



## European Polysaccharide Network of Excellence

Nature produces polysaccharides, EPNOE turns them into materials

February 2007 - N°2

### NEWS

#### ► New Workshop

The Federal Research Centre of Forestry and Forest Products is organizing:

#### **International Workshop on "Production and Functionalisation of Hemicellulose for Sustainable Advanced Products"**

Dates: 19-20 March 2007

Place: Hamburg (Germany)

Website: [http://viikki.helsinki.fi/costD29\\_WG8/](http://viikki.helsinki.fi/costD29_WG8/)

#### ► New Conferences

The Institute of Biopolymers and Chemical Fibres and the University of Bielsko-Biala are organizing:

#### **5th Central European Conference "Fibre-Grade Polymers, Chemical Fibres and Special Textiles", CEC'2007**

Dates: 5-8 September 2007

Place: Bielsko-Biala (Poland).

Website: [www.cec2007.ath.bielsko.pl](http://www.cec2007.ath.bielsko.pl)

The Cellulose Society of Japan with the support of the American Chemical Society, Cellulose and Renewable Materials Division and University of Natural Resources and Applied Life Sciences Vienna (BOKU), Department of Chemistry is organizing:

#### **2nd International Cellulose Conference (ICC2007)**

The aim of the conference is to bring together scientists working on this sustainable and very promising biomaterial for the 21st century.

Dates: 22-25 October 2007

Place: Tokyo (Japan).

Website: [www.nta-mach.com/icc2007/](http://www.nta-mach.com/icc2007/)

Contact email: [thomas.rosenau@boku.ac.at](mailto:thomas.rosenau@boku.ac.at)

**In case you need more information, visit our web site [www.epnoe.eu](http://www.epnoe.eu) or send an email to [info@epnoe.eu](mailto:info@epnoe.eu)**

### Editorial

EPNOE is approaching its second anniversary. We are now ready to adjust our type of organisation to the legal requests of the partners and to the need for efficiency. The new organisation will be more streamlined than the present one.

This structure will allow us to offer a rapid response to the needs and demands of the European industry as well as to organise a common research of the best quality.

To further strengthen our involvement with industry EPNOE is setting up a Business and Industry Club, called EPNOE BIC, which will be established in April this year (we will come back to this topic in our next Newsletter).

Some of the services that the Business and Industry Club will propose are:

- Privileged access to:
  - some of the EPNOE partners databases
  - some of the EPNOE research Information
  - the results of EPNOE's ongoing survey of developments within the polysaccharide area
- Organisation of meetings dedicated to topics of current importance

On the research side, EPNOE is very active. The six Fundamental Themes are now operational, with the first results expected to be presented next September during our internal scientific meeting.

Quite a large number of applied collaborative projects (direct contracts with industry, European projects) have been built or are under preparation, especially around the 7th Framework Programme of the European Commission. We encourage all the academic institutions and companies who are interested in collaborating with us and sharing our enthusiasm in developing new materials from the biomass-born polysaccharides to contact us by email: [info@epnoe.eu](mailto:info@epnoe.eu).



Dr. Patrick Navard  
Coordinator of EPNOE  
Centre for Material Forming  
Ecole des Mines de Paris (France)

