



European Polysaccharide
Network Of Excellence

N°3 - MAY 2007



“Nature produces polysaccharides, EPNOE turns them into materials”

editorial

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E PNOE is now an adult network with its two year anniversary celebrated this month. It is the largest organised group of research and education institutions in the World able to deal with all aspects of the use of biomass-based polysaccharides to prepare materials. At a time where the challenges associated with the shortage of oil resources, global warming, green chemistry and concerns about the handling of the biomass are at the forefront of most political and social agenda, EPNOE has more and more clear roles to play in research, education and expertise in national or EU committees.

The legal structure that will represent EPNOE and serve as a management unit has been created, after long legal discussions. Called “EPNOE Association”, it has the form of a non-profit body and is established in France. This is an important step towards both the insurance of a lasting character of EPNOE and the possibility to be represented and to interact officially with industry (see the article about the Business and Industry Club in this issue).

Research among the partners is now running at full speed with more than twenty large research projects and another set of more than thirty collaborations among the members. The first results are expected to be visible at the end of the year.

Two main actions will be conducted this year: education and establishment of close collaborations between EPNOE and industry. For this second action, a meeting between EPNOE and companies will be organised on November 30th in Paris. The preliminary agenda includes a presentation of new, exciting results from EPNOE research, a description of important research trends outside Europe (mainly Asia and USA), information about the activities of several organisations active in promoting biomass-based materials, information about FP7 and discussion around the services EPNOE should provide to industry.



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

news

▶ New Workshop



Institute of Biopolymers and Chemical Fibres in cooperation with Polish Chitin Society and Medical Academy in Wroclaw and with the support of the Ministry of Science and Higher Education are organizing:

13th Workshop “New Aspects on Chemistry and Application of Chitin and its Derivatives”

- Dates: 17-19 September 2007
- Place : Wroclaw (Poland)
- Information : ibwch@ibwch.lodz.pl

▶ New Students



University of Jena (Germany)
New diploma student

Holger Wondraczek «Reactive nanoparticles»

New PhD student

Shazia Saghir «Swellable polysaccharide derivatives for pharmaceutical applications»

New postdocs

Yin Xueqiong «Xylan derivatives»

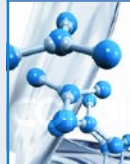
Fraunhofer Institute for Applied Polymer Research (Germany)

New PhD student

Andre Lehmann «Synthesis and Characterisation of Thermoplastic Polysaccharides»

Mirjam Mai is working on the Fermentation of Polysaccharide materials

▶ New Articles



Dialkylaminoethyl xylans: polysaccharide ethers with pH-sensitive solubility; K. Schwikal, Th. Heinze; Polymer Bulletin

Cellulose chemistry: Novel products and synthesis paths, book chapter; Th. Heinze, K. Petzold; In: Monomers, Oligomers, Polymers, and Composites from Renewable Resources (M.N. Belgacem, A. Gandini, Eds.), Elsevier Publishers

Synthesis and characterization of sulphur containing dextran- and cyclodextrin derivatives; St. Hornig, T. Liebert, Th. Heinze; Polymer Bulletin



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Description of Epnoe research

Fundamental theme 2 Disassembly of polymers: extraction, dissolution beha- viour and solution properties of polymeric components

Fundamental Theme 2 aims at developing structure-preserving methods for dissolution of polysaccharides from lignocellulosic biomass. Novel methods and techniques based on new biotechnical and green chemistry based pre-treatments and extraction techniques would allow isolation and characterization of various polysaccharides in an intact form. Preservation of structure would enable flexibility in further controlled modification of polysaccharides and consequently could permit access to new materials.

The scientific target of the theme is to gain understanding of the restraints for dissolution and extraction of biomass polysaccharides. Knowledge generated on the interaction between conventional and novel solvents and the polysaccharide structure will be exploited in development of new enzymatic, physical and chemical pre-treatment methods and extraction techniques, using both conventional and novel speciality solvents.

The work in Fundamental Theme 2 focuses on:

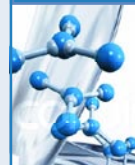
- Enhancing the dissolution of hemicelluloses from wood
- Enhancing the dissolution of cellulose in novel solvents
- Generating knowledge on the supramolecular structure of polysaccharides in chosen solvents
- Generating knowledge on the mechanism of dissolution and polymer and solvent interactions by analytical and modelling methods

The research contributed by EPNOE partners from Finland, Austria and France is expected to foster ideas for new technology that could enhance and intensify the extraction of polysaccharides from various, chosen biomass materials. It is also expected to open doors to entirely new techniques for comprehensive utilization of biomass for high-value products and materials.

