



European Polysaccharide
Network Of Excellence



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

editorial

Dear readers,

On March 1st, 2012, a new European Commission funded project called EPNOE CSA started with the aims of expanding and strengthening EPNOE activities. EPNOE was selected after a tough competition where only five such networks were successful. This new project is specifically dedicated to increase EPNOE interactions with industry in all sectors of activities and to expand EPNOE activities over two areas: Food and Health. This new project is a chance for all EPNOE members to develop our knowledge-transfer organisation among a wider scientific and technological academic, research and industrial community network. One meeting was already organized in Sophia Antipolis in March. Its programme is available on our public website. It comprised the EPNOE Association Governing Board meeting and the 1st EPNOE CSA Industrial meeting 2012 with topics like:

- Presentation of 14 new projects accepted or recently submitted by EPNOE members in EU or National funding institutions
- Recent results obtained by four on-going European projects
- Presentation of activities and results in COST Action FP0901
- EPNOE Industrial Conference, a new concept devised in collaboration with Erfurt Messe in Germany
- Five presentations from EPNOE industrial members

Several other meetings will take place this year around knowledge transfer and research/industry partnership. EPNOE is now facing a new development phase that should drastically increase its efficiency and attractiveness and all companies willing to join EPNOE and participate to its activities are welcome. EPNOE CSA project, described in the following pages, should bring its first results within one year. We will keep you informed about them.

With my best wishes,



Dr. Patrick Navard
Coordinator of EPNOE
Armines/Mines ParisTech/CNRS
CEMEF - Centre for Material Forming
Sophia-Antipolis
(France)

news

Members' info

New post-docs

- At Innsbruck University, Austria: Dr. Barnaby Caven joined Thomas Bechtold's team after he finished his thesis at Leeds University.

- At Cemef/MINES ParisTech, France: Georg di Pour works with Tatiana Budtova on the "preparation and study of new thermal superinsulating materials based on nanostructured silica and cellulose for construction applications".

New PhD student

- At Innsbruck University, Austria: Fatma Selami joined Thomas Bechtold's team for her PhD studies on "Polymer surface modification towards better performances" after having completed her master thesis at EMPA (St Gallen, Switzerland).

PhD defenses

- Hai Vu Manh, from the Innsbruck University, defended his thesis entitled "Modification of regenerated cellulosic fibres by alkali - iron - tartaric acid complexes" on October 2011.

- Loan Vo, from the Innsbruck University, defended her thesis "cellulosic carbamate synthesis and shaping process" on December 2011. Loan has carried on as a post doc at the same institute.

Forthcoming articles



Cellulose ester-polyolefine binary blend: Morphological, rheological and mechanical properties"; *F. Besson, T. Budtova* - European Polymer Journal, doi: 10.1016/j.eurpolymj.2012.02.010

Dissolution of unmodified waxy starch in ionic liquid and solution rheological properties; *W. Liu, T. Budtova* - Carbohydrate Polymers, doi:10.1016/j.carbpol.2012.01.090

Influence of water on cellulose-EMIMAc solution properties: a viscometric study; *K. Anh Le, R. Sescousse, T. Budtova* - Cellulose (2012) 19:45–54, DOI 10.1007/s10570-011-9610-3

Studies on the fibre surfaces modified with xylan polyelectrolytes; *B. Vega, K. Petzold-Welcke, P. Fardim, Th. Heinze* - Carbohydrate Polymers 2012, CARBPOL-D-11-01939R1



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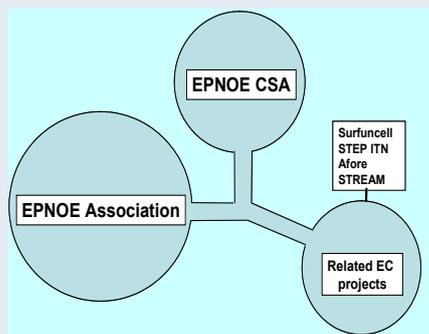
New European Project EPNOE CSA

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EPNOE CSA (CSA stands for Coordination and Support Action) is a European commission funded project that started March 1st, 2012 for a duration of three years (2012-2014). It is composed of the 16 academic and research members of EPNOE. It aims at ensuring a durable financial viability to EPNOE Association while strengthening academia/research – industry relationship and promoting knowledge transfer.

