

Johan Gadolin Visitors Program

In 2002 our Centre received a prestigious nomination from the European Union. We became a Marie Curie Training Site for doctoral students in Europe in the area of Process Chemistry. This nomination gave us extra funding for inviting PhD candidates from different European countries for a research visit to our Centre. During the four years of the program we had altogether 18 talented PhD visitors from eight different European countries visiting us for a period of typically six to twelve months. The visits were very mutually inspiring and useful. The visiting students made good use of our expertise and equipment in their research. Our people made useful connections to a number of new European research environments. Several of the visits have led to further collaborative research activities of many kinds.

After the successful Marie Curie Training Site program we very much wanted to continue our visitors program. This was finally made possible by a strong support from the Åbo Akademi Foundation. With the funding from the Foundation we are now able to invite about the same number of PhD candidate visitors as before. However, the new program makes it possible to invite also post doctorate fellows or visiting

professors. Also, the visitors can be from anywhere in the world, not just from the EU.

To honour another important scientist besides Marie Curie – now one with a strong connection to the research in Turku - we have called the new program Åbo Akademi Process Chemistry Centre Johan Gadolin Visitors Program. We will start advertising the Johan Gadolin Scholarships shortly. Those interested in a longer visit at our Centre, please keep an eye on our web pages. We look forward very much to hosting many new visitors in the coming four years!

For those of the Newsletter readers who are not familiar with Johan

Gadolin: He was the professor in Chemistry at the old Åbo Akademi in Turku in 1785-1822. The element Nr 64 is named after him. He had a great interest in applied chemistry of many kinds: wood composition, minerals, human body and bone, combustion etc. Interestingly, he was already definitely working on something we today at our Centre like to call Molecular Process Technology!

With the best summer wishes

Mikko Hupa



Prof. Mikko Hupa.

Portrait Unveiling Ceremony at PCC

On the second of april 2007, colleagues, friends, and family gathered at the Laboratory of Industrial Chemistry at PCC to celebrate the 70th birthday of Professor Emeritus Lars-Eric Lindfors.

We all know Lars-Eric - an elegant gentleman who has faithfully been serving Åbo Akademi University his entire life. He was the very first diploma worker of the famous Professor Leif Hummelstedt. Lars-Eric was assistant professor in Industrial Chemistry and his career was crowned with success by the professorship in Chemical Technology, the honoured Borgstöm chair, which is the oldest chair at the Faculty of Technology.

Lars-Eric has been a member of innumerable working teams and committees. He has been the Dean of the former Faculty of Chemical Engineering and a member of the board of directors at Åbo Akademi University.

The personality and the content of the work is though far more important than formal positions. We all know Lars-Eric as a friendly and initiative person who always has the patience to listen and the ability to encourage. He has initiated several new research areas at PCC - modeling and computer simulation of chemical reactors to name a few. From primitive methods at the start he has advanced to the most complicated measuring techniques and computer systems. He also initiated the research in catalysis and led us to the wonderful world of EU-projects.

Today, the laboratory of industrial chemistry is a part of a national



Prof. Em. Lars-Eric Lindfors.

centre of excellence and world famous for its speciality on catalytic processes. At the late summer 2007 we have one of the largest international conferences, EUROPACAT, in Åbo. During his days as Professor Emeritus, Lars-Eric has spent a considerable time at the laboratory of Industrial Chemistry,

which we are all very grateful for.

Åbo Akademi University has traditionally used well established portrait artist. However, the art needs new faces and we wanted to try a new young talent. Jani Helge Nurminen has graduated from the art academy that has the historical Swedish name Åbo Ritskola.

New Graphical Image

Newsletter readers might have noticed the new style of our news bulletin. The new graphical image has been developed by a working group consisting of one person from each of the four research groups at our centre. PCC has a new logo and the idea is that this new layout should

be used in power point presentations, posters, business cards, annual reports, letter heads, etc., for a symmetrical reason. Templates will be distributed and the new layout will be used from now on.

Super Day at PCC - Two Dissertations on May 25

Anti-Cancer Compounds via Hydrogenolysis.

Dr. Heidi Markus at PCC has discovered a new heterogenous catalytic pathway for the preparation of anticarcinogenic lignans.

The hydrogenolysis of hydroxymatairesinol to matairesinol and the dehydrogenation of hydroxymatairesinol to oxomatairesinol was investigated.



