



European Polysaccharide  
Network Of Excellence



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

## editorial

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**E**PNOE is adapting its organisation to a new situation. After October 2009, the European Commission contract that helped EPNOE to be established and to function will stop. EPNOE will continue its life through the EPNOE Association which gathers the initial 16 academic and research partners and the industrial members of its Business and Industry Club.

EPNOE will be run through four main internal sections and one external body.

The internal section will be composed of:

- Management section, under the responsibility of the President, taking care of the general coordination and management actions and of communication;
- Business and Industry Club (BIC), under the responsibility of the Coordinator, organising all the BIC events and constantly up-dating the BIC web site services;
- Research section, under the responsibility of the Vice-President for research, with its two sub-sections on Materials and Food;
- Education section, under the responsibility of the Vice-President for education, taking care of the EPNOE bi-annual conference.

A novel external section has been recently created to organise the relation between EPNOE and the European Commission-sponsored projects coordinated by EPNOE members. Three such projects are running, STEP (a twelve-partner, education-through-research Marie Curie project on polysaccharide materials), Surfucell (a four-year NMP large project about cellulose surface functionalisation with 13 partners) and Afore (a four-year NMP large project focusing in the area of forest biorefineries, more specifically on the development of separation, fractionation and upgrading technologies of the wood components to chemicals and polymers, with twenty partners). No doubt that several more projects will emerge in the near future. This section will promote interactions between EPNOE-coordinated EC projects by organising an annual joint meeting where the non-confidential results will be exchanged. The first meeting is planned for autumn 2010.

With this initiative, EPNOE is showing its capacity to organise research in Europe and boost knowledge circulation and innovation.



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

## news

### Recent events



#### EPNOE Food Group: 1st meeting

The first meeting of the EPNOE Food Group took place in Amsterdam in August 2009. The group built the foundation of what will constitute the EPNOE food road map and research activities. More information will be given in the next EPNOE Newsletter.

#### 'Polymers from Bioresources' EPF session

The European Polymer conference (EPF09) was organized in July 12-17, 2009 in Graz, Austria with more than 1000 participants. EPNOE had a session called 'Polymers from bioresources', which was organized by Anton Huber (University of Graz) and Pedro Fardim (Åbo Akademi University). The session had 49 oral presentations and nearly 100 posters with active participation of polymer and polysaccharide scientists.

#### Intensive Programme (IP)

The EPNOE Education Task Force ran an EU/EAECA supported Intensive Programme (IP) on 'Sustainable Utilization of Renewable Resources' in Graz from June 29th to July 10th for 50 Master and Doctoral students and will organise a similar event in summer 2010. More information: [www.cepolmc.nawigraz.at](http://www.cepolmc.nawigraz.at)

### Forthcoming events



#### EPNOE EC Contract: Final meeting

The final meeting of the EPNOE EC project will take place in Åbo, Finland, on September 25, 2009. EPNOE will continue to operate after this date in a self-sustained manner through the EPNOE Association umbrella.

#### 1st EPNOE conference

The 1st EPNOE Conference «Polysaccharides as a Source of Advanced Materials» will be held in Åbo/Turku (Finland) on September 21-24, 2009. There will be about 260 participants from 31 countries attending this meeting. More info: <http://congress.utu.fi/epnoe2009/>

#### 'Solvents interaction with cellulose'

EPNOE will organise a symposium called "Solvents Interaction with Cellulose" at the Spring ACS meeting, March 21-25, 2010 in San Francisco. The symposium will be organised by Charles Buchanan (Eastman Chemical Company), Patrick Navard (Center for Materials Forming, Sophia Antipolis) and Pedro Fardim (Åbo Akademi University).



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## news

### ► Members' info

#### **New project in sports textiles**

The University of Innsbruck will be involved in a five-year research activity including four scientific institutions and five industrial partners to conduct research about innovative sports textiles including polysaccharide materials. The tasks include performance improvement in competitive sports by cooling, compression, air resistance, rain-proof, breathable fabrics, textile for muscles and joints.

#### **New program in Biomass refinery**

The Finnish Funding Agency for Technology and Innovation (TEKES) is funding a new program in Biomass Refinery in cooperation with Finnish based industry. The total funding is about 10 million euro per year during five years and it is part of the framework of Forest Cluster Oy – a Strategic Centre for Science, Technology and Innovation. The Finnish members of EPNOE (Åbo Akademi University and VTT) have a key role in themes involving fractionation, hemicelluloses, lignin, cellulose and bioactive substances.

