



European Polysaccharide
Network Of Excellence



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

editorial

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E PNOE is entering its fourth year; the last year where the construction of the network will be supported by the European Commission and when all the necessary Research and Education tasks will have to be terminated. It is also the year devoted to consolidating the building of the Business and Industry Club (BIC) of EPNOE which is now operational. Current and future developments are:

1. The BIC web site is complete with its range of services offered to BIC members

2. EPNOE members are preparing themselves to respond to a series of calls for research proposals which the European Union will announce this autumn. This will provide an opportunity for BIC members to further extend research collaboration.

3. A private BIC meeting with scientific talks will be organised by EPNOE on 9th & 10th October 2008 in Hamburg, Germany. This meeting will facilitate the dissemination of the latest results of EPNOE members and provide time for sharing information and building projects. The full programme will soon be available on the EPNOE web site.

EPNOE is very active in organising joint European and International meetings where European and foreign scientists share experiences and data.

1. Europe/Japan: Several EPNOE members have a long standing history of coordinating a joint Europe/Japan cellulose conference. The last one was co-organised in Kyoto by the University of Natural Resources and Applied Life Sciences, Vienna Austria. The next Europe/Japan cellulose meeting will be held in Hamburg between the 16th and 19th September 2009, co-organised by vTI "Institute for Wood Technology and Wood Biology", Hamburg Germany.

2. EPNOE-American Chemical Society: A very successful EPNOE-American Chemical Society meeting took place in New-Orleans last March, co-organised by Åbo Akademi, Turku Finland with the participation of officials from the US department of Agriculture and the European Commission.

3. EPNOE/India: This will be an EPNOE/Polymer Processing Society one-day meeting on polysaccharide processing organised by Cemef, Sophia Antipolis, France in March 2009 in Goa, India.

I wish all the many readers of our EPNOE newsletter a very enjoyable summer.



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

news

► Conference



1st EPNOE international conference on polysaccharides

Polysaccharides as a Source of Advanced Materials

- Date: September 21-24, 2009
- Place: Turku/Åbo (Finland)
- Information: <http://congress.utu.fi/epnoe2009>

► Members' info



New student:

Nuno dos Santos, studying cellulose dissolution within the Centre for Material Forming/ Ecole des Mines/ CNRS (Sophia-Antipolis, France); the University of Hamburg/ vTI «Johann Heinrich von Thuenen Institute» (Germany) and the University of Jena (Germany).

Scientific achievements:

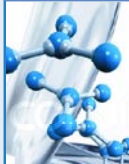
At the 9th International Hydrocolloids conference in Singapore an entire session was dedicated to the scientific achievements of John Mitchell (University of Nottingham) culminating in the presentation of the Food Hydrocolloids Trust medal.

A second accolade has recently been bestowed on John Mitchell by being elected to "a worldwide group of elected distinguished food scientists and technologists" - the International Academy of Food Science and Technology.

New Starch Processing Centre:

The University of Nottingham's polysaccharide research capability will be substantially enhanced following the opening of a 1M€ Starch Processing Centre in the Division of Food Sciences supported by the East Midlands Development Agency (<http://www.nottingham.ac.uk/biosciences/starch-centre/>)

► Forthcoming article



Upgrading of paper grade pulps to dissolving pulps by nitren extraction: yields, molecular and supramolecular structures of nitren extracted pulps; R. Janson, J. Puls, A. Bohn, A. Potthast, B. Saake - Cellulose DOI10.1007/s10570-008-9224-6



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Zoom on EPNOE Partners' research

Biobased innovations

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At AFSG-WUR (Agrotechnology and Food Sciences Group, Wageningen UR), research and development activities are concentrated around sustainable applications for safe food and non-food products. By smart combination of interdisciplinary expertise, novel bio-inspired options are investigated and concrete solutions are invented in close corporation with small and large business & industrial partners and with support from governments and investors from all continents.

Non-food

The better use of renewable resources fits in the global policy of CO₂ neutral production to combat climate change and the consequently developing bio-based economy. Industrial strategic research is focussed on novel methods for biorefinery and product manufacturing based on biomass from crops or by-products from the agro-food industries. Bio-polymer based films, composites and coatings are designed for the functional demands in the end products. Lignocellulosic and carbohydrate rich biomass can be converted effectively, profitably and sustainably into high value chemicals, polymers or materials and fuel or energy. A central role is granted for polysaccharide processing and technologies for conversion to bio-polymers or derivatives into value added products. International collaboration to investigate novel - and sometimes exotic - resources provides perspective for new industrial activities.

Food

Also in the area of healthy, tasteful, and safe foods AFSG-WUR develops new concepts and technologies that are meeting consumers' food preferences. Storage of fresh commodities, smart packaging, chain logistics, sensoric quality control are studied. Knowledge of the complete production chain and distribution networks are combined with epidemiology, toxicology & molecular, microbial and biophysical sciences, bio-active ingredients, and process technology. This approach enables the design of healthy and safe food including dietary fibre, prebiotics and functional foods.

