EcoBuild
institute Excellence Centre for eco-efficient and durable wood based materials and products

EcoBuild
NEWSLETTER 2009-2

EcoBuild – a competence centre for eco-efficient and innovative wood-based materials

Message from the Manager

The main news item this time is the 4th European Conference on Wood Modification, ECWM4, which was organised by EcoBuild, SP and KTH in Stockholm in April. In summary: It was a great success! An enormous work was done by the pillars of the organisation committee, Finn Englund, SP Trätek, and Kristoffer Segerholm, KTH/SP Trätek. A brilliant effort was also made by Mats Westin, who did not only take active part in shaping the scientific programme but also coordinated the R&D presentations related to EcoBuild. No less than 16 presentations, out of 97, were given by EcoBuild participants, all selected by the Scientific Committee in sharp competition. The Proceedings can be ordered from SP Trätek through the conference web site www.ecwm4.com.

Read also about the newly reformulated ideas, vision, mission and strategies! The board, the centre management and a group of project leaders have worked with this revision during the spring. The purpose is mainly to root the Centre ideas deeper, and we should reflect more around this than we may have done so far, now that we have worked together for a couple of years. Read, think, and react!

Important questions for us to think about are, for instance: What does EcoBuild mean to you, personally? Have we built a genuine atmosphere or culture in the centre, and what does that represent? Or is your relationship to EcoBuild only a limited project? I sometimes hear the expression "the project EcoBuild". We would like to get rid of that. EcoBuild is an excellence centre, in other words a strong research environment and a meeting place for cooperative R&D between universities, institutes and industry. Collaborative projects is the modus operandi.

EcoBuild is now being evaluated, and a special hearing will take place August 25 with an international group of evaluators. We will be represented by the board chairman, the centre management, an industrial representative and some active researchers. The preparations for Phase 2 are proceeding at full steam, in a dialogue with the industry. An application for Phase 2 was submitted May 30 to the public financiers. It is available for downloading by centre participants on our internal web site.

Have a nice summer! *Magnus Wålinder*

Centre Management

Magnus Wålinder
Centre Manager

Mats Westin
Deputy Centre Manager

ECWM4: A successful conference!

As announced earlier, the conference ECWM4, or The 4th European Conference on Wood Modification, was held in Stockholm on the 27-29 April. SP/EcoBuild were responsible for the arrangements, in cooperation with KTH. The venue, the Norra Latin City Conference Centre, served its purpose very well with its practical, comfortable and beautiful premises. The experienced and professional support given by the conference bureau Congrex and the staff at Norra Latin was of course a greatly contributing factor for the smoothness of the conference. In conclusion, the whole event was a big success, and all comments from the delegates were positive, some even overwhelmingly so.

The scientific programme was well balanced, covering many special aspects of the overall theme and everything from very fundamental science to market aspects. The programme contained no less than three keynote presentations, that gave overviews of broad areas as the development in general of the wood modification area, durability of thermally modified and acetylated wood, and UV-resistance and photostabilisation of wood. A special treatment of the poster presenters has become a standard procedure in this conference series, and most of them was given the opportunity to give a mini-lecture about their poster. That particular attention was highly appreciated. The organising committee had some nervous moments before all speakers had delivered and uploaded their presentations on the computer in the lecture hall, but with a small margin it all fell in place and from then on the time schedule was kept perfectly during the three days!

In spite of the current global financial difficulties, which appeared at a very inconvenient time precisely when the registration was about to open, the conference managed to attract 190 delegates from 30 countries. This must be seen as a sign of the topical importance of the conference theme and of the widespread and growing interest.

In total 97 papers were presented (43 as oral and 54 as poster presentations), out of which 13 oral and 3 poster presentations of high quality were contributions from EcoBuild researchers. This tally, combined with the overall successful organization of the conference, tells that EcoBuild indeed managed brilliantly to place its flag on the scientific map within this research field.

