



European Polysaccharide  
Network Of Excellence

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**“Nature makes polysaccharides,  
EPNOE turns them into products”**

## editorial

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Summer will be an active and exciting time for EPNOE. Two very large meetings are being organized in July by EPNOE partners: the **European Polymer Federation meeting** in Graz, and **Eurocarb 15, the 15th European Carbohydrate Symposium** in Vienna, both with more than 700 expected participants. These two meetings are sponsored by EPNOE.

At the same time, EPNOE scientists will be engaged in a challenging exercise: preparing the **EPNOE Road Map**, comprising both education and research aspects. The target is to build a Road Map to guide EPNOE members at the 2015-2020 horizon, taking into account the widest possible sources of information:

### Part A: Institutional and official data

- EU policy
- Foreign policy
- Society needs

### Part B: Industry

- Technological Platforms
- Market studies
- Other documents

### Part C: Opinions of scientists

- EPNOE brain storming sessions, including the Student/post-doc brain-storming in Utrecht
- Individual contributions from EPNOE scientists
- Analysis of scientific trends in publications
- Opinion of scientists outside EPNOE

Two groups of EPNOE scientists are undertaking this work: the Research Task Force (Karin Stana-Kleinschek, Thomas Heinze, Anna Suurnäkki, Volker Ribitsch) and the Education Task Force (Pedro Fardim, Anton Huber, John Mitchell, Valeria Harabagiu). We expect to have a finalized EPNOE Road Map by the end of this summer.

This summer will also see the release of a very important 227 page document entitled **“Product overview and market projection of emerging bio-based plastics”**. This document was commissioned by EPNOE and European Bioplastics, and has been prepared by Martin Patel's group at the University of Utrecht.

Finally, I wish to congratulate several EPNOE scientists, **Thomas Rosenau** for his election as Fellow of the International Academy of Wood Science, **Tatiana Budtova**, recent holder of the Mines-ParisTech Industrial Chair on Bioplastics, **Sylvia Radosta** and **Waltraud Vorwerg**, Association of Cereal Research medalists, recognizing their support for collaboration between science and industry.



**Dr. Patrick Navard**  
Coordinator of EPNOE  
Centre for Material Forming  
Sophia-Antipolis  
(France)

## news

### Recent events



#### Industrial Chair on Bioplastics

The Center for Material Forming (CE-MEF) of Mines ParisTech together with Arkema, Nestlé, l'Oréal, PSA and Schneider Electric opened an industrial Chair on bioplastics. The inauguration took place in Paris on June 18, 2009,

in presence of researchers, partners-sponsors, representatives of different companies and journalists. The Chair holder is Tatiana Budtova. More information about the Chair on <http://www.cemef.mines-paristech.fr/sections/recherche/chaire-industrielle>.

#### KUR-project meeting

Antje Potthast, professor for biopolymer analytics at BOKU University, Vienna, hosted the KUR-project meeting, bringing together leading experts from Middle European Centers of conservation science, museums and libraries to discuss current developments and future perspectives of cellulose conservation and mass deacidification.

### Forthcoming events



#### STEP-ITN meeting

The Annual meeting of STEP-ITN (Shaping and Transformation in the Engineering of Polysaccharides - Initial Training Network) will be held on 29 September - 1 October 2009 at the

University of Jena. More information on: [www.stepitn.eu](http://www.stepitn.eu).

#### Workshop

XVth Workshop "New Aspects on Chemistry and Application of Chitin and its Derivatives" will be organised in Torun (Poland) on September 28-30, 2009 by Institute of Biopolymers and Chemical Fibres, Ministry of Science and Higher Education and Faculty of Chemistry of Nicolaus Copernicus University (Poland).

#### Presentation of unexpected results

Dr Mita Lad has completed her post-doc year with Tim Foster in the Division of Food Sciences at the University of Nottingham. Her subject of competitive hydration of starch and non-starch polysaccharides will be presented at the 15th Gums and Stabilisers for the Food Industry conference in Wrexham (22-25 June 2009) and at the EPNOE Conference 'Polysaccharide as a Source of Advanced Materials' in Turku, Finland (21-24 September 2009). Unexpected results in starch-xanthan mixtures may lead to new functionalities in industrial application.