#### **Researchers' projects**

- Dr Hiroshi Kamitakahara, Mrs Chiyo Ishizu and Mr Atsushi Nakagawa from Kyoto University, Japan, are working at the University of Jena, financially supported by a DFG-JSPS grant, in the field of diblock copolymers of regioselectively functionalised cellulose ethers.

- Mrs Ludmila Fidale, PhD student of Prof. Omar A. El Seoud from the Sao Paulo University, Brazil, is staying at the University of Jena in order to prepare cellulose esters for polarity measurements. The work is supported by a joint DAAD-CAPES project.

- Tatiana Budtova (CEMEF, Sophia-Antipolis) is participating as a partner in a new French Research Agency (ANR)- sponsored project starting in Autumn 2009 on making hybrid nanostructured cellulose-based materials for thermal insulation of buildings.

#### **New Post-Doc**

Gulnura Fauland joined the group of Prof. Bechtold in the frame of the 'Sports Textiles' project funded by COMET Programme, FFG-Austria.

Topic: Thermal and moisture related properties of textile assemblies.

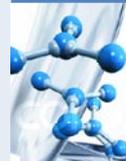
#### **New PhD student**

Björn Noske started his diploma thesis in the field of synthesis and characterisation of regioselectively functionalised cellulose derivatives. Supervised by Prof. Thomas Heinze.

### ► Forthcoming articles

Inclusion Complexes of  $\gamma$ -cyclodextrin and Carboxyl-modified  $\gamma$ -cyclodextrin with C60: synthesis, characterization and controlled release application via microgels, *A. Fifere, T. Budtova, E. Tarabukina, M. Pinteala, C. Peptu, V. Harabagiu, B. Simionescu*, Journal of Inclusion Phenomena and Macrocylic Chemistry

### ► Forthcoming articles



Effect of alkali pre-treatment on hydrolysis of regenerated cellulose fibers (part 1: viscose) by cellulases, *C. Schimper, C. Ibanescu, T. Bechtold* - Cellulose

Novel Aspects of the Renewable Resource Cellulose, *Th. Heinze, M. Janura, A. Koschella (Eds)* - Macromolecular Symposia

Evaluation of molten inorganic salt hydrates as reaction medium for the esterification of cellulose, *K. Thümmel, S. Fischer, J. Peters, T. Liebert, Th. Heinze* - Cellulose

Homogenous carboxymethylation of cellulose in the NaOH/urea aqueous solution, *H. Qi, T. Liebert, F. Meister, Thomas Heinze* - Reactive and Functional Polymers

Self-association of cellulose ethers with random and regioselective distribution of substitution, *S. Sun, T.J. Foster, W. MacNaughtan, J.R. Mitchell, D. Fenn, A. Koschella, Th. Heinze* - Journal of Polymer Science

Ammonium-Based Cellulose Solvents Suitable for Homogeneous Etherification, *S. Köhler, T. Liebert, Th. Heinze* - Macromolecular Bioscience

Comparative in vitro study on cytotoxicity, antimicrobial activity and binding capacity for pathophysiological factors in chronic wounds of alginate and silver-containing alginate, *C. Wiegand, Th. Heinze, U.-C. Hipler* - Wound Repair and Regeneration

On the specific behaviour of native cellulose fibers upon dissolution, *N. Le Moigne, P. Navard* - American Chemical Society series

Structural changes and alkaline solubility of wood cellulose fibers after enzymatic peeling treatment, *N. Le Moigne, K. Jardeby, P. Navard* - Carbohydrate Polymer

Comparison of solution-state properties of cellulose dissolved in NaOH/water and in ionic liquid (EMIMAc), *T. Budtova, M. Egal, R. Gavillon R, Gericke M, T. Heinze T. Liebert, C. Roy, K. Schluffer, P. Navard* - American Chemical Society series

Effect of Enzymatic Treatment on Solubility of Cellulose in 7.6%NaOH-water and Ionic Liquid, *P. Rosenberg, T. Budtova, M. Rom, P. Fardim*, American Chemical Society series

Effect of shear on the rheology and crystallisation of palm oil, *E. Tarabukina, F. Jégo, J-M Haudin, P. Navard, E. Peuvrel-Disdier* - J. Food Science



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## EPNOE activities

### Extent of collaboration between the 16 EPNOE academic and research partners.

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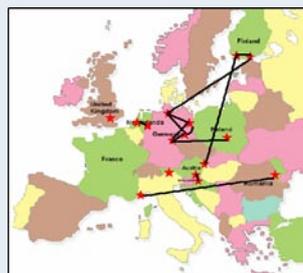
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**P**articipation to EPNOE for the 16 academic or research institutions was the occasion to boost research and education collaborations.

