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European Polysaccharide Network Of Excellence



"Nature makes polysaccharides, EPNOE turns them into products"

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editorial

Dear Reader,

Once more, an issue of EPNOE Newsletter is dealing with innovation. Innovation is the process by which an idea is transformed into a marketed product or service showing a clear advantage over existing products or services. Innovation is crucial for the competitivity of Europe, as it is for all countries. Many opinions prevail about the real mechanisms by which ideas are generated and transformed into innovative products. For each claimed mechanism, famous counterexamples exist. Most probably, many ways exist and are efficient, depending on the situation encountered in the community in which it is generated.

The EPNOE community is looking at its own way. Scientific research has been favored through brainstorming sessions, informal, frequent meetings and discussions and exchanges of researchers and students. Knowledge transfer has been organized between academic and industrial members through meetings and contacts. Now, new steps are taken for trying to boost the generation of new ideas, the preparation of new research projects to study them and the transfer of these ideas to companies able to develop them into products.

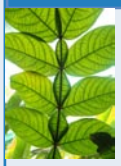
EPNOE is also very active in participating to collaborative activities aimed at structuring research in Europe, as the new COST action on wood-based nanofibres.
Finally, let's recall that our international meeting EPNOE 2013, which is co-organised with the American Chemical Society, will take place in Nice, October 21-24, 2013. You are all welcome. You will find more information at http://epnoe2013.sciencesconf.org and in case of any question, you must contact: epnoe2013@sciencesconf.org.

Hoping to meet you in Nice, I send you my best wishes.

Dr. Patrick Navard
Coordinator of EPNOE
Armines/Mines ParisTech/CNRS
CEMEF - Centre for Material Forming
Sophia-Antipolis
(France)

news

Member's info



New responsibility

Starting from January 1, 2013, Dr. Johannes Ganster has taken over the responsibility as division director «Biopolymers» at the Fraunhofer Institute for Applied Polymer Research IAP in Potsdam-Golm. The division is composed of four departments with about 50 scientists, engineers and technicians.

New staff

• At the University of Jena, Germany:

- David Bleeck joined the group as trainee. He works in the field of cellulose functionalization (Supervisor: Prof. Thomas Heinze)

- Daniela Colevati Ferreira from University of Sao Paulo (Brazil) joined the group as guest scientist. She works in the field of probing properties of cellulose derivatives by applying perichromism of dyes. (Supervisor: Prof. Thomas Heinze)

• At Cemef - MINES ParisTech, France:

Dr Jordi Girones from Spain, Dr Loan Vo from Vietnam and Dr Hunhui Wang from China joined the team led by Patrick Navard to develop the use of miscanthus in polymer composites and concrete. It has to be noted that Loan and Hunhui were previously working in other EPNOE institutions. Three undergraduate trainees are or will be soon part of this team.

Publication

The special issue of Carbohydrate Polymers dedicated to the 2nd International Polysaccharide Conference EPNOE 2011 has been published.

EPNOE Book

The EPNOE book "*The European polysaccharide Network of Excellence (EPNOE): research initiatives and results",* is now on sale. It offers in its 401 pages a panorama of some of the research activities performed in EPNOE institutions. Most chapters were written by at least two different EPNOE institutions.This book is published by Springer. More information can be found at http://link.springer.com/book/10.1007/978-3-7091-0421-7/page/1



EPNOE Industrial Member's research

Starch adds a special touch

Starch in cosmetics

The term cosmetics comes from the Greek 'kosmeo' and means 'to decorate'. Historically, starch in the form of rice flour was used as face powder by Asian men and women as long as over a thousand years ago. Whitened faces were characteristic of the aristocracy, and thus a sign of prosperity. In the baroque and rococo eras, a non-toxic alternative to toxic lead white powder was found in wheat and rice powder. It was only in the 20th century that cosmetics became accessible to the entire population. Women in particular were central to the growing importance of powder, rouge, lipstick and skin care products.