As everybody knows, the social contacts are in many cases equally important as the scientific presentations during any conference. The opportunities to discuss with more experienced colleagues, to expand one's network, and to let a previously well-known name become associated with a well-known voice and face are particularly valuable to young researchers. Therefore, the social programme is not a peripheral part of a conference but an integral part of the whole arrangement. At ECWM4, the welcome reception gave the delegates a chance to become acquainted with the venue already Sunday evening. An excellent light buffet was served while old and new friends met and chatted, interrupted only by a short performance by the choir Örjanskören, lining the balcony on three sides of the hall.

By invitation from Stockholm City, another delicious buffet was offered Tuesday night in the City Hall. The programme also involved a guided tour of the premises, including the Blue Hall and the Golden Hall, where the Nobel Prize ceremonies and festivities are held each year. The evening was rounded off by a boat trip on lake Mälaren on one of the traditional white passenger boats. The jazz band even inspired to some dancing on board. The concluding activity of the conference was the visit to the Vasa museum on Wednesday afternoon, where the guides were impressed by the unusual knowledge about wood material science among the visitors!

Time to reflect

The Centre management has now at the end of May submitted to the public financiers its formal application for a continued support during the next three years, the period that we call EcoBuild Phase 2. The building up of a complex excellence centre is naturally associated with difficulties, but even if there are details where quicker or more ideal solutions could have been found from the beginning, we are still immensely happy and proud of the vitality and dynamics that have developed and the progress that has been achieved during the first two years. Therefore, we are strongly convinced that EcoBuild will take another leap in its development at the onset of Phase 2, and that the current stabile foundation will eventually support a lasting centre.

Before this application the management and the board have made some extra thought efforts concerning the strategic plans. It is a strength for the centre if all participants understand and share the formulated goals and visions. All readers who are involved in the work are therefore kindly asked to read this text carefully and spend some time on reflection. It is built on a strategy document that was attached to the application but that will be further polished before the next phase. If you have ideas about different phrasings you are extremely welcome to discuss them with the centre management. Make your voice heard! It counts!

We want to emphasize that *no strategies or goals are locked*. Many factors in the surrounding world affects what is of prime importance for a centre like EcoBuild, and we must at all times have a keen ear and a good footwork to adapt to new opportunities that frequently present themselves.

In short: The strategic planning consists of several levels, where the first is the central conceptual idea. It has been formulated as the *use of renewable raw materials for the production of innovative, eco-efficient and durable wood-based products.* Of particular importance are applications as building products and furniture, but also textiles.

Research Target Areas

The five areas symbolised by the jigsaw puzzle pieces are presumably well known to most readers. They are described more fully on the centre web pages, and since there is a certain flexibility and continual change in the contents of the research we try to update the descriptions when needed. Some adjustments will probably be made after the summer, when the next major steps are taken in the planning.

Vision

The vision describes a state that we endeavour to reach after a certain time.

Before year 2013 EcoBuild is

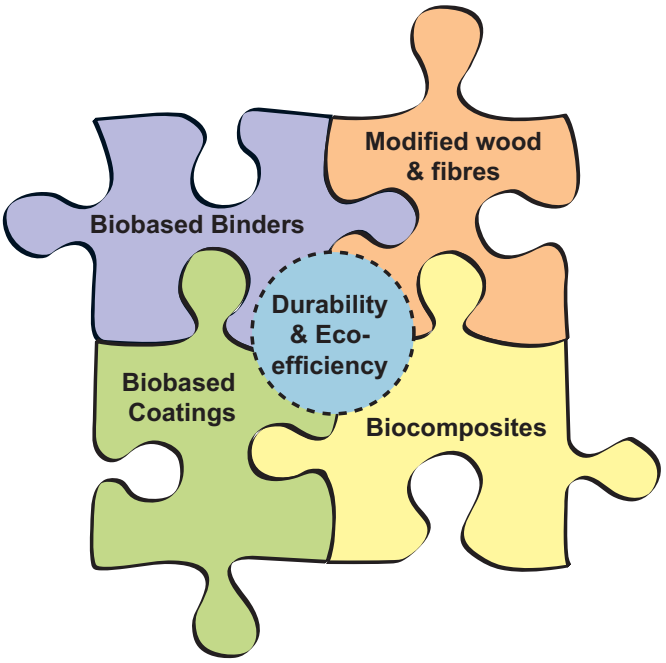
- an internationally competitive competence centre in the field of wood science and technology with an emphasis on applied "green chemistry", eco-efficiency and durability
- an active and progressive arena for cooperation between industry, research institutes and universities for innovations related to wood and biobased materials and products