Biodegradable disposable packaging films based on starch for:



Figure 1: Food items (potatoes)



Figure 2: Compostable bag for organic household waste

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www.fibrecrops.nl
www.afsg.wur.nl
www.biobasedproducts.wur.nl

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Description of EPNOE research

Fundamental Theme 6: Polysaccharides in human technology

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Polysaccharides play a key role in human health and well being. Nowadays, polysaccharides are applied as functional food ingredients and prebiotics, as drug carriers, gels for skin care or vaccines. Many different biological roles for polysaccharides have been reported from specific cytotoxicity for tumor cells to immune enhancing properties. The potential of polysaccharides as nanomaterials for medical, pharmaceutical and cosmetic applications is boundless.

Fundamental Theme 6 targets:

In this context, key targets of FT6 are to develop novel polysaccharide architectures and applications for these biomaterials. Topics of interest for EPNOE partners involved in this field are:

- Polysaccharide-based nanocarriers for drug delivery systems,
- Modification of polysaccharides for antithrombotic applications
- Novel polysaccharides with anti-microbial properties

Research highlights:

Research to date, with contribution by EPNOE partners from the Netherlands, Poland and France, focused on the preparation and characterisation of novel polysaccharide materials for target delivery and controlled release of bioactive compounds .

Starch-based nanocarriers: Reactive derivatives of various starches with DS of 0.2 ± 0.01 were obtained and characterized by NMR, SEM, X-Ray and rheology (Figure 1). Epoxidation of these AHP-starch derivatives and cross-linking with a spacer produced sol-gel structures suitable for encapsulation of bioactives.

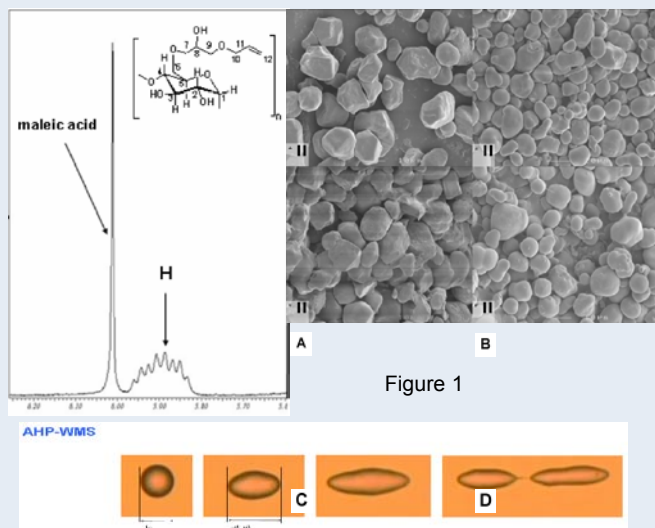
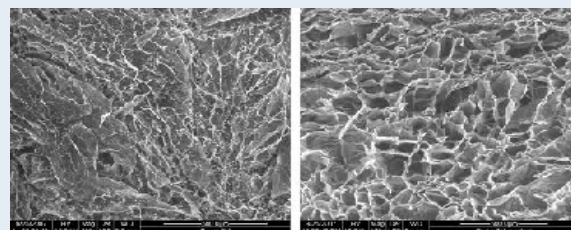


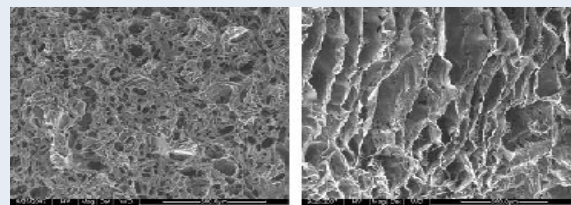
Figure 1

Figure 1. Characteristics of modified starches: 1H-NMR fingerprint of the AHP-group in reactive starch (left); SEM images (right) of (A) waxy-maize starch (WMS), (B) amylose-enriched starch (AEMS) and their AHP derivatives (C: AHP-WMS) and (D: AHP-AEMS), respectively; Optical micrographs of AHP-WMS droplets of granules suspensions deforming in time (t) and under shear stress (σ) (down).

Chitosan-based nanocarriers: A range of chitosan-derived materials were obtained and characterized by X-ray, SEM and GPC. Some of the novel materials obtained are (a) microcrystalline chitosan (MCCh), as nanoparticle suspension or sponge, (b) gels of chitosan-lactate (c) composite chitosan – alginate material in a sponge form, (Figure 2) and (d) bacterial cellulose modified with microcrystalline chitosan (Figure 3).



a) Surface
b) Cross-section
(Gel of chitosan salt / sodium alginate, 50%:50%)



a) Surface
b) Cross-section
(Microcrystalline chitosan / sodium alginate, 50%:50%)

Figure 2. SEM micrographs of composite chitosan/alginate sponge to be used as drug carrier



Figure 3. Composite of bacterial-cellulose-chitosan.

More information can be found in recent publications of the EPNOE partners:

- Huijbrechts, A.M.L., et al. (2007) J. Polymer Sci. part A. Polymer Chemistry, 45(13):2734-2744
- Huijbrechts, A.M.L., et al. (2008) Carbohydrate Polymers. Doi:10.1016/j.carbpol.2008.02.001
- Niekraszewicz, et al., (2007) Fibres & Textiles in Eastern Europe, 1 (60): 101-105.

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