

The Marcus Wallenberg Prize 2008

The Marcus Wallenberg Foundation proudly announces that the 2008 Marcus Wallenberg Prize is awarded to Prof. Bjarne Holmbom and Mr. Christer Eckerman at PCC for their breakthrough research and innovation creating a platform for large-scale separation, isolation, purification and applications of chemical components in wood.

The Laureates have created an understanding of the fundamental chemistry of spruce tree knots, i.e. the part of the branches that is embedded in the stem. They developed technical separation methods to extract tree knots from the pulping process and to isolate and purify chemicals from the tree knots, opening the field for many potential applications and uses. An example is hydroxymatairesinol (HMR) as a human dietary supplement.

The selective removal of knots from the pulping process brings opportunities for additional benefits by reducing process disturbances, reducing the use of bleaching chemicals and energy, and allowing more consistent quality of the paper products to be produced.

By methodical research of the highest quality, the Laureates have significantly contributed to creating a platform for the forest products industry to improve and broaden its role and commercial prospects with a range of new products and implications e.g. for chemicals,

energy, production efficiency and sustainability.

The Marcus Wallenberg Prize is an international prize that was established in 1980 to acknowledge the lifetime activities and the memory of Marcus Wallenberg, the late Chairman of Stora Kopparbergs Bergslags AB (now Stora Enso). Each year the Prize recognizes a single research breakthrough by one scientist or a small group of collaborating scientists. In the view of the Prize Selection Committee and the Board of the Foundation, the selected breakthrough will have a significant effect on the

industries.

While rewarding the winner, the Prize is also intended to stimulate further research around the world. This year, the Prize will be given for the 25th time. The Prize sum is two million SEK.

The Prize will be presented by His Majesty, The King of Sweden, at a ceremony in Stockholm on 6 October, 2008. On 7 October, a symposium around the subject of the Prize-winning research and its impact on the forest and forest products industries will be arranged.



The 2008 Marcus Wallenberg Prize winners Prof. Bjarne Holmbom and Mr. Christer Eckerman from PCC.

MASTRA - Miniaturized Ion-Selective Electrodes

A group of analytical chemists at PCC are coordinating a new international research project, MASTRA, regarding work on miniaturized electrodes for analysis of compounds being relevant for health and environment.

MASTRA is a part of ERA-Net Materials, a speciality field within the ERA-Net network created by the European Union with the aim to enhance cooperation between European researchers.

Åbo Akademi University's project partners are AGH University of Science and Technology, the Polish company DNH, the Irish Dublin City University, Environmental Protection Agency, and the international company Thermo Fisher Scientific's unit in Finland.

The first initiative to this joint project was taken by the Polish researchers in Krakow. We agreed to coordinate the project and contacted the other research groups, Prof. Johan Bobacka at PCC tells.

MASTRA is funded for three years. The total sum is 1,2 million euro and Åbo Akademi University's part is 450 000 euro. Partners in different countries are being funded separately while ÅA is funded directly by TEKES. This means that the money flow is not controlled by us, although we are coordinating the project. Our mission is to take care of the scientific part, Prof. Bobacka tells.

Prof. Andrzej Lewenstam, Åbo Akademi University's professor in chemical sensor technology, is responsible for the research within the MASTRA project done in Finland. Researchers at PCC have focused on electrically conductive polymers and ion-selective electrodes since the end of the 80's. Ion-selective electrodes, which are an important type of chemical sensors, have traditionally contained liquid solutions. Development of electrically conductive polymers has resulted in electrodes bases



Prof. Johan Bobacka and Coordinating Assistant Anne-Leena Gröning.

on solid materials, which are durable and more smaller in size than previously.

By the end of the last decade the Polish researcher Tomasz Sokalski, now working as a docent at ÅA, discovered that by the use of ion-selective electrodes one can lower detection limits and measure significantly lower concentrations.