EPNOE CSA is thus a new project that is fully integrated into the overall activity of EPNOE, as shown on the picture. The general concept of this proposal is to participate in the improvement of competitiveness of European industry, to generate new knowledge in polysaccharides through the effective expansion of EPNOE activities over two areas (Food and Health) for which several EPNOE partners are already leaders in Europe, and to increase EPNOE interactions with industry. All the actions of this project are built with the objective of durability. When implemented, the activities will continue much after the end of this project. EPNOE Association, thanks to its financial and management structure, is meant to be a durable organisation.



Why this project ?

Generation of new knowledge occurs frequently at the crossroads of different disciplines, in collaborative research with scientists of different backgrounds and through transfer of knowledge from one scientific area to another or one application field to another. This is the aim of EPNOE CSA to create such an atmosphere where Materials, Food and Health experts from academic and industrial partners will meet, discuss, elaborate research programs and exchange students, inventing new ideas, new concepts and boosting creation of new products.

This is what effectively occurred mainly in the Materials area during the last years of activity of EPNOE and this strategy will be expended within the present proposal to Food and Health sectors. The present project will create a real knowledge-transfer organisation among a wide scientific and technological academic, research and industrial community network.

news (continued)

► Forthcoming articles



Water soluble photoactive cellulose derivatives: Synthesis and characterization of mixed [(4-methyl-2-oxo-2H-chromen-7-yl)oxy] acetic acid-

(3-carboxypropyl)trimethylammonium chloride esters of cellulose; *H. Wondraczek, A. Pfeifer, Th. Heinze* - Cellulose 2012, CELLU1622R1

Homogenous synthesis of 3-allyloxy-2-hydroxypropyl-cellulose in NaOH/urea aqueous system; *H. Qi, T. Liebert, Th. Heinze* - Cellulose 2012, DOI: 10.1007/s10570-012-9687-3

Studies on the tosylation of cellulose in mixtures of ionic liquids and a co-solvent; *M. Gericke, J. Schaller, T. Liebert, P. Fardim, F. Meister, Th. Heinze* - Carbohydrate Polymers 2012, DOI: 10.1016/j.carbpol.2012.03.040

Syntheses and detailed structure characterization of dextran carbonates; *Th. Elschner, H. Wondraczek, Th. Heinze* - Carbohydrate Polymers 2012, DOI: 10.1016/j.carbpol.2012.01.091

Sorption of Anionic Polysaccharides by Cellulose; *Uttam.C. Paul, A.P. Manian, B. Široká, H. Duelli, T. Bechtold* - Carbohydrate Polymers, 87 (2012) 695-700

Production of a concentrated natural dye from Canadian Goldenrod (*Solidago Canadensis*) extracts; *P. Leitner, C. Fitz-Binder, A. Mahmud-Ali, T. Bechtold* - Dyes and Pigments, 93 (2012), 1416-1421

Steam processing of regenerated cellulose fabric in concentrated LiCl / urea solutions; *I. Tatárová, W. MacNaughtan, A.P. Manian, B.Široká, T. Bechtold* - Macromolecular Material Engineering DOI = 10.1002/mame.201100272

Sustainable dyeing processes with dyestuff based on renewable resources for the textile industry; *T. Bechtold, C. Pladerer* - ISED 2011 Europe, Int. Symposium & Exhibition on natural Dyes, La Rochelle, France 25-30 April 2011 ISBN: 978-2-911320-43-9



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NEW European Project EPNOE CSA

EPNOE CSA project objectives:

Objective 1: expanding EPNOE activities towards health-related materials and products.

Objective 2: expanding EPNOE activities towards food-related materials and products.

Objective 3: improving partnership with industry and boost innovation and knowledge transfer.

Expansion of EPNOE leadership in new areas (Health and Food):

EPNOE is a successful network focusing on Materials for engineering based on polysaccharides. With the EPNOE CSA project, the EPNOE network intends to expand over two other areas: Health and Food.