**Subscribe to the EPNOE Newsletter on [www.epnoe.eu](http://www.epnoe.eu)**



## European Polysaccharide Network of Excellence

Nature produces polysaccharides, EPNOE turns them into materials

### NEWS

#### ► New Articles

- Novel Nanoparticles based on Xylan; Th. Heinze, K. Petzold, A. Koschella; Cellulose and Chemistry and Technology
- Starch Derivatives of high degree of functionalisation.13.Novel Amphiphilic Starch Products; Th. Heinze, S. Rensing, A. Koschella; Starch/Stärke 59
- Nanoscale structures of dextran esters; St Hornig, Th Heinze; Carbohydrate Polymers
- Reactive polymeric nanoparticles based on unconventional dextran derivatives; Th. Heinze, N. Michaelis, St. Hornig; European Polymer Journal
- Research into developing antimicrobial dressing materials; Niakraszewicz A., Lebioda J., Kucharska M., Weslowska E.; Fibres and Textiles
- The nonwoven coated by chitosan with potential antimicrobial behaviour- preliminary results; Struszczyk M., Malczewska-Brzoza K.; Fibres and Textiles
- Films and nonwovens coated by chitosan for special applications. Biological decomposition aspects; Struszczyk M., Ratajska M., Malczewska-Brzoza K.; Fibres and Textiles
- Chitosan-fibroin blended fibres; Strobin G., Wawro D.; Fibres and Textiles

#### ► New PhD Students

##### University of Jena, Germany:

- Thorger Lincke : " Ionic Carbohydrates "
- Michael Schöbitz: "Polysaccharide Derivatization in Ionic Liquids"
- Marcel Meiland: "Synthesis and Characterization of Polysaccharide Borates"

##### Federal Research Centre of Forestry and Forest Products, Germany:

- Sebastian Braun: "Production of C6 – and C5 – sugars from wheat straw"

##### University of Innsbruck,CD-Lab Dornbirn, Austria:

- DI Ksenija Varga: " Cellulose Fibre Structure"

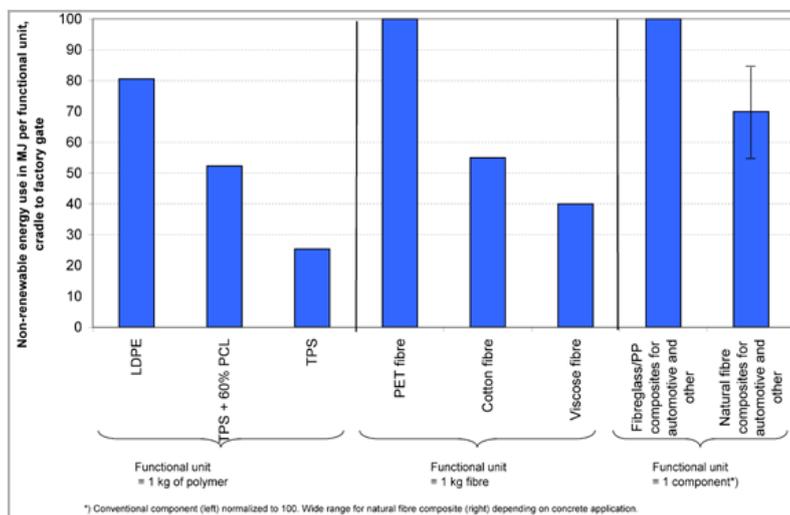
### — Zoom on EPNOE Partners' Research — Putting environmental aspects into perspective

Advanced bio-based materials and fuels have become a hot topic in Europe and world-wide. New polysaccharide-based materials such as starch polymers, novel viscose fibres and natural fibre polymer composites belong to the group of these advanced bio-based materials. Depending on the application area new polysaccharide-based materials compete with conventional materials such as petrochemical polymers or with conventional polysaccharide materials such as cotton.

A key driver for the introduction of advanced bio-based materials is the expected lower environmental impact they cause. In order to find out whether, and to which extent, this claim is valid and also for identifying opportunities for further reduction of environmental impacts, the method of life cycle assessment (LCA) has been developed. Within the EPNOE framework, this internationally standardized method (ISO) is applied by the Copernicus Institute at Utrecht University (Partner No. 16; [www.copernicus.uu.nl](http://www.copernicus.uu.nl); [www.chem.uu.nl/nws](http://www.chem.uu.nl/nws) ).

Utrecht University is currently investigating the environmental performance of several polysaccharide-based materials and other bio-based polymers. Figure 1 summarizes in a condensed way the main findings of the literature review prepared by Utrecht University. It demonstrates that the production of polysaccharide products can require clearly less non-renewable energy use (primarily fossil fuels) than their conventional counterparts. Similar results are found for most other environmental impact categories. While the results in Figure 1 refer exclusively to the production stage (cradle to factory gate) further work is required in order to cover the entire life-cycle including also the use phase and waste management. Moreover, Utrecht University is applying the methodology of life cycle assessment to some novel polysaccharide-based materials.