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## news

### ▶ Forthcoming events

#### International Symposium

The 7th International Symposium "Materials made of Renewable Resources", which will be held on the 9th and 10th September 2009 at Messezentrum Erfurt, will show possibilities on biologically based polymers. Industry and science will be able to find the ideal communication platform for new ideas and cooperation. The symposium will be focusing upon new developments in fibre composite materials, and the market and application development in the field of biopolymer materials, as well as the use of bio-based adhesives and products made out of wood fibre materials. More information: <http://narotech.messe-erfurt.de/>

### ▶ Members' info

#### Appointment

Thomas Rosenau, Chair of chemistry of renewable resources at BOKU University Vienna, was elected Fellow of the International Academy of Wood Science, "recognizing his contributions to the fundamental chemistry of cellulose dissolution processes, hydrogen bonding in cellulose, and chromophore formation in cellulosic materials".

#### Professor appointment

Hans-Peter Fink, director of the Fraunhofer Institute for Applied Polymer Research IAP, has been appointed adjunct professor at the University of Postdam and honorary professor at the University of Kassel in the field of biopolymers.

#### Award

The Association of Cereal Research e.V. in Germany gave the Saare-Award to Dr. Sylvia Radosta and Dr. Waltraud Vorweg at the 60th Starch Convention in Detmold. They received the medal for the support of collaboration between science and industry.

#### New projects

The University of Hamburg has started two new projects:

- National sources: "Zero Waste, the city of the future, a biorefinery adapted according to its requirements"
- European sources (ERA-Net): "Production and upgrading of 2,3-butanediol from biomass".

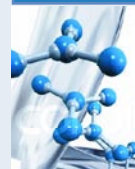
#### COST Action

The new COST Action FP0901, "Analytical Techniques for Biorefineries", aims at developing and evaluating analytical methods related to forest-based and agroindustrial Biorefineries. The Action will start this autumn. Laboratories, institutes, and companies that are interested to join the Action can get more information from the coordinator, Prof. Stefan Willför at Åbo Akademi University (contact per email: [swillfor@abo.fi](mailto:swillfor@abo.fi)).

#### New book edition

The book «Esterification of Polysaccharides» by Thomas Heinze, Tim Liebert and Andreas Koschella is now available in Chinese language.

### ▶ Forthcoming articles



Experimental study of the break-up of starch suspension droplets in step-up shear flow; *M.Desse, J.Mitchell, B.Wolf, T.Budtova* - Journal of Rheology

Rheological properties of cellulose/ionic liquid solutions: from dilute to concentrated states; *M. Gericke, K. Schluffer, T. Liebert, Th. Heinze, T. Budtova* - Biomacromolecules

Evaluation of fluorescent polysaccharide nanoparticles for pH sensing in biosamples; *A. Schulz, St. Hornig, T. Liebert, E. Birckner, Th. Heinze, G.J. Mohr* - Organic and Biomolecular Chemistry

Determination of the surface coverage of adsorbed dextran and  $\beta$ -cyclodextrin derivatives on gold by surface titration; *St. Hornig, T. Liebert, A.R. Esker, S.L. Stoll, J. Mertzman, W.G. Glasser, Th. Heinze* - Langmuir

Magnetic nanoparticles coated with tailored polysaccharide-based shells – Interaction with human cells ; *J. Wotschadlo, T. Liebert, Th. Heinze, K. Wagner, M. Schnabelrauch, S. Dutz, R. Müller, F. Steiniger, M. Schwalbe, T. Kroll, K. Höffken, N. Buske, J. Clement* - Journal of Magnetism and Magnetic Materials

Dextran-based nanoparticles: a new approach for polymer prodrugs; *St. Hornig, H. Bunjes, Th. Heinze* - Journal of Colloid and Interface Science

Novel 3-Mono-O-Hydroxyethyl Cellulose: Synthesis and Structure Characterization; *D. Fenn, Th. Heinze* - Cellulose

Regioselectively oxidized 3-O-alkyl ethers of cellulose: Synthesis and Characterization; *X. Yin, A. Koschella, Th. Heinze* - Reactive and Functional Polymers

Clicking Pentafluorostyrene Copolymers: Synthesis, Nanoprecipitation and Glycosylation; *C. Remzi Becer, K. Babiuch, D. Pilz, St. Hornig, Th. Heinze, M. Gottschaldt, U. S. Schubert* - Macromolecules

The reduction of dispersed indigo by cathodically formed 1,2,4-trihydroxynaphthalene; *S. Komboonchoo, A. Turcanu, T. Bechtold* - Dyes and Pigments





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## EPNOE activities

### EPNOE Business and Industry Club

The contract linking the European Polysaccharide Network of Excellence (EPNOE) to the European Commission will soon come to an end. In October 2009, the funding from the European Commission will be finished and EPNOE will move forward alone.