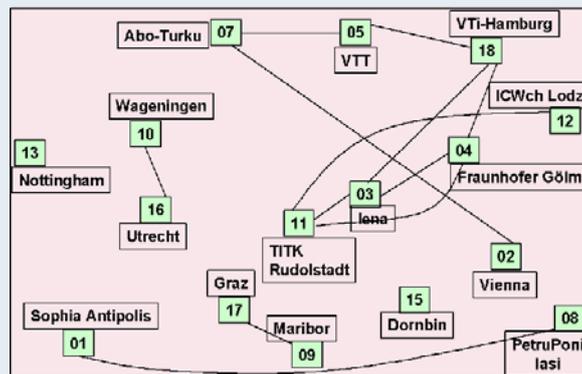
While between 2000 and 2004, less than ten formal collaborations were active, i.e. less than two per year on average (figures 1 and 2), there were more than 40 formal collaborations in 2008 and beginning of 2009, more than 30 implying students or post-docs (figure 3). More than twenty PhD are common to at least two partners and about 40 papers with at least two partners being co-authors were published or accepted in 2008-2009. This huge increase of collaboration is at the origin of many initiatives like R&D proposals to EC or transnational calls and common collaborations with companies.

Students are one of the beneficiaries of these tremendous and boiling research activities. Many students collaborated effectively with other institutions, from full co-advisory to more focused help (access to equipment, expertise). About fifty of them gathered in May in a private EPNOE meeting in Utrecht where they were given the chance to present their latest research results.

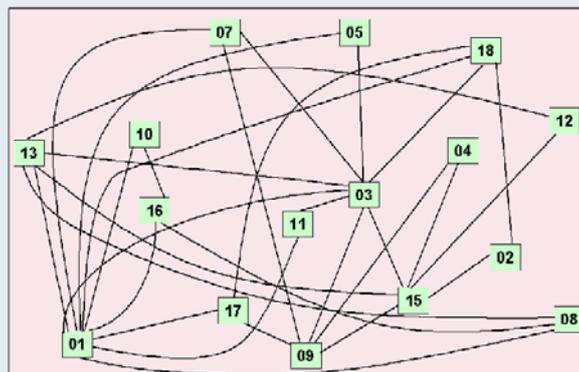
**Figure 1:**  
Formal collaborations having existed between 2000 and 2004 on a geographical map.



**Figure 2:**  
Same as Figure 1, redrawn. Each line corresponds to one or more collaborations between two partners. Numbers refer to the identity number of each partner.



**Figure 3:**  
Formal collaborations between the 16 EPNOE partners implying common work with undergraduate, graduate students or post-doctoral scientists in 2008-beginning of 2009.





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## EPNOE partners' research

### Advanced biomass-based materials

**T**he utilization of biomass as a source of advanced materials and chemicals is a rapidly growing research and technological field. The Department of Chemical Engineering at Åbo Akademi University (ÅA) has leading expertise in the areas of biomass conversion since 1920.

Currently we have more than 100 researchers working in topics of fractionation technology, chemo and thermo conversion, biopolymers, catalysis, bioactive substances and engineering of functional bio-based materials. The Laboratory of Fibre and Cellulose Technology (FCT) and the Laboratory of Wood and Paper Chemistry (3PK) are the active research partners participating in EPNOE. Both laboratories have a project portfolio which combines research topics of fundamental and industrial relevance.

The FCT research is focusing in creating high-added value fibre products and functional cellulose materials through a combination of interface chemistry, supramolecular chemistry and sustainable technologies. Disassembly and fractionation of biomass by using water based methods and directed re-assembly to obtain multifunctional cellulose materials is also in the core of FCT activities.

The 3PK research is focusing in extraction and functionalisation of hemicelluloses or bioactive substances from biomass, paper chemistry and development of analytical methods for biorefinery. The fundamental understanding of wood and papermaking at the molecular level is in the core of 3PK activities.

