan from a 38-mm chitosan staple fibre and fibres containing silver nanoparticles. The nonwoven chitosan is built of several needle-punched layers of fleece, with a lengthwise arrangement of chitosan fibres.

Antibacterial activity of silver nanoparticles containing chitosan staple fibres was determined. The nonwoven were characterized by tenacity and extension, sorption properties, apparent density, surface density, thickness and air permeability.

The nonwoven was prepared from chitosan staple fibers: without silver nanoparticles (NWChit-P1) and with silver nanoparticles (NWChit-P2).



NWChit-P1 NWChit-P2

Figure 1. Image of chitosan of nonwoven

Conclusion

Chitosan fibres and modified with nanoparticles of silver were assessed in regard to their suitability in the manufacture of nonwoven using typical industrial equipment. Nanoparticles of silver proved to be the right additive to chitosan fibres, conferring enhanced bacteriostatic and bactericidal properties upon the fibre. The fibre, bearing such properties, is a promising material for medical uses like wound dressings. To achieve this purpose, it needs to be processed to textile forms, like nonwoven. Attempts to prepare chitosan nonwoven on typical textile machinery produced positive results. It may be regarded as an achievement since it is the first time that chitosan nonwoven was made from pure chitosan staple fibres.

1. Niekraszewicz A., Kucharska M., Wawro D., Struszczyk M.H., Kopias K., Rogaczewska A.; (2007) Development of a Manufacturing Method for Surgical Meshes Modified by Chitosan. FIBRES & TEXTILES in Eastern Europe 3(62): 105-109.

2. Wawro D., Krucińska I., Ciechańska D., Niekraszewicz A., Stęplewski W.; (2011) Some functional properties of chitosan fibres modified with nanoparticles, EUCHIS'11, 10th International Conference of the European Chitin Society

3. Wawro D., Stęplewski W., Dymel M., Sobczak S., Skrzetuska E., Puchalski M., Krucińska I.; (2012) Antibacterial Chitosan Fibres Containing Silver Nanoparticles, FIBRES & TEXTILES in Eastern Europe, 20, 6B (96): 24-31.

4. Wawro D, Pighinelli L.; (2011) Chitosan Fibers Modified with HAp/β–TCP Nanoparticles, International Journal of Molecular Sciences; 12(11):7286-7300.

5. Strobin G., Ciechańska D., Wawro D., Stęplewski., W, Jóźwicka J., Sobczak S., Haga A.; (2007) Chitosan Fibres Modified by Fibroin, FIBRES & TEXTILES in Eastern Europe 15, (58): 64 - 65.

6. Wawro D., Stęplewski W., Wrześniewska-Tosik K.; (2009) Preparation of Keratin-Modified Chitosan Fibres, FIBRES & TEXTILES in Eastern Europe 17, (75): 37-42.

7. Wawro D., Stęplewski W., Brzoza-Malczewska K., Święszkowski W.; (2012) Collagen-modified chitosan fibers intended for scaffolds, FIBRES & TEXTILES in Eastern Europe 20; 6B (96): 32-39.



European Polysaccharide Network Of Excellence

PreSTFibre 4kids®

Development and implementation of an innovative technology for the production new generation fruit and vegetable products enriched with dietary fibre preparation from potato starch with prebiotic properties for children and youth

Janusz Kapusniak

Faculty of Science and Technology, Jan Dlugosz University in Czestochowa, Poland

The PreSTFibre4kids project is coordinated by Jan Dlugosz University in cooperation with the most modern specialist pediatric hospital in Poland, the biggest comprehensive cancer center in Poland, one of the leading juice, nectar and soft drink producer in Poland and one scientific partner. The main goal of the project is to conduct development works, which will result in the development and implementation of the technology of production of unsweetened vegetable and fruit products enriched with a fibre preparation from potato starch with prebiotic properties and acceptable organoleptic and appropriate storage stability by children and adolescents. In addition, a pilot study evaluating the effect of enrichment of vegetable and fruit products with fibre preparation from potato starch with prebiotic properties on overweight and obese children and metabolic complications is planned. Evaluation points will be anthropometric, metabolic, immunological parameters and changes in intestinal microbiota and metagenome. The project envisages the use of a prebiotic preparation developed by a team of scientists from the Jan Dlugosz University in Czestochowa under the direction of prof. Janusz Kapusniak and Institute of Fermentation Technology and Microbiology of Lodz University of Technology under the direction of prof. Zdzisława Libudzisz. In terms of structure and properties, this is a resistant dextrin obtained by controlled dextrinization of potato starch acidified with hydrochloric and citric acids under strictly controlled conditions. Due to the development works carried out within the project, the fully tested in operational environment and improved final prototype ready for commercialization will be developed.

