

Cooperation through joint positions outside PCC – friend or foe?

Although our PCC cooperation has been and will in the future continue to be a true success story, we do have to extend our cooperation towards other parties as well. This comes naturally through our projects on different levels in e.g. EU, Academy of Finland, Tekes, and the different SHOK programs. However, I would here like to discuss the opportunities we get through the establishment of joint positions with other universities or research entities. The PCC is actually somewhat of a pioneer in this respect within Åbo Akademi University. The PCC laboratories have or have had several such positions: Catalysis and Reaction Engineering has a joint professorship with Umeå University in Sweden through Prof. Mikkola, Process Analytical Chemistry has a FiDiPro professorship with New York University through Prof. Levon and also a professorship partly connected to the industry through prof. Lewenstam. My own Wood and Paper Chemistry laboratory had a joint position with VTT Technical Research Centre of Finland through visiting Prof. Auer, which ended early 2011 at the retirement of Prof. Auer. Furthermore, we currently have three joint positions with the Finnish Forest Research Institute (Metla), through Prof. em. Holmbom, Docent Pranovich, and Senior Researcher Hemming. More recently, our laboratory has established a joint position with the Wallenberg Wood Science Center (WWSC) from KTH in Sweden, through Dr Xu.

All of the abovementioned joint positions are valuable to our research and open up possibilities also for joint projects and common research strategies with the involved parties. I

will take the last two mentioned (Metla and WWSC) as examples.

With Metla we form common projects and research strategies in the areas of wood chemistry and biorefining, jointly supervise PhD students, and also get access to some research infrastructure (e.g. analytical equipment, research forests) we currently lack in our own laboratory and in the PCC. Metla naturally also get access to our laboratory and expertise, so this is nothing but a win-win situation for both parties. Forming this alliance hopefully also enables us to influence larger research strategies in Finland in the future to a greater extent.

With WWSC we particularly find a path for introducing our knowledge and research around hemicelluloses into the world of biocomposites and new materials from trees, while again also getting access to a certain research infrastructure we lack in our own laboratory. This cooperation has been very promising from the beginning and already now we extend it to include some of our PhD students through laboratory visits and a forthcoming “Summer school in biorefinery and biocomposite analysis” to be organised 2012. Also with WWSC, we aim at finding new possibilities for common projects funded by a Nordic financier.

The abovementioned cooperation is very much in line with the strategies of both Åbo Akademi University and the Department of Chemical Engineering, since both emphasize national, Nordic, and international cooperation. However, the strategies and our most important sponsors, that is Tekes and the Academy of Finland, also value interdisciplinary cooperation. The PCC



Professor Stefan Willför

could thus in the future aim at establishing similar cooperation and joint positions with excellent persons from areas such as Business and Economics, Social Sciences, or Biosciences.

I will end up by answering my question in the title “Cooperation through joint positions outside PCC – friend or foe?”. This kind of cooperation is definitely a friend that we should aim at utilising even more in the future.

Stefan Willför

The Magnus Ehrnrooth Prize to Prof. Tapio Salmi

Finnish Society of Science and Letters awarded **Academy Professor Tapio Salmi** the **Magnus Ehrnrooth Foundation prize** in chemistry. Salmi was awarded the prize because of his research on the mechanisms of many organic chemical reactions as well as reaction kinetics, especially catalytic hydrogenation, oxidation, aldolization, esterification, hydrolysis, chlorination, and isomerization of organic compounds.

The research has led to many improved processes and patents and Prof. Salmi is the author of more than 350 scientific journal articles and he has written two textbooks concerning reaction engineering and catalysis. Prof. Salmi has supervised more than 40 doctoral theses.



Academy Professor Tapio Salmi

Prizes to Johan Werkelin and Henrik Grénman

The Rector of Åbo Akademi has awarded prizes from the Harry Elving Trust to two PCC members: **Johan Werkelin** was appointed "Teacher of the year" and received an award for excellence in teaching. **Henrik Grénman** was awarded a researcher prize for his doctoral thesis "*Solid-liquid reaction kinetics. Experimental aspects and model development*". The work is of fundamental character in chemical reaction engineering. The interaction between reactive solids and liquids was studied exclusively in the work and new mathematical models were developed to describe the reactivity of particles in non-ideal cases.