These two areas were studied in depth regarding future needs and the results were included in the EPNOE Association Research Road Map 2010-2020 (Z. Persin, et al. «Challenges and opportunities in polysaccharides research and technology: The EPNOE views for the next decade in the areas of materials, food and health», Carbohydrate Polym, 84 (2011) 22–32).

The full implementation of these two new application areas (Food and Health) together with the already running cross-sector Materials section within EPNOE Association will establish extensive exchanges between these three different communities and will allow products, theories and concepts used in one community to be used and developed in another.

Increasing EPNOE interactions with industry, mainly with SMEs

EPNOE wishes to boost innovation and knowledge-transfer with industry, and particularly with SMEs, because:

- Innovation, especially fast innovation, is in majority in the hands of SMEs.
- SMEs often need scientific help that they will find among EPNOE Association members.
- SMEs will find within EPNOE Association a network of companies and research centres that are very actively building collaborative research projects they can be associated with. This is indeed what occurs with the five SMEs members of EPNOE Association. As an example, each was associated with the building of at least one collaborative project in 2009-2010.

EPNOE CSA is built around four Work Packages:

- **Work Package 1: Project Management and Financial Viability Assessments**
The main task of WP1 is to turn the project concept and objectives into practice (project progress, following-up budgets matters and taking care of the general communication issues).
- **Work Package 2: Expanding EPNOE activities towards health-related materials and products**
WP2 has two tasks: one is the development of the EPNOE Association in health-related research, training, infrastructure, testing and other services, and the second is related to preparing industrial contacts in this area.
- **Work Package 3: Expanding EPNOE activities towards food-related materials and products**
WP3 has two tasks: one is the development of the EPNOE Association in food-related research, training, infrastructure, testing, and other services, and the second is related to preparing industrial contacts in this area.
- **Work Package 4: Preparing industrial participation and innovation**
The main targets of WP4 are to increase industrial participation within EPNOE in all sectors of activities and to organize an innovation strategy for research. Two other tasks are designed: one is the establishment of a regular participation in industrial fairs, and the second is dedicated to finding ways to establish formal relations with relevant European Technology Platforms.



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EPNOE Members' project

New EC project: Textiles for Ageing Society - TAGS

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Europeans are living longer but are having fewer children and by 2060 there will be only two working adults for every person over 65 years, compared with four now, Eurostat's Projected old-age dependency ratio showed. Another Eurostat's study, Population structure and ageing, showed that the EU population is ageing rapidly.

There exist a number of challenges imposing on society by increasing percentage of ageing people. Numerous activities funded by EC have sought to ensure that the elderly remain a healthy, valued and productive part of society but, promoting the quality of life for the elderly is still a challenge. Senior citizens have specific needs for clothing, assistive fabrics and other textile products fundamental to personal, hygiene and medical products that are an essential part of their daily life. The need for adaptation of textile products increases with increasing care required by elderly. Ageing people enjoying a healthy life have different needs in comparison with the elderly suffering from illnesses and disabilities. Innovation in these areas has the potential to benefit millions of elderly lives, from both groups across Europe, by significantly facilitating and enhancing quality of lives, improving the effectiveness of medical and social care services for chronically ill elderly, speed up recovery after medical treatment, and providing products with new properties.

"TAGS" joins in one network: the elderly, represented by social and medical care institutions, together with manufacturers, technology developers and research institutions; with the purpose of active exchange of information, experiences and know-how in the field of textiles for elderly. Generally "TAGS" addresses demands on textiles, encompassing the elderly of all kinds, with the focus on specific needs of the elderly with regard to the textiles in four areas:

- Bedding Textiles
- Clothing
- Textile Products for Hygiene and Personal Care
- Therapeutic and Recreational/Leisure Textiles.

The main objectives of "TAGS" are: to identify new materials, production techniques, and technologies based on demands and requirements formulated by end-users and industry towards improving textile products for the elderly; to assess the scope, boundary conditions for innovation and identify barriers preventing progress; to set up systems for active discussion and dissemination of information between partners, provide public with access to general information; to generate new joint and collaborative concepts, joint research activities; to identify standards, specifications for products and formulate recommendations for policy makers.