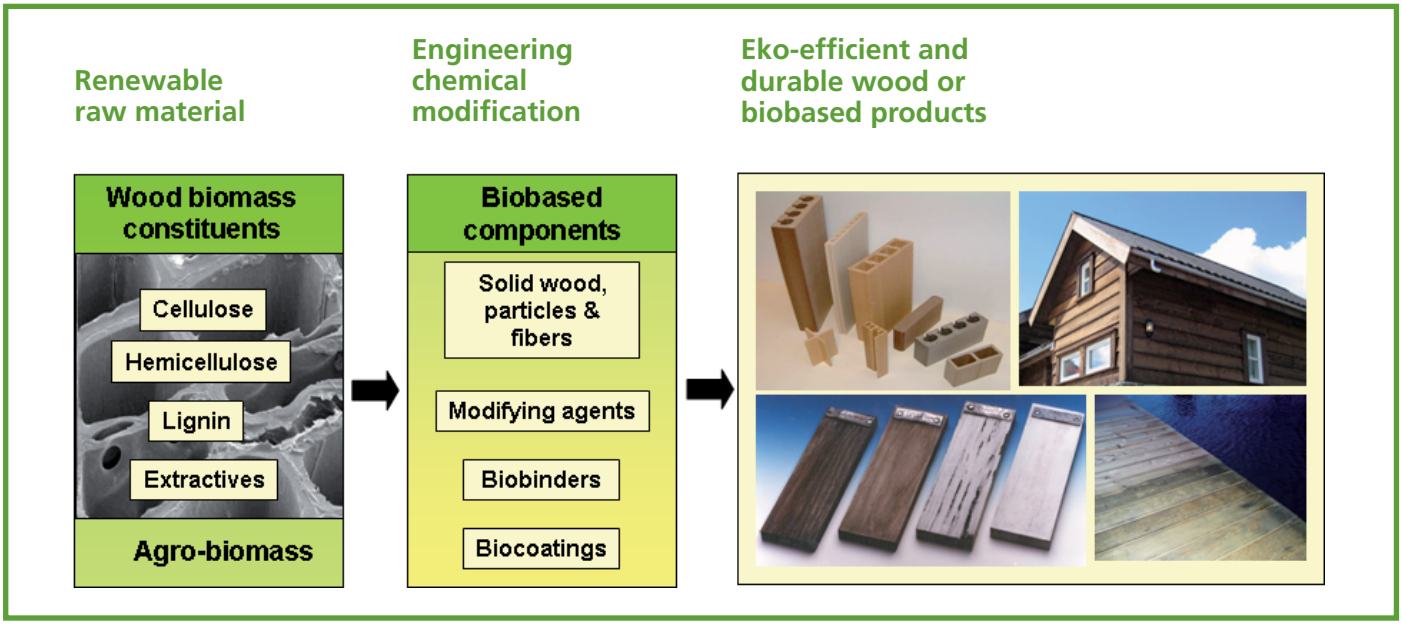
Mission

The mission can be seen as a comprehensive description of our daily work and for whom we carry it out.

The Centre works on a daily basis with

- development of competence and excellence related to new biobased materials and products for industrial application and commercialization
- finding the right competences and resources within the university-institute-industry network for project-driven development of new biobased materials and products





