



European Polysaccharide
Network Of Excellence

N°8 - NOVEMBER 2008



**“Nature produces polysaccharides,
EPNOE turns them into materials”**

editorial

Autumn is bringing new challenges to EPNOE scientists. Like leaves falling from trees in our forests, new calls for collaborative projects are falling from the European Commission. Already, EPNOE scientists have enjoyed their first success with two large projects having been accepted mid-2008:

- 1- STEP, coordinated by Dornbirn (Marie Curie Research network, 4.3 Meuros).
- 2- Surfucell, coordinated by Graz (research project, 8 Meuros).

In September 2008, EPNOE scientists submitted four other projects, two of which have already passed the first stage:

- 1- Biorefining of agrobiomass by-products (Marie Curie network), coordinated by VTT.
- 2- Bioplastics (Marie Curie network), coordinated by Armines.
- 3- H2n0 (research project packaging), coordinated by Wageningen (passed first stage).
- 4- AFORE (research project forest biorefinery area related), coordinated by VTT (passed first stage).

There will be opportunities to discuss the latest EC calls and to prepare the organisation of proposals during the EPNOE Business and Industry Club (BIC) meeting being held in Hamburg on October 9 & 10 and at other EPNOE meetings. When successful these projects are boosting our research capacities and offering many PhD students and post-doctoral scientists the opportunity to become experts in polysaccharide research. As a consequence they will move on to industry where there is an extensive and increasing demand for high level scientists able to understand the scientific, technological and societal challenges associated with the field of biomass-based polymers.



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

news

▶ Events



Workshop

11th European Workshop on Lignocelluloses and Pulp (EWLP)

EWLP is a conference series, which takes place every 2nd year and which was originally started 1990 in

Hamburg. The 10th EWLP, recently organized in Stockholm attracted 230 participants from 26 countries.

- Date: August 16-19, 2010
- Place: vTI, Hamburg (Germany)
- Information: juergen.puls@vti.bund.de

▶ Members' info



New staff:

University of Jena (Germany):

Dr. Hiroshi Kamitakahara joined the group of Prof. Heinze in the frame of the joint project «Synthesis and structure-property-relationships of cellulose diblock-copolymers with re

gioselective functionalization» funded by DFG and JSPS.

University of Nottingham (UK):

Dr Mitaben Lad has joined Tim Foster at Nottingham to work on polysaccharide blends in food relevant systems. Her initial studies involve the comparison between xanthan and guar gum in the presence of starch systems.

New students:

University of Jena (Germany):

M. Sc. Taha Genco joined the University of Jena as new Ph. D. student working in the field of unconventional chemistry of polysaccharides.

Petru Poni (Iasi, Romania):

George Stiubeanu, Hybrid materials based on siloxanes and lignocellulosic derivatives
Supervisor: Prof. Bogdan C. Simionescu

Award:

Within the 8th International Symposium «Alternative Cellulose» (ALCERU) held in Rudolstadt, Germany, September 3-4, 2008, Stephanie Hornig was honored with the «ALCERU Award 2008», in the category «Young Elite» for the development of new concepts for the design of nanostructures based on polysaccharides.



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New lab:

A new Christian-Doppler lab «Advanced cellulose chemistry and analytics» was founded at the Department of Chemistry, BOKU University Vienna. Financed 50% from five industrial partners and

50% from the Austrian government for a total of 7 years, the lab consisting of a team of 5 PhD students and postdocs under the supervision of Univ.Prof.

Thomas Rosenau and Ao.Univ.Prof. Antje Potthast will conduct research into basic and applied aspects of cellulose chemistry.

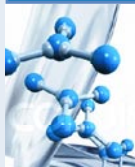
New equipment:

The Thuringian Institute for Textiles and Plastics (TITK, Germany) is currently expanding its capabilities towards the preparation of nano-functionalised materials. A Nanospider NS LAB 200S (Elmarco) lab-scale spinning machine was purchased to place nano-fibre coatings on top of substrates, preferably non-wovens.