Johan Werkelin and Henrik Grénman

9th ISE Spring Meeting First Time in Finland

The 9th Spring Meeting of the International Society of Electrochemistry was held at the Mauno Koivisto Centre in Biocity, Turku, Finland, from May 8 to May 11, 2011. The theme of the meeting was "Electrochemical Sensors: From Nanoscale Engineering to Industrial Applications", which attracted more than 200 participants from 35 countries.

The Meeting was organized jointly by ISE Division 1 (Analytical Electrochemistry) and ISE Division 5 (Electrochemical Process Engineering and Technology). The program included 4 keynote lectures, 12 invited lectures, 58 oral presentations, more than 100 posters and an instrument exhibition.

The Opening ceremony was followed by a Special session celebrating the International Year of Chemistry (IYC 2011). The importance and success of electrochemistry was highlighted by Christopher Brett (Portugal), and Christian Amatore (France) described further how electrochemistry helped to reveal the biomedical properties of Egyptian black makeup.

Keynote lectures were given by Michael Mirkin (USA) "Nanoscale electrochemical sensors prepared by electrodeposition, Justin Gooding (Australia) "Nanoparticle architectures for improving selectivity and sensitivity of electrochemical affinity biosensors", Jiri Janata (USA) "Work function potentiometric sensors" and Ritu Katakya (UK) "Chiral sensing and its significance".

Invited lectures were given by Gordon Wallace (Australia), Richard Baldwin (USA), Richard G. Compton (UK), Serge Zhuiykov (Australia), Andrzej Lewenstam (Finland), F. Xavier Rius (Spain), Dermot Diamond (Ireland), Eric Bakker (Switzerland), Robert E. Gyurcsanyi (Hungary) and Li Niu (China).

The poster prize was awarded to Takeshi Irisako from Tokyo University of Science (Japan).

We were fortunate to enjoy excellent Spring weather during the whole conference, including Tuesday evening when the conference dinner was held at Restaurant "Naantalin Kaivohuone" in the old town of Naantali by the sea.

Thank you all for making the 9th ISE Spring Meeting a success!

Johan Bobacka

Chair of the 9th ISE Spring Meeting



Åbo Akademi Process Chemistry Centre Annual Meeting

The Åbo Akademi Process Chemistry Centre Annual Meeting 2011 was held on August 26–27 in the ICT Building. The topic of the meeting was “*Conference on Molecular Process Technology*”, which refers to our original idea of the common research approach. The event was opened by the Chancellor of Åbo Akademi **Jarl-Thure Eriksson** followed by review of the PCC activities by **Prof. Mikko Hupa**. Keynote lectures were held by **Prof. Jean Claude Charpentier**, **Prof. Douglas Reeve**, **Prof. Jiri Janata**, and **Prof. J.W. Niemantsverdriet**. Research highlights in molecular process technology were presented by **Prof. Ari Ivaska**, **Prof. Mikko Hupa**, **Prof. Tapio Salmi**, and **Prof. Stefan Willför**. Flash presentations of selected posters and a poster session took place on the second day. In the evening the PCC members enjoyed the opera performance “*Henrik och häxhammaren*” at Turku Castle.



Camure 7 & ISMR 8 Conference

Top scientists in Chemical Reaction Engineering gathered in Naantali on May 22–25, 2011, when the PCC acted as a local organizer of the conference CAMURE–8 & ISMR–7. The conference is a fusion of two symposia: Catalysis in Multiphase Reactors (CAMURE–8) and International Symposium on Multifunctional Reactors (ISMR–7). 90% of the industrially applied processes in the world use catalysts to enhance the rate of chemical processes. Examples of such chemical processes are reactive distillation, reactive extraction, and membrane technologies. The main topic of the conference was multiphase catalysis and multifunctional chemical reactors and it attracted 170 experts from Europe, America, Asia, and Australia.

Catalysis is used for production of base chemicals and fuels, polymers and for production of fine and specialty chemicals. Catalysis is one of the key technologies of tomorrow. It is time to adapt to the use of renewable resources, especially biomass. The conference series started in Lyon in France 1994. The last Camure & ISMR event took place in Montreal in Canada 2009. In 2011, the conference was held for the first time on Nordic ground at the Naantali Spa Hotel. At the opening ceremony on May 22 the City Manager of Naantali **Timo Kvist** gave a speech and so did also the Rector of Åbo Akademi **Professor Jorma Mattinen**. **Academy Professor Tapio Salmi** held a historical lecture about the development of the Naantali area from a religious village to a modern and attractive town with tourism and industry. At the dinner in restaurant Kaivohuone, the Chancellor of Åbo Akademi **Jarl-Thure Eriksson** held a philosophical speech and **Dr. Juha Lehtonen** brought greetings from industry to the conference.