This discovery opened many new opportunities for this research area and attracted a global interest. The low detection limits can be achieved even for ion-selective electrodes based on solid materials. The ion transport in the electrode system is improved by optimizing the ion-selective membrane and the solid contact.

In potentiometric measurements with chemical sensors, two electrodes are needed: an ion-selective electrode and a reference electrode. In the MASTRA project these two type of electrodes are developed based on solid materials.

This is a challenge. The development has already come so far that ion-selective

electrodes with solid contact are used, but as reference electrodes the traditional model has been used and therefore the technique can still be improved.

In MASTRA each unit has its role and none of the teams could accomplish the project alone. Knowledge has to be combined. Researchers in Dublin are very specialized on ion-selective membranes and are thus important partners to PCC. The Polish researchers are modeling the origin of signals in electrodes in order to get a theoretical background for optimizing the ion transport.

The main application of ion-selective electrodes has been in the field of clinical analysis. Ions in blood samples have been measured at hospitals. If the development succeeds, it will in future be possible to measure very low concentrations of cadmium, lead, and mercury in seawater using portable instruments, to name an example. Today such samples have to be brought to laboratories and measurements have to be done with larger instruments.

Metso Paper Mechanical Pulping Award to Dr. Ville Saarimaa

The Metso Paper sponsored Mechanical Pulping Award 2007 was granted again for an especially honored thesis in the field. This time the award was received by Dr. Ville Saarimaa from Åbo Akademi University. The award has been granted since 1989 for a member of the Finnish Paper Engineers' Association with the aim of adding students' and researchers' interest towards mechanical pulping, recycled fiber and stock preparation technologies and their use in practice in papermaking processes.

The award was granted to Mr. Saarimaa for his thesis "Pectic acids in mechanical pulping and papermaking" at the fall meeting of the Finnish Paper Engineers' Association held on 16 November.

The research focused on the effects of pectic acids in mechanical pulp production and papermaking. Pectins dissolve to process water in the form of pectic acids during the alkalic peroxide bleaching. The pectic acids with their high electric charge density consume cationic retention polymers and may weaken dewatering during sheet formation and cause yellowness of the paper. The harmful effects of pectic acids can be avoided for example with enzymatic pectin treatment which cracks the pectin polymers and decreases their retention in pulp. Alternatively, a water cleaning stage, such as microflotation, can be added to the process. Saarimaa's thesis was considered to demonstrate a thorough study of the subject and to generate new ideas for research in the field.



Photo: Mr. Ville Saarimaa (standing left) receiving this year's award handed by Metso Paper's Mr. Jouni Kaartoluoma, Business Manager, Mechanical Pulping Process Services (standing right).

Best Oral Presentation by Zhang Di

The "2007 Best Oral Presentation Award" granted by the International Society for Ceramics in Medicine in the 20th International Symposium on Ceramics in Medicine, Bioceramics 20, was awarded to Di Zhang at PCC. The award was given at the symposium that took place in Nantes, France, in October 24 to 26, 2007. The title of Di Zhang's presentation was "In Vitro Behavior of Fiber Bundles and Particles of Bioactive Glasses".



EFCATS Award to Dr. Kalle Arve

Dr. Kalle Arve at PCC became the first ever Finnish researcher to receive the European Federation of Catalysis Societies award for the best doctoral thesis in Europe for the time period 2005-2007. The award was granted on August 31, 2007, at the EURO PACAT VIII conference that took place in Åbo. The title of Dr. Arve's thesis was "Catalytic Diesel Exhaust Aftertreatment: From Reaction Mechanism to Reactor Design." The motivation for the award was the broadness of the work, including catalyst preparation, mechanistic and kinetic studies, kinetic modeling and reactor design.



GUEST LECTURES

Prof. Philippe Buhlmann, Department of Chemistry, University of Minnesota, Minneapolis, MN, USA: "*Electrochemical Sensors for Biological and Environmental Applications*" on February 7, 2008. Host: Prof. Andrzej Lewenstam.