Collaboration:

The University of Maribor (Slovenia) and Abo Akademi (Finland) are cooperating on analysis and functionalization of spruce galactoglucomannans. Docent Stefan Willför from ABO visited Maribor in April and Aleš Doliška Abo in August. The ultimate goal is to develop a polysaccharide formulation, which can be used for anticoagulation in medicine.

Forthcoming articles



Influence of the functionalization pattern of ethyl cellulose on the interactions with polystyrene latex particles in aqueous mixtures; *W. A. Wennerstrand, M. Olsson, L. Järnström, A. Koschella, D. Fenn, T. Heinze* - Journal of Colloid and Interface Science

Novel Cellulose Ether 3-Mono-O-(3'-hydroxypropyl) Cellulose: Synthesis and Structure Characterization; *K. Schumann, T. Heinze* - Macromolecular Symposia.

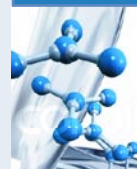
Hydrolytic stability of water-soluble spruce O-acetyl galactoglucomannans; *C. Xu, B. Holmbom, H.A. Schols, S. Willför* - Holzforschung, in press.

Phthalimide-N-oxyl (PINO) Radical, a Powerful Catalytic Agent, Its Generation and Versatility Towards Various Organic Substrates; *S. Coseri* - Catalysis Reviews.

Water soluble sulconazole- α -cyclodextrin complex: physico-chemical characterization and preliminary pharmacological studies; *L. Miron, M. Mares, V. Nastasa, M. Spulber, A. Fifere, M. Pinteala, V. Harabagiu, B. C. Simionescu* - Journal of Inclusion Phenomena and Macrocyclic Chemistry.

Polydimethylsiloxane modified chitosan. III. Preparation and characterisation of hybrid membranes; *D. Enescu, V. Hamciuc, Rodinel Ardeleanu, Mariana Cristea, A. Ioanid, V. Harabagiu, B.C. Simionescu* - Carbohydrate Polymers

Forthcoming articles



Polydimethylsiloxane modified chitosan. III. Preparation and characterisation of hybrid membranes; *D. Enescu, V. Hamciuc, R. Ardeleanu, M. Cristea, A. Ioanid, V. Harabagiu, B. C. Simionescu* - Carbohydrate Polymers.

Interactions of Ionic Liquids with Polysaccharides. IV. Dendronization of 6-Azido-6-Deoxy Cellulose; *T. Heinze, M. Schöbitz, M. Pohl, F. Meister* - Journal of Polymer Science: Part A: Polymer Chemistry.

Interactions of Ionic Liquids with Polysaccharides.7: Thermal stability of cellulose in ionic liquids and N-methylmorpholine-N-oxide; *S. Dorn S., F. Wendler, F. Meister, T. Heinze* - Macromol. Mater.

Dressing Sponges from Chitosan and Chitosan-Alginate Fibres; *M. Kucharska, A. Niekraszewicz, M. Wisniewska-Wrona, K. Brzoza-Malczewska* - Fibres & Textiles in Eastern Europe.

Forming conditions and properties of starch film; *D. Wawro, J. Kazmierczak* - Fibres & Textiles in Eastern Europe

Pilling in Cellulosic Fabrics, Part 1: Assessment of Pilling Formation Method; *H.M. Bui, A. Ehrhardt, T. Bechtold* - Journal of Applied Polymer Science

Pilling in Cellulosic Fabrics, Part 2: A Study on Kinetics of Pilling in Alkali-Treated Lyocell Fabrics; *H.M. Bui, A. Ehrhardt, T. Bechtold* - Journal of Applied Polymer Science

Effect of NaOH Treatment on Swelling and Dyeing Properties of Lyocell Fibers; *H.B. Öztürk, T. Bechtold* - Fibers and Textiles in Eastern Europe

Splitting Tendency of Cellulosic Fibers Part 3: Splitting Tendency of Viscose and Modal Fibers; *H.B. Öztürk, T. Bechtold* - Cellulose