The project is coordinated by Research Institute for Textile Chemistry and Textile Physics, (AUT); project partners are TITK (GER), NIRI (UK), warmX (GER), Textilverein (AUT), Tessitura Florida (ITA), Connexia (AUT), KHBG (AUT), ANS (ITA), DCS (ITA).

Textiles for Ageing Society - TAGS is a part of the FP7 Programme for Research and Technological Development, and its duration is 1.1.2012 - 31.12.2015.





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EPNOE Members' activities

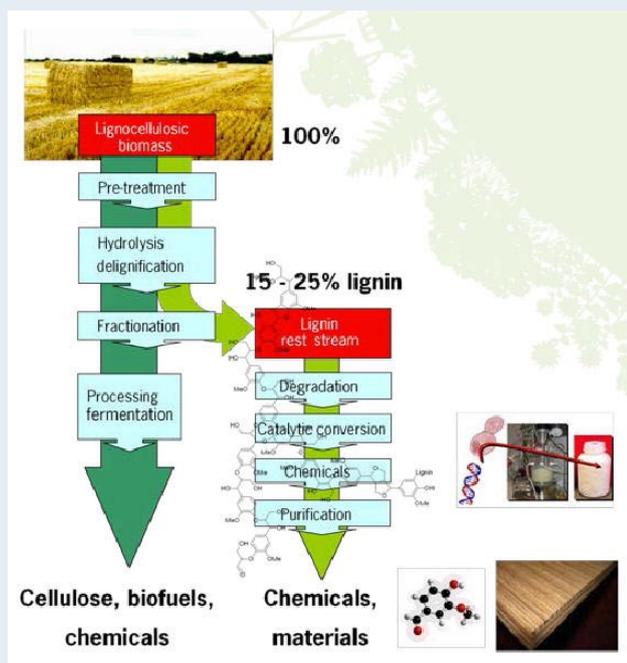
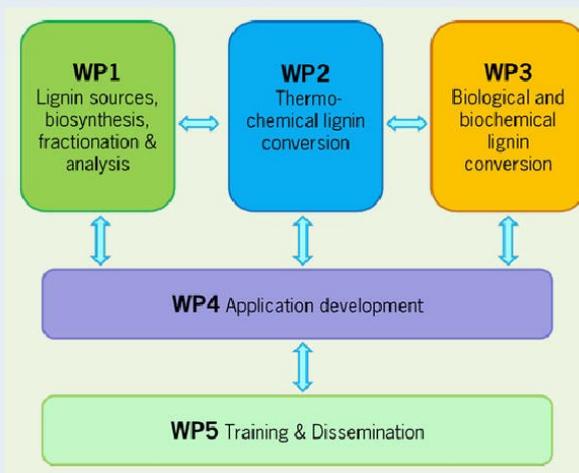
Wageningen UR Lignin Platform

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Objective and composition Lignin Platform

- It is the objective of the Wageningen UR Lignin Platform to promote interdisciplinary research and to create a network on the valorization of lignin for the industrial production of lignin-derived chemicals and compounds
- The Wageningen UR Lignin Platform is composed of a large number of outstanding scientists from different disciplines. These disciplines cover the whole biomass chain from biomass cultivation to lignin production, conversion and application development.
- The Lignin Platform is supported by a number of industrial sponsors. Selected complementary external knowledge institutes complete the Lignin Platform.
- The Lignin Platform is composed of several workpackages (WP) as shown right



Lignocellulosic biorefinery with integrated value added lignin valorization

Lignin Platform members

- Wageningen UR Lignin Platform members are experts in: plant breeding, biomass fractionation, (bio)chemical conversion of lignin, (bio)catalysis, enzymes, lignin characterisation and application development
- Lignin Platform members have broad experience in International and National collaboration networks and projects
- Outstanding scientific publications and worldwide recognized experts
- Their know-how covers the whole biomass to product chain
- State-of-the-art techniques and facilities for lignin research and application development are available
- Highly valuable propositions for industrial lignin valorization
- More info on www.ligninplatform.wur.nl

Richard Gosselink, Hans Mooibroek, Jacco van Haveren
Wageningen UR Food & Biobased Research, The Netherlands



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EPNOE Member's activities

Research Studio

Smart Technical Embroidery

The Research Institute for Textile Chemistry and Textile Physics of the University Innsbruck, with its focus on textiles chemistry and physics is unique in Austria. Due to the special competences in cellulose fibre research, textile chemical and physical research, the institute keeps a competitive position among the comparable institutions in Europe. Interdisciplinary fundamental research for textiles is a particular strength of the Institute, which also marks a strong difference to existing competitors in the field. During its specialised research activities the institute already executed specific co-operations with companies active in the field of embroideries.