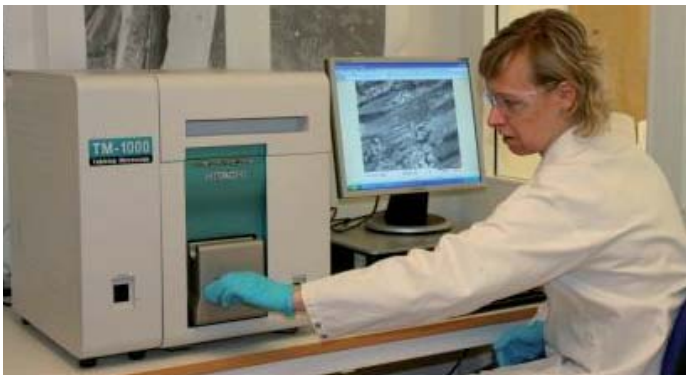
A very simple illustration of the collaborative network is the three cog-wheels. They can grip each other in several ways, and one or another can be the driving wheel in different cases. The problem formulation and the formulation of research needs should above all come from the industry, and it is also there the implementation takes place. Product and process development, as well as coordination, is made both from industry and institutes. Expertise and special equipment can be found in all three kinds of cog-wheels. The most important role for the universities lies in education on undergraduate and graduate levels and in long-term strategic research.

Strategies

On the whole, added R&D values and synergy effects between the different Centre Parties are expected to lead to technical breakthroughs and innovations, in particular concerning "green" chemistry and development of biobased materials and products. The more specific strategies below are tools used in order to fulfil our mission and reach our vision.

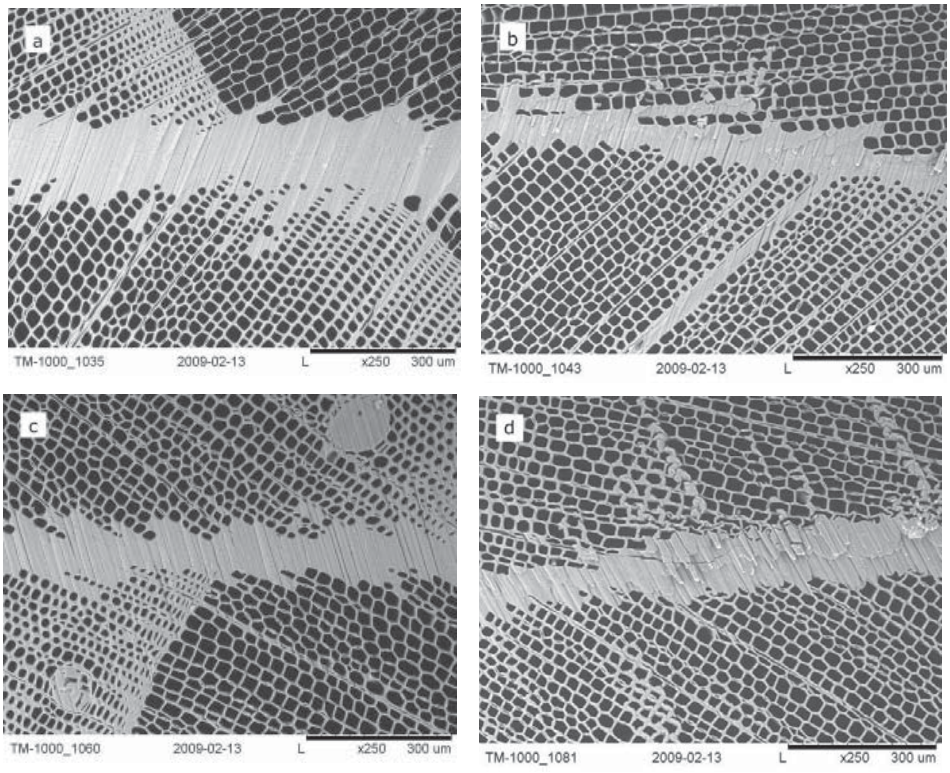
- Emphasis on expanding the centre ideas to the European and international level.
- Focus on attracting funding from the EU research programs.
- A strengthened international research network attached to the centre is necessary. Initiatives in the form of exchange of researchers and participation/cooperation in European and international projects should therefore be encouraged by the centre.
- A continuous competence development for the benefit of the centre Parties, mainly by attracting skilled researchers to the centre, as well as promoting their competence development.
- Support efficient knowledge transfer between the participants in the centre and to promote/maintain shared employment and exchange of personnel between these.
- Stimulation of cooperation within the centre by a continuous improvement work regarding the centre communication activities, such as frequent and efficient project meetings, web-based work spaces, newsletters, seminars, and courses.
- Promoting flexibility and efficient procedures for starting and running projects, mainly initiated and guided by the industry, without loosing the over-all long-term scope and scientific foundation of the centre.