Dr. Aldo R. Boccaccini, Imperial College London, United Kingdom: "*Progress in the Development and Characterisation of Bioactive Scaffolds for Tissue Engineering*" on April 17, 2008.

Prof. Andrey Simakov, Centro de Ciencias de la Materia Condensada, Universidad Nacional Autonoma de Mexico: "*Advanced Techniques for Characterization of Heterogeneous Catalysts*" on May 29, 2008.

DOCTORAL DEFENSES

Igor Busygin: "*Hydrogenation of Vicinal Diketones over Cinchona Modified Pt Catalysts*" on June 8, 2007.

Linda Fröberg: "*Factors Affecting Raw Glaze Properties*" on September 7, 2007. Opponent: Prof. Bo Jonson, Växjö universitetet, Sweden.

Blanka Toukoniitty: "*Utilization of Electromagnetic and Acoustic Irradiation in*

Enhancing Heterogeneous Catalytic Reactions" on November 2, 2007. Opponent: Dr. Fredrik Sandelin, Shell Global Solutions, Amsterdam, Netherlands.

Ville Saarimaa: "*Pectic Acids in Mechanical Pulping and Papermaking*" on November 23, 2007. Opponent: Prof. Per Engstrand, Mittuniversitetet, Sweden.

Matias Kangas: "*Chemical Reaction Engineering in Skeletal Isomerization*" on March 8, 2008. Opponent: Dr. Sami Toppinen, Neste Jacobs Oy, Borgå/Porvoo, Finland.

Pia Sjöberg-Eerola: "*All-Solid-State Ion Sensors. Single-Piece and Solid-Contact Sensors for Chloride and Lithium Ions*" on April 4, 2008. Opponent: Prof. Magdalena Maj-Zurawska, University of Warsaw, Poland.

Jouni Karhu: "*Equilibria and Balances of Metal Ions in Kraft Pulping Processes*" on April 10, 2008. Opponent: Prof. Raimo Alén, University of Jyväskylä, Finland.

Erik Vedel: "*Predicting the Properties of Bioactive Glasses*" on April 18, 2008. Opponent: Dr. Aldo R. Boccaccini, Imperial College London, United Kingdom.

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PCC FACTS AND MISSION

A Centre of Excellence in research appointed by the Academy of Finland for the periods 2000-2005 and 2006-2011. The Åbo Akademi Process Chemistry Centre (ÅA-PCC) studies physico-chemical processes at the molecular level in environments of industrial importance, in order to meet the needs of tomorrow's processes and product development. Our particular focus on the understanding of complex process chemistry we call *Molecular Process Technology*.

The Centre consists of four research groups at the Department of Chemical Engineering, Faculty of Technology, Åbo Akademi University:
· Combustion & Materials Chemistry (Prof. Mikko Hupa),
· Kinetics & Catalysts (Prof. Tapio Salmi),
· Process Analytical Chemistry (Prof. Ari Ivaska) and
· Wood and Paper Chemistry (Prof. Bjarne Holmbom).
In the year 2007, about 130 people (including 20 senior researchers) took part in the PCC activities with a total funding of approximately 6 million euros.

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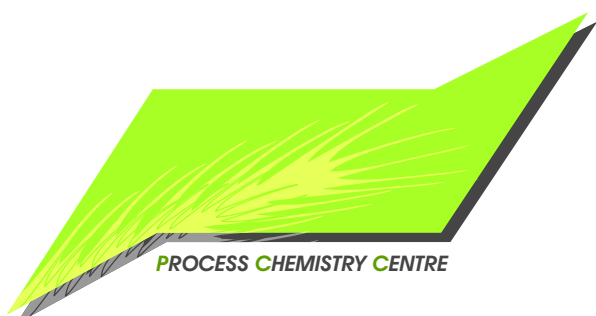
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