Swelling Behavior of Cellulosic Fibres – Part I: Changes in Physical Properties; *A. Ehrhardt, S. Groner, T. Bechtold*, Fibers and Textiles in Eastern Europe

CI Reactive Black as a visible crosslinker to Improve Physical Properties of Lyocell Fabrics; *H.M. Bui, A. Ehrhardt, T. Bechtold* - Cellulose

Changes in the intra- and inter-fibrillar structure of lyocell (TENCEL®) fibers caused by NaOH treatment; *H.B. Öztürk, A. Potthast, T. Rosenau, M. Abu-Rous, B. MacNaughtan, K.C. Schuster, J. R. Mitchell, T. Bechtold* - Cellulose



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Description of EPNOE research

Life Cycle Assessment

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Life Cycle Assessment (LCA) is the most important method for assessing the environmental impacts of a product. It is an internationally standardized approach (ISO) that covers all life stages of a product. LCA encompasses the entire process chain covering all steps from the extraction or cultivation of raw materials, via pretreatment, conversion and downstream processing and, in addition, the product usage and waste management.

LCA is applied:

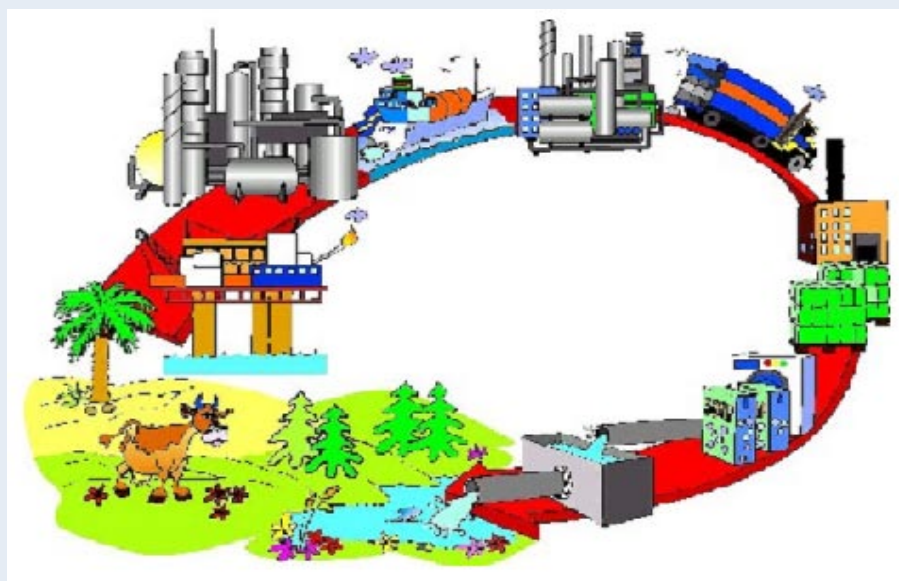
- As an input for decision making in ongoing R&D
- For identifying improvement options and improvement potentials in existing processes
- In order to make strategic decisions about future R&D and to take investment decisions
- To support decision making of public bodies (e.g., for decisions on research funding and policy making)
- For corporate environmental reporting and for marketing reasons.

Within EPNOE, LCA services are offered by the Department of Science, Technology and Society (STS) at Utrecht University in the Netherlands. In the past, Utrecht University has conducted environmental assessments of man-made cellulose fibres, starch polymers, bio-based packaging films and bio-based chemicals produced by biotechnology and by C1 chemistry.

The body of work done (by Utrecht University and by others) shows the clear potential of bio-based chemicals to reduce the environmental impacts, in particular those related to non-renewable energy use and greenhouse gas emissions. The work also shows that substantial differences in

For further information please contact Dr. Martin Patel, m.k.patel@uu.nl

Martin Patel
Leader of the LCA activity
University of Utrecht (The Netherlands)





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Zoom on EPNOE Partners' research

Functionalisation of oriented polymer material

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With the goal of developing more functionalized materials, the research and development activities of the Laboratory for Characterisation and Processing of Polymers (LCPP) are concentrated on modification of oriented polymers using various polysaccharides from the solution onto the outer surface and onto/into accessible inner surfaces of the polymer materials as well as on nano – coatings (Figure 1). At LCPP different analyses of polymers with the accent on surface modifications are performed in order to define surface morphology, streaming potential, surface charge, the quality and quantity of specific dissociable and accessible groups, their dissociation constant (pK values) in solvents of different polarity, contact angle, quantity and quality of surface energy and adsorption character.