Electron microscopy



A prerequisite of modern material research is the ability to study the behaviour of materials on a microscopic level. Many anatomic and morphological details determine e.g. the eventual mechanical properties that can be measured on larger test specimens. In order to fully understand the functions of a complex material or a ready product you must first understand its individual components and phenomena on a micro-scale.

Many of EcoBuild's sub-projects utilise the new and easy-to-handle SEM instrument (Scanning Electron Microscope), TM-1000 from Hitachi, which is placed at SP Trätek in Stockholm. It was financed by a special grant from Formas and arrived a year ago. Earlier, electron microscopes were always instruments that filled half a room, but small and handy alternatives are also available today.



As an example of investigations where the SEM has been of use, some pictures from one of the contributions to ECWM4 are shown here. Marielle Henriksson, Magdalena Sterley and Jonas Danvind studied glulam posts that were produced from thermally modified spruce boards and glulam posts that were subjected to heat treatment after gluing. A short summary of the interesting results is that both methods gave comparable results, but the thermally modified posts showed a higher ratio of adhesive bond failure in shear strength testing, indicating that the glue was somewhat weakened by the heat treatment. On the other hand, the number of internal microcracks diminished, in comparison to what is normally observed at thermal modification of unglued timber in larger dimensions.

SEM image of adhesive bonds in thermally modified post glued with MF glue (a, c) and PRF glue (b, d). The scale bar is 300 µm.

Area 5: Durability & Eco-efficiency

The presentation of active researchers in EcoBuild here continues with the fifth and last technical area, Durability & Eco-efficiency. A few key words are given for each person, giving a glimpse of their professional profile.

Sub-projects:

Dp 19 Service Life Prediction

Dp 20 Metal-free preservatives

Dp 21 Durability and LCA

Dp 22 Ecotox

Dp 23 Understanding protection mechanisms

Area coordinator: Mats Westin, Ph.D., SP Trätek
Durability, Wood modification, Chemical analysis, Wood material science

Pia Larsson Brelid
Ph.D., SP Trätek
Wood modification, Wood protection, Mechanical/ chemical/biological properties, Process development

Jöran Jermer
SP Trätek
Durability, Wood protection, Standardisation

Annica Pilgård
Ph.D., SP Trätek
Molecular biology, Ecotoxicology, Durability

Gry Alfredsen
Dr., NFLI
Wood material science, Decay and mould, Molecular methods

Finn Englund
Ph.D., SP Trätek
Organic synthesis, Surface treatments, Wood science, Environmental issues

Charlotte Gjelstrup Björdal
Dr., SP Trätek
Wood material science, Wood anatomy, Microscopy, Decay fungi, Moulds

Lena Bengtsson
Engineer, SP
UV-exposure, Weatherability, Light fastness

Susanne Ekendahl
Fil. Dr., SP
Microbiology, Biological degradability, Biological testing

Linda Eriksson
Engineer, SP
Microbiology, Biological degradation

Pernilla Johansson
M.Sc., SP
Microbial growth on wood

Gunilla Bok
M.Sc., SP
Moulds and rot on wood and paint, Microbial analyses, Building materials

Annika Ekstrand-Tobin
Ph.D., SP
Building physics and IAQ, Quality assurance, Microscopy, Mould on building materials

Sigrunn Kolstad
Chief engineer, NFLI
Wood protection, Impregnation, Durability testing, Molecular methods

Andreas Treu
Dr., NFLI
Wood biology, Wood technology, Chemical modification of wood, Microwave modification of wood

Morgan Fröling
Dr., Chalmers
Chemical environmental science, Life cycle analysis, Service life prediction

Sven Thelandersson
Professor, LTH
Structural Engineering, Reliability issues, Timber engineering, Building systems, Design methodology

Eva Frühwald
Dr., LTH
Timber drying, Shape stability

Marie Grimstrup
Osmose
Product development, Evaluation, Authorization

Jörg Habicht
Ph.D., BASF
Wood protection, Wood modification, Durability, Wood composites

In addition, the following persons have been active in Area 5:
Greg Morrison (Chalmers), Simon Forster och Andrew Hughes (Arch Chemicals), Stephan Breyne (BASF), Tord Isaksson (LTH)

The third annual meeting of EcoBuild

The annual meeting was held shortly after the latest newsletter issue. Many exciting results were displayed during the seminar, and the participants in EcoBuild were on the whole given an excellent chance to lift their eyes from their personal project activities and to renew their surveys of the whole centre. This was also the first of the EcoBuild seminars where the scientific council (paicture) was assembled to get a similar overview.