The research in the field of technical embroideries builds on the competences of the institute:

- textile materials, polymer chemistry and polymer modification
- textile physics and mechanics
- textile chemistry and chemical modification of assemblies
- production and processing technology
- sensors and electrical devices / electrochemistry, corrosion
- scale up and material testing.

There is a significant growth in demand of technical textiles for a large variety of products and markets e.g. composite materials.

The pressing need for a coordinated high level research activity, including transfer of basic results into products, prototype development and assistance in product scale-up can be managed in an ideal way through the Research Studio Smart Technical Embroidery.

The activities of the research studio will focus around two main activities which both base on existing basic know-how and expertise available at the institute:

- Composites and 3D-structures: Embroidery as structural element



Fig. 1:
3D –Stickerei

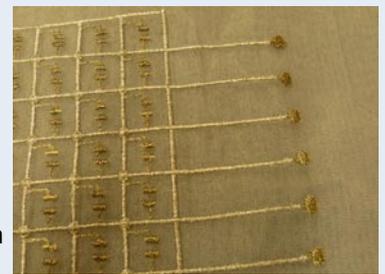


Fig. 2:
Electric circuit in
textile structure

- Molecular and electrical functionality: Implementation of functionality in embroidery: molecular chemical functionality (e.g. indicator dyes, pharmaceutical products); electrical functionality (e.g. sensors, optical elements)

The Research Studio „Smart Technical Embroidery“ (RS-STE) will utilise research results of the institute and advance them into important technology transfer topics for utilization by regional embroidery producers. The planned activities will establish the Research Studio as a major scientific partner close to new market applications.

Research Institute for Textile Chemistry and Textile Physics-University Innsbruck

Contact: Thomas.Froeis@uibk.ac.at



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EPNOE Industrial Partner's activity

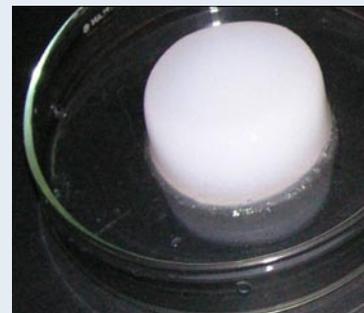
Novel Cellulose ethers with designed rheological performance

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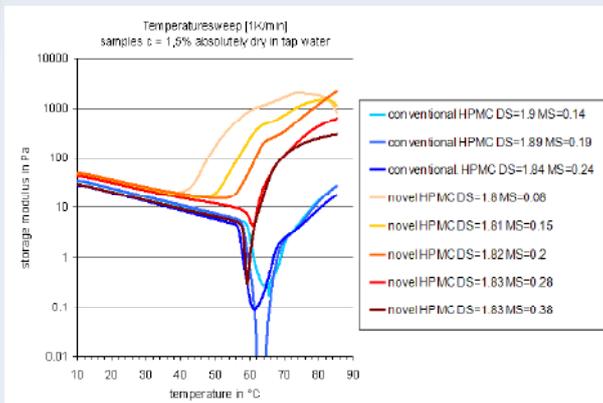
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Cellulose ethers like hydroxypropylmethylcellulose (Methocel™, HPMC) are key components in a variety of application systems. Many of these applications take advantage from the thermoreversible gelation performance which is associated with the type and amount of substituents. Historically the design space of Methocel™ products was limited since their use in many application areas is regulated with respect to amount of substituents located on average on a glucose unit.