In order to carry on its activities after the European contract, EPNOE was legally established into a non-profit organisation called "EPNOE Association". The aim of the association is to organise and perpetuate the activities of the network.

To ensure that EPNOE perpetuates its research and collaborative links, the Business and Industry Club (BIC) was created. The BIC enables companies working or planning to work with polysaccharide-related products to join the EPNOE Association. The fees collected from BIC companies (associate members), together with those paid by EPNOE institutions (regular members), are used for organising the activities of the association.

By becoming associate members of EPNOE Association, BIC companies enter into a close interaction with the biggest European network on polysaccharides. This means fruitful collaborations with brilliant scientists from 16 top-ranked institutions in Europe in the field of biomass-based products, and the opportunity to network with other companies active in different market segments.

In addition to this precious added-value, BIC companies receive many other benefits such as: access to EPNOE databases, strategic and technological trends, market studies, follow-up of about 70 PhD and post-doctoral studies, implementation of R&D projects, and participation to dedicated meetings.

EPNOE Association is very proud to welcome 22 companies to the Business and Industry Club (BIC). The 2nd EPNOE-Business and Industry Club meeting took place in Utrecht from 11 to 13 May 2009 and gathered an astonishing 82 participants. Eighteen oral presentations on students' latest scientific results and thirty-two posters were delivered.

Titles of the oral presentations:

- Characterization and Utilization of Spin Coated Cellulose Model Films from Ionic Liquid Solutions
- Side reaction of cellulose in 1-alkyl-3-methylimidazolium-based ionic liquids
- Mobility and Oxidative Stability in Plasticised Food Matrices, The Role of Water
- Synthesis and Processing of Polysaccharide Esters
- On the Disassembly of Polysaccharides from Hardwoods
- N-Hydroxyphthalimide (NHPI) as Mild Oxidation Agent for Viscose Fibers
- Novel Paths for the Synthesis and Application of Cellulose Sulfate using Ionic Liquids

- Dendronized Cellulose - Synthesis and Application
- Comparative X-Ray Diffraction and Solid State NMR Studies on Cellulose Crystallinity
- Reactive Starch: Preparation, Characterisation and Applications
- Present and Future Development in Plastics from Biomass
- Cellulose Processing using Green Solvents: Ionic Liquids and NaOH-Water
- Polysaccharide Adsorption Studies using QCM
- Effect of Alkali Treatment on Structure, Chemical Reactivity and Fiber Properties of Lyocell (Tencel®) Fibers
- Modified Non-Wovens for Medical Application
- Recent Studies of the Glass-Rubber Transition and Crystallisation of Amorphous Cellulose
- Water Content Dependence of Starch Product Crispness

### Members' info



#### New PhD students

- Galina Rodionova, "Nanofibrillated cellulose", under the supervision of Prof. Thomas Heinze, at the Norwegian University of Science and Technology.
- Loan Thi To VO "Scientific Concept of Thermal Processing of Cellulose Materials", in the group of Prof. Bechtold, University of Innsbruck, in the frame of the Marie-Curie STEP ITN (Shaping and Transformation in the Engineering of Polysaccharides - Initial Training Network), funded by the European Commission.
- Fokko Schütt, "Production and upgrading of 2,3-butanediol from biomass", under the supervision of Bodo Saake, Johann Heinrich von Thünen Institute (vTI), Hamburg.
- Olga Kuzmina is working under the supervision of Prof. Thomas Heinze in IBWCh (Łódź, Poland), in the frame of the Marie-Curie STEP-ITN
- Luciano Pighinelli started his research activity in IBWCh (Łódź, Poland) in the frame of the Marie-Curie STEP-ITN,
- M. Sc. Taha Genco was recruited at the University of Jena as PhD student in the frame of the Marie-Curie STEP-ITN

#### New Post-Doc

Dr Ron Janzon started to work as a post-doc on the topic "Zero Waste, the city of the future, a biorefinery adapted according to its requirements" under the supervision of Bodo Saake, Johann Heinrich von Thünen Institute (vTI), Hamburg, Germany.