Changes in staff

A large centre like EcoBuild is constantly subject to changes. Jonas Danvind (SP), Lars Nordstierna (SP) and Katarina Johansson (SP/KTH) have recently left us for other challenges. On the other hand, we have recruited Sara Olsson and Stacy Trey, both polymer chemists with links to KTH. Sara has just begun as a PhD student but is full-time employed by SP/EcoBuild. She works in the Coatings area. Stacy comes from New York. She has spent some time here as a post-doc after her American doctor's degree and now begins to work on bio-composites, among other things.

Publications

We have not by far announced all the publications that have been made within the frame of EcoBuild. An update is given here, and even that is incomplete. In addition, submitted 12 articles are awaiting publishing, and 7 articles were published for IRG 2008 and 3 for IRG 2009.

In: *Proceedings of the Fourth European Conference on Wood Modification*, 27–29 April 2009, Stockholm, Sweden, eds. F. Englund, C.A.S. Hill, H. Militz & B.K. Segerholm. SP Technical Research Institute of Sweden, Wood Technology (ISBN 978-91-86319-36-6):

- Alfredsen, G. and Westin, M. (2009). Durability of modified wood – Laboratory vs field performance. pp. 515–522.
- Brynildsen, P. and Bendiksen, R. (2009). State-of-the-art Kebony factory and its main products. pp. 37–42.
- Englund, F., Bryne, L.E., Ernstsson, M., Lausmaa, J. and Wålinder, M. (2009). Some Aspects on the Determination of Surface Chemical Composition and Wettability of Modified Wood. pp. 553–560.
- Evans, P.D. (2009). Keynote: Weathering and photostability of modified wood. pp. 541–550.
- Henriksson, M., Sterley, M. and Danvind, J. (2009). Glulam posts with thermally modified spruce for outdoor applications. pp. 577–584.
- Johansson, K., Kärrfelt, Y. and Johansson, M. (2009). Novel coil coating concept for modified wood. pp. 213–216.
- Jones, D., Lawther, M., Torgilson, R. and Simonson, R. (2009). Acetylated wood fibres – Next stop: Commercialisation. pp. 505–513.
- Militz, H. and Lande, S. (2009). Keynote: Challenges in wood modification technology on the way to practical applications. pp. 3–12.
- Puttmann, S., Krause, A., Pilgård, A., Treu, A. and Militz, H. (2009). Furfurylated wood for window constructions. pp. 569–576.
- Rowell, R.M., Ibach, R.E., McSweeny, J. and Nilsson, T. (2009). Keynote: Understanding decay resistance, dimensional stability and strength changes in heat treated and acetylated wood. pp. 489–502.
- Segerholm, K., Omidvar, A. and Wålinder, M.E.P.(2009). Acetylation to minimize water uptake and deformation of high wood content WPC. pp. 239–242.
- Westin, M., Sterley, M. Rossi, F. and Hervé, J.-J. (2009). Compreg-type of products by furfurylation during hot-pressing. pp. 561–568.
- Wålinder, M., Omidvar, A., Seltman, J. and Segerholm, K. (2009). Micromorphology Studies of Modified Wood Using a Surface Preparation Technique Based on UV-Laser Ablation. pp. 103–110.
- Ziethén, R., Brynildsen, P., Lande, S., Kristoffersen, J. and Westin, M. (2009). Kebony – an alternative to teak for boat decking. pp. 523–530.
- Östmark, E., Lawther, M., Ziethén, R., Nordqvist, P., Khabbaz, F., Malmström, E. and Westin, M. (2009). Kebony – an alternative to teak for boat decking. pp. 531–538.