Dr. Anna Suurnäkki
Fundamental Theme 2 Team Leader
VTT Biotechnology (Finland)

news

► New Articles



Lignin and polyphenols as allelochemicals; V. I. Popa, M. Dumitru, I. Wolf, N. Anghel; Industrial Crops and Products

On cellulose reactivity in heterogeneous acetylating media; N. Olaru, D. Ciolacu, L. Olaru; e-Polymers

Solution properties of triphenylsilylcellulose; D. Bontea; J. Appl. Polym. Sci.

Removal of uranyl ions from waste waters using cellulose and modified cellulose materials; D. Bontea, C. Mita, D. Humelnicu; J. Radial. Nucl. Chem.

New polysaccharide-based microparticles crosslinked with siloxanic units. I. Synthesis and characterization; G. Mocanu, D. Mihai, D. LeCerf, L. Picton, V. Dulong; React. Funct. Polym.

Cellulose acetate butyrate/intelligent polymer microcapsules containing aminated poly(vinyl alcohol) microspheres for oral administration; Gh. Fundueanu, M. Constantin, F. Bartolotti, R. Cortesi, P. Ascenzi, E. Menegatti; J. Pharm. Biopharm.

Synthesis and characterization of polyrotaxanes based on cyclodextrines and viologen-modified polydimethylsiloxanes; N. Marangoci, A. Fifere, A. Farcas, A. Perichaud, V. Harabagiu, B. C. Simionescu, M. Pinteala; Polymer

Polyrotaxanes composed of beta-cyclodextrines and polydimethylsiloxanes: synthesis, morphology and thermal behavior

N. Marangoci, A. Farcas, M. Pinteala, B. C. Simionescu, T. Sukhanova, S. Bronnikov, A. Grigoryev, G. Gubanova, M. Perminova, A. Perichaud; Polymer

Studies on the enzymatical hydrolysis of 1.6 -glycoside bonds in potato starch; J. Kazimierzak, D. Ciechanska, D. Wawro; Fibres & Textiles in Eastern Europe.

Novel Nanoparticles Based on Xylan; Th. Heinze, K. Petzold, St. Hornig; Cellulose Chemistry and Technology



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The « Business and Industry Club » (BIC) of EPNOE

Biomass-based products is one of the few areas where the distance between fundamental and applied research is very small. Advances in the basic understanding of key issues can be very quickly used to create new materials or improve drastically the properties and processing of the existing ones. It is thus of the utmost importance that strong, active links between EPNOE members and industry are established. Such a close collaboration should benefit both sides, the research groups of EPNOE members by being better aware of the industrial challenges and industry by knowing the latest research trends and using EPNOE scientists as a collaborative pool of experts.

To promote such an interaction, an EPNOE "Business and Industry Club" (BIC) is established. Its main aim is to help EPNOE to take into consideration the industry points of view and needs in research and education, to initiate common applied projects and to provide the industry with useful information to improve their research.

The Business and Industry Club will offer a set of six main services to companies in exchange for an entrance fee:

Service 1 - Privileged access to some EPNOE partners databases

- List and description of all on-going PhD and Master theses;
- CV's of all Master and PhD students looking for a job available before being sent to other companies (with the agreement of the students);
- Name and coordinate of EPNOE researchers with their field of expertise. Access to EPNOE partners equipment database.

Service 2 - Privileged access to some of EPNOE Research Information

- Full text of non-confidential EPNOE partner's PhD and Master theses;
- Pre-prints of research papers;
- Reports of some of the common basic and non-confidential research undertaken by EPNOE Members;
- Invitation to the PhD defence of EPNOE Member's PhD students, when this is public;
- Once a year, reception of a review paper on a topic selected by the members of the BIC.

Service 3 - Privileged access to Strategic and Technological Watch data of EPNOE

- Up-dated list and description (structure, object, contact, documents, events) of most of public and private organisations in the World involved in promoting the use of renewable resources;
- Information about the participation of EPNOE in consultative- or decision-making bodies;
- Translation into English of communications at National conferences where the language is not English (European countries plus Japan, Brazil and China);
- Updated news on polysaccharide science and policy;
- Access to the EPNOE database listing the most important papers in polysaccharide research (more than 10 000 papers already listed and classified, some with the full PDF file).