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## Zoom on EPNOE Partners' research

### Bioplastics Market Study

**B**io-based plastics have experienced fast growth in the past decade thanks to technological breakthroughs and increased awareness about the depletion of fossil fuels, climate change and other environmental aspects. Several bio-based plastics were commercialized in the last few years and a number of new ones can be expected to be put on the market place in the short to medium term. In order to provide researchers, producers and (potential) users of these material with an overview, the Department of Science, Technology and Society (STS) at Utrecht University (one of the EPNOE partners) has just finalized the study "Product overview and market projection of emerging bio-based plastics" or, in brief, "PRO-BIP 2009".

The bio-based plastics investigated in this study include starch plastic, cellulose polymers and the most important other types of fully or partially bio-based plastics (i.e., PLA, PTT, PHA, PBT, PBS, PET, PEIT, PE, PA, PVC, PUR and selected thermosets). For each of these plastics, the study presents the bio-based production routes, material properties, technical substitution potentials, applications today and tomorrow, emerging producers and wherever possible, costs.

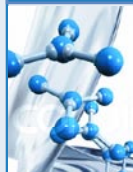
This study estimates the current global capacity of emerging bio-based plastics at 0.36 Mt (million metric tonnes). This is only 0.3% of the current worldwide production of plastics (primarily of petrochemical origin). However, the total maximum technical substitution potential of bio-based polymers replacing their petrochemical counterparts is estimated at 270 Mt, or 90% of the total global production (including fibres). It will not be possible to exploit this technical substitution potential in the short to medium term. The main reasons are economic barriers (especially production costs and capital availability), technical challenges in scale-up, the short-term availability of bio-based feedstocks and the need for the plastics conversion sector to adapt to the new plastics. Nevertheless, there are very large opportunities for the replacement of petrochemical by bio-based plastics from a technical point of view and bio-based plastics will most likely reach a global capacity of 3.0 to 3.5 Mt by 2020.

The PROBIP 2009 study, which will soon be downloadable from the EPNOE website, was funded by EPNOE and by European Bioplastics.

Dr. Martin Patel, University of Utrecht, The Netherlands

## news

### Forthcoming articles



Natural dyeing of wool and hair with indigo carmine (C.I. Natural Blue 2), a renewable resource based blue dye; *S. Komboonchoo, T. Bechtold*, Journal of Cleaner Production

Handbook of Natural Colorants, *T. Bechtold, R. Mussak* - Wiley & Sons, Verlag: Wiley-Blackwell (an imprint of John Wiley & Sons Ltd)

Alkali treatments of lyocell in continuous processes I. Effects of temperature and alkali concentration on the treatments of plain woven fabrics; *J. Siroky, AP. Manian, B. Siroka, M. Abu-Rous, J. Schlagen, RS. Blackburn, T. Bechtold* - J.Appl. Polym Sci

Carbohydrate analysis of plant materials with uronic acid-containing polysaccharides - A comparison between different hydrolysis and subsequent chromatographic analytical techniques; *S. Willför, A. Pranovich, T. Tamminen, J. Puls, C. Laine, A. Suurnakki, B. Saake, H. Sirén, K. Uotila, H. Simolin, S. Rovio, J. Hemming, B. Holmbom* - Ind. Crops Prod.

Cellulose Fibres from Alkaline Solutions of Hydrothermally Modified Cellulose Pulp; *D.Wawro, W. Steplewski, A. Bodek* - Fibres & Textiles in Eastern Europe

Chitosan Fibres Modified with Keratin; *D.Wawro, W. Steplewski, K. Wrzesniewska-Tosik* - Fibres & Textiles in Eastern Europe

Properties of Alkaline Solutions of Modified Cellulose, *D.Wawro, J. Jozwicka, S. Sobczak, W. Steplewski* - Fibres & Textiles in Eastern Europe

Analysis of galactoglucomannans from spruce wood by capillary electrophoresis; *A. Doliška, S. Strnad, V. Ribitsch, K. Stana Kleinschek, S. Willför, B. Saake* - Cellulose