Decorative cosmetics

Special starch products can be found in the formulas of lipsticks, eyebrow pencils, foundations and eye shadow. The role of starch in these products is to facilitate application, improve adhesion, give cosmetics richness and to retain moisture. In this case, starch usually replaces talc, the use of which is increasingly critically evaluated from a health perspective.


For great-feeling skin

Major areas of application for starches are creams and lotions. Quality skin-care products usually contain large amounts of oil and grease. These cause the product to be sticky and slimy. Starch performs two essential functions here. Upon application, the starch works like a large-scale ball bearing, which allows for the uniform distribution of cream with low sliding resistance. The addition of starches also significantly reduces stickiness on application and absorption phase, resulting in pleasant, velvety-feeling skin. Skin is given a special touch.

Dry shampoos

A new trend is dry shampoo. Dry shampoos are advantageous in that they give you voluminous, shiny, well-groomed hair in a short period of time. The starch-additive mixture is sprayed onto the hair. This absorbs sebum and dirt, which can then be brushed out easily without much effort. Rice starch and corn starch derivatives are used in dry shampoos.

Cosmetic starches have a future

Through intensive, application-oriented research, Zuckerforschung Tulln (ZFT) develops new products for cosmetics on the basis of corn and rice starches.

Franz Jetzinger, Marnik Wastyn
Zuckerforschung Tulln – pioneer in the development of innovative starches.

EPNOE Member's research

High efficiency current collectors by technical embroidery – lightweight for e-mobility

Background

A major problem in lightweight solutions for batteries and fuel cells results from the lack in efficient solutions to collect electric current at the side of its generation.

There is a clear demand to optimise cell design to maximise energy density, while keeping coulometric efficiency and energy efficiency at its maximum.

As the electrode reaction involves a heterogeneous charge transfer reaction the active electrode surface is of critical significance to achieve high current densities with high efficiencies.

An insufficient electrode area causes low maximum cell current, high internal energy losses and insufficient use of the redox-active mass. In an ideal case three dimensional current collectors allow to reach all particles of the electro-active mass with short distance.

Technology

A flexible solution to produce porous three dimensional current collectors for batteries, accumulators and fuel cells that utilises technical embroidery.

3D-electrodes can be produced in highly variable dimensions and from a wide range of different materials.

Porosity and thickness of the 3D-electrodes can be adjusted to the electrochemical system. The electrodes are produced in the dimensions ready to use.

Porosity and current density can be optimised to achieve homogenous current distribution under given load, which allows efficient use of redox active battery fillings.

Using the active mass of a electrochemical cell more efficient and with higher thickness reduces the overall weight of a cell concept.

Benefits

- Flexible construction of 3D-electrodes
- Efficient use of redox active material
- Optimised current distribution for high efficiency
- Easy and flexible production - can be applied on a wide range of electrode materials
- Overall weight reduction through increased thickness and efficient usage of active mass

Application

- Accumulators
- Batteries
- Fuel cells

This article was proposed by Barnaby Caven, University of Innsbruck, Austria.

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EPNOE Event

EPNOE 2013 Conference

21-24 October 2013
Nice, France

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We warmly welcome academic, industrial, and government scientists and students dealing with polysaccharides and polysaccharide-derived products to the 3rd EPNOE International Polysaccharide Conference, EPNOE 2013, entitled "**Polysaccharides and polysaccharide-derived products, from basic science to applications**", co-organized by EPNOE and the Cellulose and Renewable Materials division of the American Chemical Society (ACS).

The **major topics** covered at the EPNOE 2013 conference will be:

1. Polysaccharide isolation
2. Biosynthesis
3. Biodegradation, enzymology
4. Chemical modifications
5. Advanced physical, chemical, structural, and surface characterisation
6. Nanotechnology: nano- and micro-polysaccharide-based objects
7. Biomimetic applications
8. Fuels based on polysaccharides
9. Food ingredients
10. Biomedical applications
11. Polysaccharide-based materials
12. Bioplastics
13. Pulp and paper
14. Life Cycle Assessments- Social aspects
15. New trends

A **pre-conference course** on «Polysaccharide-based and polysaccharide-derived Bioplastics including natural fiber-reinforced composites and thermoplastics-thermosets» will be organised on **Sunday, October 20th, 2013**, in Mines ParisTech-Cemef, Sophia-Antipolis, France. Transportation from Nice to the course site and back will be organised.