Functionalisation by specific adsorption

Chitosan coating at the material finishing stage leads to advanced products for different every day use and especially medical treatments. Antimicrobial properties, especially with regard to the reduction of pathogen bacteria, can be evaluated using conductometric titration (Figure 2), while the adsorption behaviour of chitosan on PET model film surfaces can be monitored using the quartz crystal microbalance (QCM) technique as detecting a submonolayer of adsorbate on the quartz crystal surface.

Nano treatment

Applications of monodisperse silica nanoparticles (SiO₂) on activated cellulose fibres (Figure 3) via the sol-gel process result in shifting the temperature at which cellulose starts to degrade to higher values. Self-cleaning textile surfaces can be prepared using TiO₂ nano-coating via different procedures. Nanomodification of textiles by magnetic particles alters their protective ability against electromagnetic radiation caused by different advanced devices.

More information: karin.stana@uni-mb.si
<http://loppm.fs.uni-mb.si>

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

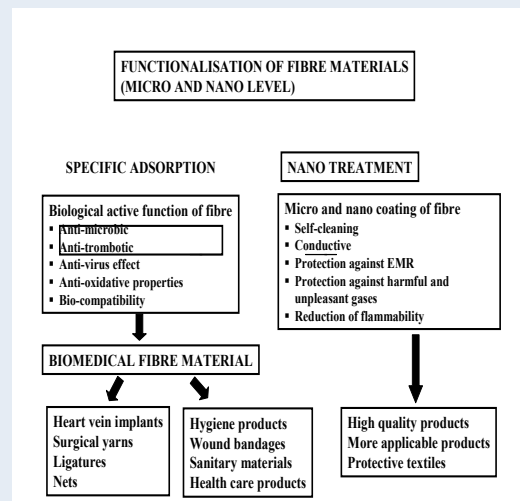


Figure 1: LCPP research and development activities

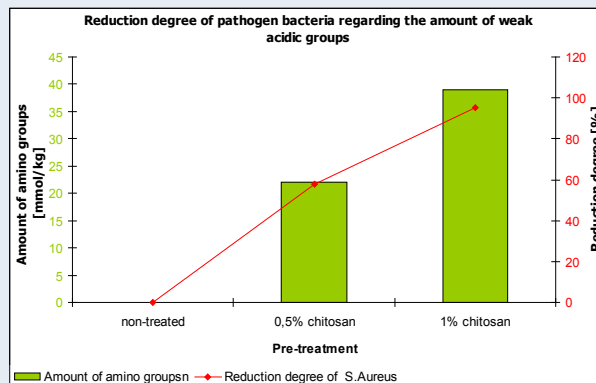


Figure 2: Reduction degree of pathogen bacteria regarding the amount of weak acidic groups in cellulose polymer determined by conductometric titration

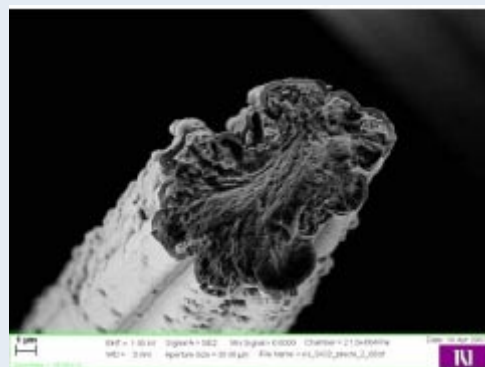


Figure 3: Cross-section of viscose fibres after silica growth in 5 ml of solution 0.2 w% TEOS as SEM image



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Governing Board of EPNOE:

The 8th Governing Board meeting of EPNOE took place in Hamburg on October 8-9, 2008. The 16 EPNOE institutions were represented.