Our laboratory is equipped with state-of-the-art facilities like devices for investigating all fundamental and technological aspects of biomass fractionation and conversion into products, including chemical, physical and nano-scale characterizations. A synergistic cooperation with European industry is a long tradition in our department. We offer extended opportunities for collaboration with industry, research institutes and universities in national and international projects and also in contract research in form of master and doctoral theses.

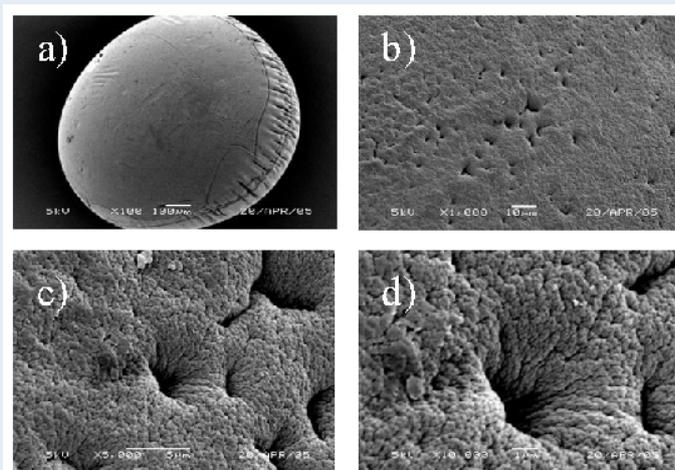


Fig. 1

Fig. 1: EM images of functional cellulose beads. The morphology of the beads can be tailored during manufacture. Magnification: a) 100x, b) 500x, c) 1000x, d) 10000x (Lab. of Fibre and Cellulose Technology)

More information:  
FCT-Pedro Fardim ([pfardim@abo.fi](mailto:pfardim@abo.fi))  
3PK-Stefan Willför ([swillfor@abo.fi](mailto:swillfor@abo.fi))

Prof. Pedro Fardim, Åbo Akademi University, Finland



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## Zoom on EPNOE activities

### EPNOE Road Map

**T**he sixteen research institutions of the European Polysaccharide Network of Excellence (EPNOE) and the companies associated with their Business and Industry Club are engaged in building a Road Map for the next 10-15 years focusing on polysaccharides. The EPNOE Road Map will describe the major research and education directions which must be followed to ensure the development of polysaccharide science and products at the horizon 2020-2025, taking into account the latest research trends and the present political, societal, educational and environmental issues.

**The EPNOE Road Map is based on three main contributions:**

 **The first contribution** is extracted from institutional and official data like EU policy, foreign policy (US, Brazil, Asia...) and from society needs expressed by various Non-Governmental Agency stakeholders. It expresses the positions of government and society towards the major questions faced in the World. They were selected on the basis where polysaccharides can play a role in solving them.

 **The second contribution** is composed of the views of industry. Key issues facing the industry to 2010 – 2015 described in Strategic Research Agendas of several technological platforms (Forestry, Suschem, Plant for the Future, Food for Life) where polysaccharide-based products should play a role were extracted and summarized together with market study data.

 **The third contribution** comes from scientist's views. It is a mix of the results of EPNOE brain storming sessions, of individual contributions of EPNOE scientists, of the analysis of scientific trends in publications and the opinion of scientists outside EPNOE. This part constitutes a very interesting set of research topics, organised in three categories: bio-assembly, dis-assembly and re-assembly.

These three contributions will be then assembled into an organised Road Map that will consider research and education. Two documents will be produced: an extended version restricted only to EPNOE members (both the academic partners and the industrial members of the Business and Industry Club) and a shorter one made public. The later will be used by scientists to better focus their research on emerging fields and should also induce companies, National funding agencies and the European Commission to offer calls for proposals in this area.

The Road Map is conducted by Patrick Navard - the Coordinator of European Polysaccharide Network of Excellence (EPNOE), the Research Task Force under the guidance of Karin Stana-Kleinschek, helped by Thomas Heinze, Volker Ribitsch and Anna Suurnakki and the Education Task Force under the guidance of Pedro Fardim, helped by Tim Foster, Anton Huber and Valeria Harabagiu. All EPNOE scientists and post-graduate students contributed to this Road Map project by participating in several brain-storming sessions.

Prof. Dr. Karin Stana-Kleinschek, EPNOE Vice-president of Research  
Dr. Zdenka Peršin, EPNOE Research Officer;  
University of Maribor, Faculty of Mechanical Engineering, Laboratory for Characterisation and processing of Polymers.