The **preliminary list of keynote lecturers** is the following:

- Gudmund Skjak-Braek (Norway)
- Thomas Rosenau (Austria)
- Kevin Edgar (USA)
- Richard Murphy (UK)
- Jay-Lin Jane (USA)
- Redouane Borsali (France)
- Vincent Bulone (Sweden)
- Didier Letourneur (France)
- Vincent Edwards (USA)
- Yapeng Fang (China)
- Herbert Sixta (Finland)
- Akira Isogai (Japan)
- Elisabete Frollini (Brazil)
- Shabbir H. Gheewala (Thailand)

The abstract submission is now open until June 15, 2013. Full registration to the conference will be possible from May.

More information: http://epnoe2013.sciencesconf.org

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Book review

Review of the book „Tailor-Made Polymer Research" (Eds. Fink, H.P., Hofmann, D.) published by the Fraunhofer Institute for Applied Polymer Research IAP (2012)

The book was published on the occasion of the 20th anniversary of the Fraunhofer Institute for Applied Polymer Research IAP in Potsdam-Golm one of the founding partners of EPNOE. The book starts with a brief survey about the history of Fraunhofer IAP by Hans-Peter Fink. The following 17 scientific papers are embracing important research activities of the institute ranging from the synthesis, chemical modification and processing of biopolymers and oil based polymers to the development of electronically and optically active functional polymers and water-based specialty polymers for a wide range of applications.

The following papers are specifically dealing with topics relevant for EPNOE:

"Man-Made Cellulose Fibers, Films, and Nonwovens: Towards Melt-Like Processing of Cellulose" by Hans-Peter Fink, Johannes Ganster, André Lehmann. A special focus is on developments towards melt like processing of cellulose particularly via spinning solutions in N-methylmorpholine-N-oxide (NMMO). Also described are activities towards more environmentally friendly spinning procedures, in particular regarding improvements of the carbamate pathway and the Lyocell process.

"Novel Cellulose and Starch-Based Products" by Bert Volkert, André Lehmann. An important example are cellulose ethers obtained under homogeneous reaction conditions after cellulose dissolution in NMMO*H2O or in ionic solvents which enables better control of homogeneous distribution of substituents along the chains. Developments on trifunctional starch mixed esters and on nanocellulose are also discussed.

"Cellulose Sulphates for Encapsulation in Biomedicine" by Kay Hettrich, Juta Rohowsky, Bert Volkert. Here biocompatibility and biofunctionality of related biomaterials for the encapsulation of cells are key issues.

"Starch Modification and Characterization" by Waltraud Vorwerg, Sylvia Radosta. Different pathways for the physical, enzymatic and chemical modification of starch are described together with typical characterization approaches.

"Starch as Paper Additive" by Sylvia Radosta, Waltraud Vorwerg, Marco Ulbrich, Henrik Petersen. An overview about the many applications of starch and starch derivatives in papermaking is provided.
"Novel Bio-Based Plastics – Molecular Design by Synthesis" by Mathias Hahn, Antje Lieske. The development and the utilization potential of improved types of poly(lactic acid) based on starch as raw material are described.

"Bio-Based Composites" by Johannes Ganster, Jens Erdmann, Hans-Peter Fink. The major focus is on bio-based composites mainly describing the potential for the utilization of man-made cellulosic fibers (rayon tire yarn) as reinforcing component in matrices of oil-based (e.g. PP) and bio-based polymers (e.g. PLA) which is leading to considerable improvements in critical properties like strength at break, Young's modulus and impact strength. Also considered is the influence of fiber-matrix interface modifications via reactive compounding.