In: *Proceedings of the 4th meeting of the Nordic Baltic Network in Wood Material Science & Engineering*, Riga, Latvia, November 13–14, 2008, (ISBN 978-9984-39-675-0):

- Alfredsen, G., Jacobsen, B., Evans, F. and Edlund, M.-L. (2008). Decking – Surface and system treatments. pp. 90–95.
- Bryne, L.E., J. Lausmaa, M. Ernstsson, F. Englund, M.E.P., Wålinder and Söderström, O. (2008). UV-laser irradiated wood - Some aspects on micromorphology, wettability, surface composition and liquid permeability. pp. 75–82.
- Pilgård, A. (2008). An overview of available DNA-based applications and results relevant for wood protection. pp. 24–29.

Gobakken, L.R., Westin, M. (2008). Surface mould growth on five modified wood substrates coated with three different coating systems when exposed outdoors. International Journal of Biodegradation and Biodeterioration 62: 397–402.

Hochmanska, P., Mazela, B., Westin, M. (2007). Biological durability of wood treated with silanes and siloxanes. Ann. Warsaw Agricult. Univ.-SGGW, For and Wood Technol. 61.

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Johansson, K. Bergman, T. and Johansson, M. (2009). Hyperbranched Aliphatic Polyesters and Reactive Diluents in Thermally Cured Coil Coatings. ACS Appl. Mater. Interfaces, 1 (1), 211–217.

Johansson, K., Johansson, M. (2008). Fatty acid methyl ester as reactive diluent in thermally cured solvent-borne coil-coatings – The effect of fatty acid pattern on the curing performance and final properties. Progress in Organic Coatings, 63, 155–159.

Lande, S., Eikenes, M., Westin, M., Schneider, M. (2008). Furfurylation of Wood: Chemistry, Properties, and Commercialization. In: Development of Commercial Wood Preservatives – Efficacy, Environmental, and Health Issues, pp 337-355. Ed: Schultz, T.P., Militz, M., Freeman, M.H., Goodell, B, and Nicholas, D.D. ASC symposium series 982, ISBN 978-0-8412-3951-7.

Lande, S., Westin, M., Schneider, M. (2008). Development of modified wood products based on furan chemistry. Molecular Crystals and Liquid Crystals, 484:367–378.

Larsson Brelid P., Wålinder, M., Westin, M. and Rowell, R.M (2008). EcoBuild – a center for development of fully biobased material systems and furniture applications. Molecular Crystals and Liquid Crystals, 484, pp. 257/[623]–264/[630].

Mazela, B., Hochmanska, P., Domagalski, P., Westin, M. (2007). Biological durability of OHT wood. Ann. Warsaw Agricult. Univ.-SGGW, For and Wood Technol. 61.

Nordstierna. L., Lande, S., Westin, M., Karlsson, O., and Furó, I. (2008). Towards novel wood-based materials: Chemical bonds between lignin-like model molecules and poly(furfuryl alcohol) studied by NMR. Holzforschung, 62, 709-713.

Schneider, M., Westin, M., Lande, S. (2009). Furfurylated Wood. In: McGraw-Hill Yearbook of Science & Technology, pp 133-135. McGraw-Hill Companies Inc. ISBN 978-007-160562-5.

Segerholm, B.K., Walkenström, P., Nyström, B., Wålinder, M.E.P., Larsson Brelid, P. (2007). Micromorphology, moisture sorption and mechanical properties of a biocomposite based on acetylated wood particles and cellulose ester. Wood Material Science and Engineering, 2(3-4), 106–117.

Segerholm, B.K., Westin, M., Larsson Brelid, P. and Wålinder, M.E.P. (2009). Wood plastic composites made from modified wood and CAP. In: Proceedings of the 4th Wood Fibre Polymer Composites International Symposium, March 30–31 2009, Bordeaux, France.