The starting material hydroxymatairesinol is found in plant parts, like wooden parts, roots, leaves, flowers, fruits and seeds. Palladium catalysts supported by activated carbon, zeolites, and carbon nanofibres were studied. An influence of acid site concentration on the activity and selectivity in the hydrogenolysis reaction was found. For palladium supported by activated carbon and carbon nanofibres, a direct dependence between the catalytic activity and the concentration of acid sites was observed, while for palladium on beta zeolite an inverse dependence was noticed. For carbon nanofibre based catalysts, not only an increase in activity but also an increase in selectivity to matairesinol was observed when the concentration of acid sites increased.

Thermochemistry and melting properties of alkali salt mixtures in black liquor conversion processes.

Dr. Daniel Lindberg has studied the thermochemistry and melting properties of alkali salt mixtures involved in black liquor and biomass combustion by evaluating and optimizing the thermodynamic data for all known phases in the Na^+ , $\text{K}^+/\text{CO}_3^{2-}$, SO_4^{2-} , S^{2-} , $\text{S}_2\text{O}_7^{2-}$, S_x^{2-} , Cl^- , Va^- system using experimental



data as input. The thermodynamic properties of the liquid phase were modeled using the Modified Quasichemical Model in the Quadruplet Approximation, which is a thermodynamic model developed especially for molten salts. Predictions of the melting behavior of the alkali salts are useful for understanding the behavior of the smelt bed and the formation of harmful deposits in the kraft recovery boiler.

Moreover, the effects of chemical and physical variations on the borate autocausticizing reactions in mixtures of alkali carbonates and alkali borates were studied by simultaneous differential thermal analysis and thermogravimetry.

Outstanding Chinese Oversea Student at PCC

"Governmental Award to Outstanding Chinese Oversea Students" is a direct translation of the prize that recently was awarded to Di Wei at PCC. This annual prize, offered from the Chinese government, is aimed to the best self-financed Chinese overseas students in all subjects. The award currently covers 31 countries worldwide.

There are 6 "winners" from Finland selected from different subjects this year for their performance of 2006.

The motivation for this prize is to encourage overseas students.

It covered Finland since 2005 and the sum of money is 5000 US dollars.



Finnish Catalysis Society Award to David Kubicka

The researcher Dr. David Kubicka received a prize by the Finnish Catalysis Society for his doctoral thesis in ring opening reactions in diesel oil production. The opening of the molecular ringstructures are of central importance in production of diesel oil from the environmental point of view.

The work was awarded since Dr. Kubicka in his work studied catalytic reaction mechanisms and developed new platinum and iridium based catalysts. Catalyst knowledge, advanced chemical analyses, and modern reaction engineering were combined in this research. The prize was delivered at Neste Oil, Esbo.



GUEST LECTURES

Prof. Andrzej Wieckowski, Department of Chemistry, University of Illinois at Urbana-Champaign, Illinois, USA: "*Surface Motions at Catalytic Electrodes with Reference to Activity in Fuel Cells*" on March 19, 2007.

Prof. A. Robert Hillman, University of Leicester, Leicester, UK: "*Solvent, the Silent Partner in Polymer Film Dynamics*" on April 2, 2007.

Prof. Adriaan van Heiningen, University of Maine, Orono, ME, USA: "*Use of a Berty Reactor to Determine Kinetics and Mechanism of Oxygen Delignification of Pulp*" on April 19, 2007.

Prof. Paolo Canu, Università di Padova, Italy: "*Computational Fluid Dynamics for Chemical Reactors*" on May 16 and May 18, 2007.

Prof. Pierre Gallezot, Institut de Recherches sur la Catalyse et l'Environnement de Lyon, Villeurbanne, France: "*Process Options for the Conversion of Renewables to Bioproducts*" on May 24, 2007.

DOCTORAL DEFENSES

Vesna Barišic: "*Catalytic Reactions of N₂O and NO over Bed Materials from Multi-Fuel Circulating Fluidized Bed Combustion*" on January 19, 2007. Opponent: Prof. Franz Winter, Vienna University of Technology, Vienna, Austria.

Di Wei: "*Organic Electronic Materials Based on Polyaniline Derivatives, Fundamental Studies and Applications*" on March 30, 2007. Opponent: Prof. A. Robert Hillman, University of Leicester, United Kingdom.

Heidi Markus: "*Hydrogenolysis and Dehydrogenation of Hydroxymatairesinol over Supported Palladium Catalysts*" on May 25, 2007. Opponent: Prof. Pierre Gallezot, Institut de Recherches sur la Catalyse-CNRS, Villeurbanne, France.

Daniel Lindberg: "*Thermochemistry and melting properties of alkali salt mixtures in black liquor conversion processes*" on May 25, 2007. Opponent: Dr. Gunnar Eriksson, GTT-Technologies, Herzogenrath, Germany.

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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 2006, 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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