Dow Wolff Cellulosics successfully expanded the design space of Methocel™ product performance within the regulatory approved boxes. Changes in processing conditions and consequently changing the chemical structure of the obtained polymer lead to new products with significantly altered rheological performance (gelation temperature, gel strength at elevated temperature) while maintaining e.g. a constant molar substitution of hydroxypropyl groups. The knowledge of changing the substituent distribution and therefore altering the product performance while maintaining the same average degree of substitution is key to tailor Methocel™ products for new applications. In addition, advanced knowledge of



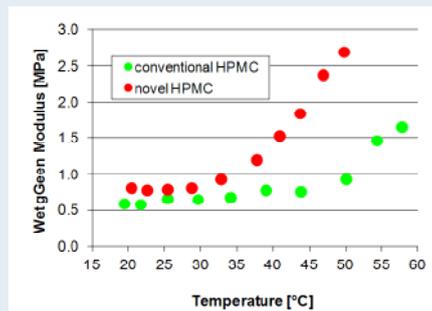
parameters influencing performance allow for a better performance control in existing applications.



These novel cellulose ethers can be applied in numerous fields of application involving not only regulated fields like food and pharmaceutical but also industrial applications.

During capsule manufacturing their use is beneficial, since they have a significantly lower gelation temperature compared to conventional HPMC at the same molar substitution. Since capsules are prepared by dipping heated pin molds into a film-forming solution to obtain a gel layer on the pin surface, a lower gelation temperature directly correlates to lower processing temperature during manufacturing.

For ceramic extrusion, ceramic powders are commonly mixed with cellulose ethers, water, and other ingredients to form extrudable pastes. The novel cellulose ethers are advantageous since the higher gel strength at elevated temperatures provides a higher stability (wet green bonding strength) during processing compared to conventional HPMC at the same molar substitution.



Roland Adden*, Matthias Knarr*, Jin Zhao**, Roland Bayer*, Meinolf Brackhagen*

* Dow Wolff Cellulosics GmbH, August-Wolff-Str. 13, 29699 Bomlitz

** Dow Wolff Cellulosics, 1691 N. Swede Rd., Larkin Lab, Midland, MI 48674



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EPNOE Member's event

Biorefining Training School 2012

2nd European Training School on the Principles and Technologies for Biorefining
Wageningen, the Netherlands, 29 Oct. – 1 Nov. 2012

Biorefining: From Concepts to Reality

Biorefining is the sustainable processing of biomass into a spectrum of marketable Biobased Products (food, feed, materials, chemicals) and Bioenergy (fuels, power and/or heat). This industry will underpin the foreseen transition towards a more Bio Economy, which will rely on plant-derived biomass feedstocks rather than fossil resources. The development of biorefinery-based sustainable value chains relies on the smart integration and deployment of technologies that are associated with a wide range of scientific disciplines. Therefore, increasingly individual actors involved in the area of biorefining need to possess both basic knowledge of the full chain composing biorefinery processes and understand the legislative and societal drivers for biorefinery deployment.

Set-up Training School

Part I – Days 1 and 2 of the curriculum will offer an overview of biorefinery concepts and will include an on-site, commented visit of state of the art pilot and industrial facilities. This introduction will provide an ideal opportunity for a wide public, including PhD students, researchers and policy makers to become acquainted with the fundamentals in biorefining and to learn more about the current status quo, notably in Europe.

Part II – Days 3 and 4 of the curriculum will take the trainee further along the learning path, providing high level information on the underpinning technologies. Starting with a series of lectures delivered by European experts, this part of the course will be completed by in-depth 3-hour training modules. By choosing a maximum of two modules a day, trainees will have the opportunity to come into closer contact with certain aspects of biorefinery technologies and to discuss these technologies with course faculty members in a more intimate learning environment.

Organisation

The European training course is organized by Wageningen UR Food & Biobased Research, Wageningen Business School and the VLAG doctoral school in collaboration with various networks and partners.

More info and registration: www.fbr.wur.nl/UK/about/biorefinerytrainingschool AND info.wbs@wur.nl

Who should attend this school?

Young researchers, public and private R&D or industry personnel and policy makers. PhD students are strongly encouraged to follow this training school. For following the complete training module 1 ECTS credit will be gained; including a poster presentation will be awarded with 1 additional ECTS credit.