The project will be implemented within a consortium composed of:

- Faculty of Science and Technology of Jan Dlugosz University in Czestochowa - Leader
- Tymbark MWS Sp. with o.o. Sp. K.,
- The Children's Memorial Health Institute
- Faculty of Biotechnology and Food Sciences, Lodz University of Technology
- Oncology Center-Institute of Maria Skłodowska - Curie.

The project is financially supported by the National Center for Research and Development (NCBR).



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EPNOE Member's Scientific Publications

At Jena University, Germany:

Synthesis and properties of thermoplastic starch laurates S. Blohm, Th. Heinze, Carbohydrate Research 486 (2019) 107833

Studies on the controlled release of drugs from magnetic nanobiocomposites Th. Heinze, R. Müller, M. Zhou, M. Rabel, P. Warncke, D. Fischer, Indonesian Journal of Fundamental and Applied Chemistry 4 (2019) 1-8

Revisiting very disperse macromolecule populations in hydrodynamic and light scattering studies of sodium carboxymethyl celluloses M. Grube, I. Perevyazko, Th. Heinze, U. S. Schubert, I. Nischang, Carbohydrate Polymers 229 (2019) 115452

Determination of the binding situation of pyridine in xylan sulfates by means of detailed NMR studies L. Gabriel, W. Günther, F. Pielenz, Th. Heinze, Macromolecular Chemistry and Physics (2019) DOI:10.1002/macp.201900327

All sugar based cellulose derivatives synthesized by azide-alkyne click chemistry A. Koschella, C.-Y. Chien, T. Iwata.2, M. S. Thonhofer, T. M. Wrodnigg, Th. Heinze, Macromolecular Chemistry and Physics (2019) DOI:10.1002/macp.201900343

At Armines-CEMEF, France

N. Buchtová, C. Pradille, J-L. Bouvard, T. Budtova, "Mechanical properties of cellulose aerogels and cryogels", Soft Matter , 15, 7901-7908 (2019)

E. BOIX, E. GINEAU, J O NARCISO, H. HOFTE, G. MOUILLE et P. NAVARD "Influence of chemical treatments of miscanthus stem fragments on polysaccharide release in the presence of cement and on the mechanical properties of bio-based concrete materials", Cement and Concrete Composites, (2019) https://doi.org/10.1016/j.cemconcomp.2019.103429

L. T. T. VO, J. GIRONES, M-P. JACQUEMOT, F. LEGEE, L. CEZARD, C. LAPIERRE, F. EL HAGE, V. MECHIN, M. REYMOND et . NAVARD "Correlations between genotype biochemical characteristics and mechanical properties of maize stem - polyethylene composites", Industrial Crops and Products, (2029) https://doi.org/10.1016/j.indcrop.2019.111925

At Utrecht University, The Neterlands:

UU has recently published a critical review on circularity metrics and frameworks. The review aims to map methodological developments regarding circularity metrics for products and services, in order to: (1) identify the foundations of circularity metrics used so far and their applications, (2) evaluate the validity of current circularity metrics, based on predefined requirements and a CE definition anchored in the sustainability concept, and (3) provide recommendations on how to measure circularity. The literature search provided a wide variety of CE metrics being developed and applied (seven measurement indices, nine assessment indicators and three assessment frameworks).

Corona B, Shen L, Reike D, Rosales Carreón J, Worrell E. Towards sustainable development through the circular economy—A review and critical assessment on current circularity metrics. Resour Conserv Recycl [Internet]. 2019 Dec 1 [cited 2019 Sep 25];151:104498. Available from: https://www.sciencedirect.com/science/article/pii/S0921344919304045?dgcid=coauthor



Other News

3rd ECOFRAM conference (ECOfriendly Flame Retardants And Materials) will be held at the School of Chemistry (ENSCM) on 3rd and 4th June.

ECOFRAM 2020 one of the major events in 2020 about the fire retardancy of polymers, is delighted to welcome you to Montpellier (France).

The topics of the event will be the following:

- Sustainable FR additives
- Biobased and biodegradable FR polymers and composites
- Global life cycle approaches
- Fire safety regulation and ecological issues

The abstract submission deadline for orals or posters is the 15th February 2020 .

https://ecofram2020.mines-ales.fr

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Organisation (*organization*):

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déclare adhérer comme Membre Affilié **Individuel** à l'**Association EPNOE**, Association Loi 1901, sise 60 Bd St Michel 75006 Paris, déclarée le 14 décembre 2007 et publiée au Journal Officiel le 5 janvier 2008 sous le numéro 1006, et accepter ses statuts.