Figure 1:



Dr Martin K. Patel - LCA Activity Leader- and Li Shen  
University of Utrecht; Department of Science Technology and Society  
(The Netherlands)



## European Polysaccharide Network of Excellence

Nature produces polysaccharides, EPNOE turns them into materials

### Description of EPNOE Research Fundamental Theme 1 Structure and Properties of Bioassemblies

EPNOE is about integration: bringing ideas and people together in the European polysaccharide area that would not have interacted without the network. One of the important outcomes of this collaboration is the elaboration of an EPNOE Research Road Map which includes the description of six Research Fundamental Themes.

Fundamental Theme 1 aims to bridge the starch and cellulose worlds. Interfaces can be a fertile ground for innovation! Following brainstorming between the EPNOE partners it was decided to focus on the “amorphous” phase in starch and cellulose. Our targets are to better understand water relationships, mobility and order within this phase. The sample set we are working on consists of ball milled amorphous cellulose, amorphous amylose and amylopectin and several cellulose derivatives all equilibrated to water contents in the range 0-30% wwb. So far we have:

- Obtained sorption isotherms for most of these samples
- Used X ray diffraction to demonstrate that these samples are indeed amorphous.
- Investigated thermal transitions using differential scanning calorimetry and some novel mechanical techniques.
- Carried out some limited studies on mechanical properties of films.

As we move deeper into the project we hope to obtain information on the amorphous phase “order” from the radial distribution function obtained from X ray diffraction patterns and use atomic force microscopy to understand the distribution of amorphous regions in cellulose and starch products. This fundamental information will be of value to companies interested in fibre and film production and other processes for fabricating polysaccharides.

EPNOE partners from Austria, Germany, Poland, Romania and the UK are inputting work and knowledge into the project and EPNOE will build links between the young polysaccharide scientists of the future and this project will provide opportunities for research students to visit other partners.



Irina Raschip from the “Petru Poni” Institute of Macromolecular Chemistry, Romania setting up an X-ray diffraction experiment in the Division of Food Sciences, University of Nottingham, UK.

Prof. John Mitchell - Fundamental Theme 1 Team Leader  
University of Nottingham; School of Biosciences  
Division of Food Sciences (UK)

### 7th Framework Programme

As a Christmas present for all research groups, the European Commission published last December 22nd a grant agreement document for research actions, known as the seventh Framework Program (FP7). The program will cover the period extending from 2007 to 2013, with the main aim of supporting and implementing the objectives of the Lisbon objective: “...to become the most dynamic competitive knowledge-based economy in the world”. The FP7 document is divided into four main topics: Cooperation, Ideas, People and Capacities. It has been designed to improve the cooperation, the research and the transference of knowledge among all the European universities, research centres and industries.

EPNOE members will be active participants in building FP7 proposals and they will be submitting several applications. EPNOE members will play an important role in subjects connected with Training and Research. Following are some of the fields where EPNOE members' role can be significant:

- Marie Curie programs for the transfer of knowledge
- Nanotechnology

- Nanomaterials
- Materials processing
- Food, agriculture, biotechnology
- New functional products, renewable and with enhanced properties
- Materials and devices with high added value in textile, medical, or pharmaceutical applications
- Potential of polysaccharides and their impact in replacing oil-derived materials by biodegradable products

There is no doubt about the importance of the EPNOE members' contributions and their expected impact in industry. The experience and the research previously performed by EPNOE in these and related fields can fit perfectly into the goals pursued by the European Union.

Dr Julian López-Viata- Gallardo - EPNOE Scientific Officer  
University of Maribor - Faculty of Mechanical Engineering  
Laboratory for Characterization and Processing Polymers (Slovenia)