The book with the ISBN number 978-3-00-038248-2 can be obtained via dieter.hofmann@iap.fraunhofer.de

This article was proposed by Dieter Hofmann, Fraunhofer Institute for Applied Polymer Research, Germany.

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New EPNOE initiative

Dormant ideas

Open innovation is now a process which proved its efficiency. It has been tried in many configuration types. One originated from large companies unable to exploit all the results generated by their R&D departments and offering these results to SME's. Another example is the TWO team initiative of the Confederation of European Pulp Industry where good ideas imagined by individuals unable to exploit them are selected by two competing teams and transformed into innovation.

However, implementing a situation where researchers are giving ideas to be merged with others for further exploitation in an open way is a nearly impossible task, strongly hampered by issues of confidentiality and intellectual and property rights.

The EPNOE academic/research community, already used to brain-storming sessions, decided to meet this challenge. It is the "Dormant Ideas" initiative.

A "dormant idea" is defined as a research or application idea that will not be used by its author due to several reasons (lack of time or resources to develop it, not fully validated, missing a critical expertise, not properly tested, not applicable to the area it was devised for, outside the main strategic areas of the member, having no idea what to do with it, etc.…).
They can also fall into such description: "un-identified knowledge" or "things you know but without realizing they could be useful" or "things you know that you don't know what to do with".

Most academic/research EPNOE scientists managed to go above the many reasons for not participating and an impressive list of more than 160 such ideas is now shared by the EPNOE academic community.

These dormant ideas will

- develop more intense collaboration within partners through discussions around these ideas
- offer the opportunity to bring into existing research projects ideas from another group
- create by combination new, applicable projects or products.

A first phase of exploitation among dormant ideas' authors will take place in April 2013. Each EPNOE academic scientist will select the authors of ideas he/she wishes to discuss with in order to transform this idea into a project.

In a second phase that will take place in May, these ideas will be transferred to the companies which are members of EPNOE. It will be the task of these companies to identify the ideas that can be further developed in their laboratories.

To our knowledge, it the first time that researchers from so many different institutions and countries are sharing ideas in this way.

This article was written by Patrick Navard, Cemef-MINES ParisTech, France.

New COST action

COST Action FP1205: Innovative applications of regenerated wood cellulose fibres

A COST action is an intergovernmental framework for European Cooperation in Science and Technology, allowing the coordination of nationally-funded research on a European level. COST has a very specific mission and goal. It contributes to reducing the fragmentation in European research investments and opening the European Research Area to cooperation worldwide. As a precursor of advanced multidisciplinary research, COST plays a very important role in building a European Research Area (ERA). It anticipates and complements the activities of the EU Framework Programmes, constituting a "bridge" towards the scientific communities of emerging countries. It also increases the mobility of researchers across Europe and fosters the establishment of scientific excellence in the nine key domain

A COST action dedicated to wood cellulose fibres will start before summer 2013, with a duration of four years. The main objective of the Action is to improve knowledge of and increase opportunities for nanocellulose and regenerated cellulose derived from wood sources in a wide range of emerging innovative processes and markets through networking of major academic actors.

In order to develop cellulosic fibres for the benefit of the European wood processing sector in an efficient, affordable, environmentally acceptable and sustainable manner, there is a need for a better rationalisation of activities at the level of Europe. The structure offered through COST Actions provides the tools for such a rationalisation, through:

- The creation of an information portal for sharing of information.
- The establishment of training mechanisms, not only for experienced researchers, but also for young researchers.
- The development of technological and scientific forum among researchers for boosting result dissemination.

The Management Committee of COST is composed of two persons per participating countries. EPNOE scientists are well represented in this Management committee, since seven EPNOE scientists are representing Austria (T. Rosenau), Germany (T. Heinze, A. Koschella), Finland (P. Fardim, A. Suurnakki), France (P. Navard) and the Netherlands (J van Dam).

We will keep informed the EPNOE community of any advances made in this action.

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