(declare to join as ***Individual*** *Affiliated Member the* ***EPNOE Association****, 60 Bd St Michel 75006 Paris, declared under law of 1901 on December 14th 2007 and published in the French Journal Officiel on January 5th 2008 under number 1006, and accept its statutes.)*

L'adhésion est effective pour l'année calendaire en cours dès le paiement de la cotisation annuelle.

(Membership is effective for the current calendar year upon payment of the annual membership fee.)

Cotisation annuelle (*Annual membership fee*) 150 euros HT (hors taxes) (*net fee excluding taxes and duties*). 50 euros HT pour les étudiants en Master et en thèse. *50 euros for Master and PhD students.*

Fait à (lieu), ***done in*** *(place)*:……

Date: ……

Signature:

A compléter et envoyer à l'adresse postale suivante, ***to be filled in and sent to the following postal address:***

Sylvie Massol, CEMEF ARMINES, CS10207
F-06904 Sophia Antipolis – France

Ou par e-mail ***(or by e-mail to)*** **contact@epnoe.eu**

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European Polysaccharide Network Of Excellence

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EPNOE BULLETIN D'ADHESION COLLECTIF- Membre Affilié
EPNOE COLLECTIVE MEMBERSHIP FORM – Affiliated Member

Nous, *We,* (nom du centre de recherche/institut, *name of the research centre/institute*):
……
dont la forme et le capital sont (*which form and capital are*):
……
dont l'adresse est (*which address is*):
……
……

déclarons adhérer comme Membre Affilié à l'**Association EPNOE**, Association Loi 1901, sise 60 Bd St Michel 75006 Paris, déclarée le 14 décembre 2007 et publiée au Journal Officiel le 5 janvier 2008 sous le numéro 1006, et accepter ses statuts.

*(declares to join as Affiliated Member the **EPNOE Association**, 60 Bd St Michel 75006 Paris, declared under law of 1901 on December 14th 2007 and published in the French Journal Officiel on January 5th 2008 under number 1006, and accept its statutes.)*

L'adhésion est effective pour l'année calendaire en cours dès le paiement de la cotisation annuelle.
(Membership is effective for the current calendar year upon payment of the annual membership fee.)

Cotisation annuelle (*Annual membership fee*) 1 000 euros HT (hors taxes) la première année (*1 000 euros the first year net fee excluding taxes and duties*) et 700 euros les années suivantes (*700 euros the following years*)

Fait à (lieu), ***done in*** *(place)*:……
Date: ……

Par (nom), ***By*** *(name)*: ……..
Titre, ***Title***: ……...
dûment habilité(e) à cet effet (*duly empowered to that effect*).

Signature:

A compléter et envoyer à l'adresse postale suivante, *to be filled in and sent to the following postal address:*

Sylvie Massol, CEMEF ARMINES, CS10207
F-06904 Sophia Antipolis – France

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BULLETIN D'ADHESION COLLECTIF – Membre BIC « Business & Industry Club »

COLLECTIVE MEMBERSHIP FORM – BIC « Business & Industry Club » Member

Nous, We, (nom de la société/organisation, name of the company/organisation) :

……

dont la forme et le capital sont (which form and capital are) :

……

dont l'adresse est (which address is):

……

déclarons adhérer comme Membre BIC à l'Association EPNOE, Association Loi 1901, sise 60 Bd St Michel 75006 Paris, déclarée le 14 décembre 2007 et publiée au Journal Officiel le 5 janvier 2008 sous le numéro 1006, et accepter ses statuts.

(declare to join as BIC Member the EPNOE Association, 60 Bd St Michel 75006 Paris, declared under law of 1901 on December 14th 2007 and published in the French Journal Officiel on January 5th 2008 under number 1006, and accept its statutes.)

L'adhésion est effective pour l'année calendaire en cours dès le paiement de la cotisation annuelle.
(Membership is effective for the current calendar year upon payment of the annual membership fee.)
Cotisation annuelle (cocher la case) – Annual Membership fees (tick as appropriate)

Moins de 50 employés, less than 50 employees	☐ 1000 euros HT, net fee.
51 à 500 employés, 51 up to 500 employees	☐ 2500 euros HT, net fee.
Plus de 500 employés, more than 500 employees	☐ 6000 euros HT, net fee.

Fait à (lieu), ***done in*** *(place)*:……
Date: ……

Par (nom), ***By*** *(name)*: ……..
Titre, ***Title***: ……...
dûment habilité(e) à cet effet (*duly empowered to that effect*).

Signature:

A compléter et envoyer à l'adresse postale suivante, ***to be filled in and sent to the following postal address:***

Sylvie Massol, CEMEF ARMINES, CS10207
F-06904 Sophia Antipolis – France

Ou par e-mail ***(or by e-mail to)*** **contact@epnoe.eu**

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