2nd Business and Industry Club (BIC) meeting:

A very profitable and rich meeting took place in Hamburg on October 9-10, 2008.

Programme of the 2nd BIC meeting:

Thursday 9 October

- 14:00 - 14:20 Welcome – Overview of BIC - P. Navard (Sophia Antipolis, France)
- 14:20 - 14:50 Presentation of the fundamental research directions of EPNOE - T. Heinze (Jena, Germany)
- 14:50 - 15:20 Towards understanding Food Polysaccharide Functionality on a Molecular Level - H. Schols (Wageningen, the Netherlands)
- 15:20 - 15:50 Enzymes as smart tools in tailoring biomaterials - Anna Suurnäkki (Helsinki, Finland)
- 15:50 - 17:00 Coffee break and EPNOE academic institution poster session.
- 17:00 - 17:30 Lignocellulose biorefinery - J. Puls (Hamburg, Germany)
- 17:30 - 18:15 General discussion
- 18:15 End of afternoon session
- 19:00 Dinner

Friday 10 October

- 8:30 - 9:00 EC projects: EC call, EPNOE projects that are planned and opportunities for BIC members - K. Stana Kleinschek (Maribor, Slovenia)
- 9:00 - 9:30 Controlling cellulose dissolution: thermodynamical versus structural effects - P. Navard (Sophia Antipolis, France)
- 9:30 - 10:00 Polysaccharide coatings in medical applications - K. Stana-Kleinschek (Maribor, Slovenia)
- 10:00 - 11:00 Coffee break and BIC industrial partner poster session.
- 11:00 - 11:30 Scientific strategies towards new textile fibres - T. Bechtold (Innsbruck, Austria)
- 11:30 - 11:50 Overview of the three EPNOE market studies - Danuta Ciechanska (Lodz, Poland), J. van Dam (Wageningen, the Netherlands) and M. Patel (Utrecht, the Netherlands)
- 11:50 - 12:15 EPNOE Education actions - 1st EPNOE conference – Pedro Fardim (Åbo Finland)
- 12:15 - 12:30 Conclusion - End of meeting

▶ Members' info



Recruitment

Marie Curie fellowships (PhD and Post-doc) will be available at:

- Research Institute of Textile Chemistry/Physics, University of Innsbruck, Austria
- Institute of Organic Chemistry and Macromolecular Chemistry, University of Jena, Germany
- School of Biosciences, University of Nottingham, UK
- Institute of Biopolymers and Chemical Fibers, Poland
- Laboratory for Characterization and Processing of Polymers, University of Maribor, Slovenia
- East Thuringian Material Testing Company, Germany
- Innovation and Business Development Textiles, Lenzing AG, Austria
- Unilever Food and Health Research Institute, Netherlands

For more information, please go to:
www.uibk.ac.at/textilchemie/mc/step-itn.html

New students:

Center of Material Forming (Cemef - Armines):
PhD Students:

- Anne Le Duc: Multilayer films with biomass-based core
- Kim-Anh Le: Cellulose dissolution and surfaces (Surfuncel EC Project)

PhD Defence:

The following PhD defences will take place in Cemef, Sophia-Antipolis (France).

- Topic: Swelling and dissolution mechanisms of cellulose fibres
Name: Nicolas Le Moigne
Supervisor: Patrick Navard
Date: 9 December 2008
- Topic: Study of the dispersion mechanisms of silica in elastomers
Name: Céline Roux
Supervisor: Patrick Navard, Edith Disdier
Date: 16 December 2008
- Topic: Numerical Modelling of Dip-coating
Name: Emmanuelle Rélot
Supervisor: Patrick Navard, Jérôme Bikard
Date: 17 December 2008
- Topic: Flow properties of starch suspensions. Comparison to other food thickeners
Name: Melinda Desse
Supervisor: Tatiana Budtova, John Mitchell, Bettina Wolf
Date: 19 December 2008