Service 4 - Organisation of Dedicated meetings

- Private Annual Business and Industry Club scientific conference;
- Tutorials on new "hot off the press" topics;
- Annual General Meeting/Working Panel of the BIC members (sharing expertise and knowledge, considering technical development affecting company operations, building an awareness of importance and impact of the developing legislation, meeting potential customers/partners and defining educational needs for knowledge transfer).

Service 5 - Close interaction with EPNOE

- Participation to the definition of the common fundamental research of EPNOE;
- Platform for suggesting basic topics of interest for industry;
- Using the expertise of EPNOE partners for building National and European projects with EPNOE Members.

Service 6 - Dedicated infrastructure to enforce BIC networking activities

- Access to a private BIC web site (collaborative platform);
- Promotion of products and expertise of each BIC member.

For more information send a mail to:
patrick.navard@epnoe.eu

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Coordinator of EPNOE
Ecole des Mines de Paris (France)



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Zoom on EPNOE Partners' research

Modification of Cellulosic Textile Materials towards New Products

The industrial and consumer markets have a growing demand for environmentally-friendly, high-performance and wear-comfort textiles. A specialized working group at the Research Institute for Textile Chemistry and Textile Physics (Dornbirn, Austria) has been investigating new ways of fulfilling the modification factors for regenerated cellulosic textile materials (NMMO and xanthogenate type) germane to the influence of several swelling solutions, their mixtures as well the accessibility levels of vapour, salts and ions.

A material surface modification is expected to occur simply by dipping in swelling solutions. A partial dissolution of cellulose molecules may take place initially on the surface with simultaneous swelling of amorphous and crystalline regions, depending on solution type and concentration. The swelling modifies the cellulosic textile material parameters such as accessibility, carboxyl content, swelling degree (fiber diameter, water/solvent retention values), tensile strength/elongation, abrasion resistance, crystallinity, dyestuff uptake, splitting/fibrillation numbers and pilling rates.

In addition to the swelling agent (alkali), the catalyst type/concentration (salt) is an important parameter affecting the accessibility of cellulosic textile materials. The accessibility of different salts is done by electrokinetic studies. Other methods to investigate different levels of accessibility in cellulosic textile

materials are dynamic water vapour sorption, iodine sorption capacity and complexation of Fe (III) – ions with cellulose structure in alkaline solution.

These results appear to indicate a complex interaction between regenerated cellulosic substrates (as insoluble polymer) and the selected reagents and catalysts. Furthermore, there is the possibility of using such systems in alternative routes for processing cellulosic textile materials.

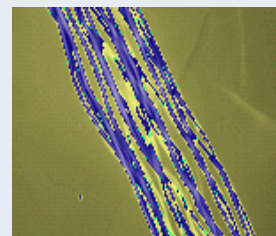


Figure 1: Splitting of lyocell fibre in an alkali solution

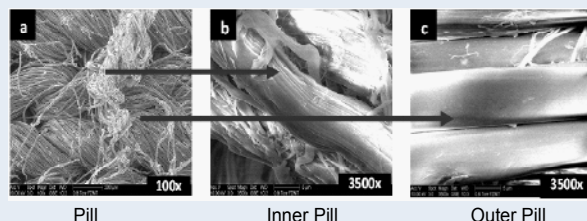


Figure 2: Lyocell structure deformation caused by abrasive treatment

Dr. Anelise Ehrhardt, Institute of Textile Chemistry and Textile Physics, University of Innsbruck Dornbirn-Austria

Novel Technology for Cellulosic Nonwovens

The Fraunhofer Institute for Applied Polymer Research, Potsdam-Golm/Germany, the US company Weyerhaeuser, and REICOFIL GmbH, Germany have jointly developed a technology for manufacturing cellulosic self-bonded melt-blown nonwovens utilising the lyocell process. A pilot line with a working width of 60 cm was installed at the Fraunhofer Institute. Cellulosic micro fiber nonwoven fabrics with basic weights from 10 to 200 g/m² with excellent absorbency/strength properties can be produced on this line. The novel technology has been presented at various international conferences and is published in Chemical Fibers International 4/2006 and Lenzinger Berichte, 86 (2006) 124 -131. Contact www.iap.fraunhofer.de for further information.

Dr. habil. Hans-Peter Fink and Dr. Horst Ebeling
Fraunhofer Institute for Applied Polymer Research, Potsdam, Germany