Upcoming conferences 2009

- 4-6 juni: 7th International Conference "Wood Science and Engineering in the Third Millennium" – ICWSE 2009, Brasov, Rumänien
- 14-17 juni: 12th EuCheMS International Conference on Chemistry and the Environment, Stockholm Sweden (www.chemsoc.se/sidor/KK/icce2009.htm).
- 14-18 juni: International Dendrimer Symposium 6, KTH, Stockholm (www.webforum.com/ids2006/web/page.aspx?pageid=28440)
- 21-23 juni: Forest Products Society 63rd International Convention, Doubletree Hotel Boise-Riverside, Boise, Idaho, USA (www.forestprod.org/confic09.html)
- 31augusti-4 september: 4th International Bioenergy Conference – Sustainable Bioenergy Business, Jyväskylä, Finland (www.bioenergy2009.finbioenergy.fi)
- 16-18 september: International Panel Products Symposium, IPPS 2009, Nantes, France (www.bc.bangor.ac.uk/ipps)
- 22–23 september: Third International Coating Wood and Wood Composites Conference: "Durable and Sustainable – Today and Beyond", Charlotte, NC (www.coatingstech.org/Programs/index.cfm?event=ACSeriesDetail2)
- 28-30 september: International Conference on Wood Adhesives 2009, Harveys Resort Hotel & Casino, South Lake Tahoe, Nevada, USA (www.forestprod.org/confadhesives 09.html)
- 28 september-2 oktober: 10th International Conference on Frontiers of Polymers and Advanced Materials, Santiago, Chile (www.10icfpam.cl)

Key facts about EcoBuild

EcoBuild is a competence centre for cooperation between universities, institutes and industry. The centre is located in the Stockholm campus site of KTH and SP Technical Research Institute of Sweden. The 35 industrial partners cover the whole range from small and medium-sized enterprises to large international corporations, and several of them are based abroad.

The centre is estimated to have a turnover of ca. 100 MSEK during the period 2007-2012. VINNOVA, the Knowledge Foundation and the Swedish Foundation for Strategic Research contributes with 40 MSEK. The industry co-finances with 60 MSEK, half of which is as cash contributions and the rest with their own work.

At the moment ca. 107 persons are connected on to the activities of EcoBuild. Around 80 researchers are directly involved in the projects. 42 of these are senior researchers, out of which 34 have a PhD degree. Ca. 56 pursue their research mainly at institutes or universities and ca. 25 at the partner industries. The cooperation is reinforced by several cases of double affiliation. 5 PhD students work directly as EcoBuild students, and another 3 external students work within connected projects.

Industrial partners and financiers

AB Bitus, A-Cell Acetyl Cellulosics AB, Akzo Nobel Industrial Coatings AB, Akzo Nobel Nippon Paint AB, Arch Timber Protection, BioVelop A/S, Byggelit AB, Casco Adhesives AB, DanAcell Danmark A/S, Dr. Wolman GmbH - BASF Group, Guteform AB, IKEA of Sweden AB, Karlson Husindustrier AB, Kebony ASA (tidigare WPT), KIRAM AB, Lammhults Möbel AB, Norrskogs Forskningsstiftelse/NWP, Ofk Plast AB, Osmose Denmark A/S, Perstorp Specialty Chemicals AB, Primo Sverige AB, Rögle Tröskeln AB, Scandinavian FineWood AB, SF Marina Wallhamn AB, Slottsbro AB, SSAB Tunnplåt AB, Sveaskog, Swedish Cable Channel System AB (SCCS), Svenska Lantmännen, Corporate R&D, Södra Skogsägarna, TanumsFönster AB, Vest-Wood Sverige AB (Swedoor), Viance (tidigare CSI), VIDA Packaging AB.

Centre Board

Ralph Nussbaum, Research Manager Coatings IKEA
Lars Stigsson, CEO KIRAM
Eva Hörwing, CEO Byggelit Holding
Ulf Odda, General Manager Casco Board Systems (Akzo Nobel)
Hans Thulin, (ordf.) CEO TanumsFönster
Per-Erik Petersson, CTO Chief Technology Officer/Prof SP
Istvan Furó, Prof KTH
Per Brynildsen, Research Director Kebony

Main financiers of the Centre

VINNOVA Knowledge Foundation Swedish Foundation for Strategic Research

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SP INFO 2009:41