We enjoyed 52 oral presentations and we were watching 75 poster presentations. The conference operated in two parallel sessions. Problems dealing with multiphase reactors and multifunctional systems were highlighted in a particularly versatile program. The oral and poster presentations treated synthesis of chemicals and fuel components in multiphase reactors, catalysts and kinetics, mass transfer and fluid dynamics in multiphase systems. A special session was devoted to computational fluid dynamics (CFD) modelling. A fruitful dialog between chemists and chemical engineers characterized the event. The discussions were intense in this relatively condensed conference, since experts from the whole world were present.

The price for the best poster presentation was given to **Sabine Schwidder** from Brandenburgische Technische Universität Cottbus. She had under the supervision of **Professor Klaus Schnitzlein** developed an interactive simulation program for modeling of trickle bed reactors.

The real scientific program started already on Sunday May 22 when **Professor Faical Larachi** from Université Lavalin Quebec gave a fascinating plenary lecture about bonding of carbon dioxide by using ionic liquids. The theme multifunctional reactors was actual all the time and we had the possibility to listen to top level specialists like **Professor Enrico Drioli** from Università di Calabria and **Professor Alirio Rodrigues** from Universidade do Porto. Drioli presented opportunities with membrane reactors when the aim is to shift the equilibrium of reversible reactions to the side of the reaction products. The theme of Rodrigues' plenary speech was chromatographic reactors, which are becoming more important for example in separation of reaction product from raw materials in processes using biomass. **Dr. B. Zhong** from Beijing (RIPP) gave a very interesting plenary lecture on the development of a new amorphous nickel catalyst that can be used in a magnetically stabilized catalyst bed.

The plenary speech of **Claude de Bellefon** from Université de Lyon, CNRS–CPE, on microstructured reactors was one of the highlights of the sunny days in Naantali. In his speech, Bellefon could announce that the next Camure & ISMR takes place in Lyon, France 2014 – in Lyon Camure started and to Lyon Camure shall return.



GUEST LECTURERS

Prof. Gordon Wallace, Australian Research Council (ARC) Centre of Excellence for Electromaterials Science, Wollongong, Australia: "*Novel Electromaterials for Energy and Medical Bionics: Materials Discovery, Fabrication and Characterisation*" on May 5, 2011.

Prof. Alan W. Rudie, US Forest Service Forest Products Laboratory in Madison, WI, USA: "*Value Prior to Pulping: Softwoods*" on December 8, 2011.

DOCTORAL DEFENSES

Anna Österholm: "*Electronic and Structural Properties of Polyazulene Materials: An in situ Spectroelectrochemical Investigation*" on June 17, 2011. Opponent: **Prof. Toribio Otero**, Universidad Politécnica de Cartagena, Spain.

Minna Piispanen: "*Characterization of Functional Coatings on*

Ceramic Surfaces" on July 1, 2011. Opponent: **Prof. Aleš Helebrant**, Institute of Chemical Technology, Prague, Czech Republic.

Valerie Ayamba Eta: "*Catalytic Synthesis of Dimethyl Carbonate from Carbon Dioxide and Methanol*" on September 16, 2011. Opponent: **Dr. Danielle Ballivet-Tkatchenko**, Université de Bourgogne, France.

Sonja Enestam: "*Corrosivity of Hot Flue Gases in the Fluidized Bed Combustion of Recovered Waste Wood*" on November 4, 2011. Opponent: **Prof. Marcus Öhman**, Luleå tekniska universitet, Sweden.

Bright Kusema: "*Catalytic Transformation of Arabinogalactan, its Oligomers and Monomers into Valuable Chemicals*" on November 28, 2011. Opponent: **Prof. Rüdiger Lange**, Technische Universität Dresden, Germany.

Kim Granholm: "*Sorption/Desorption Reactions of Metal Ions with Pulp*" on December 9, 2011. Opponent: **Prof. Alan W. Rudie**, US Forest Service Forest Products Laboratory in Madison, WI, USA.

Pasi Vainikka: "*Occurrence of Bromide in Fluidized Bed Combustion of Solid Recovered Fuel*" on December 21, 2011. Opponent: **Prof. Franz Winter**, University of Vienna, Austria.

Continuation of GSCE 2012–2015

Many of the PhD works at the PCC are done with support from the national graduate schools. Currently the PCC is responsible for the coordination of the national Graduate School in Chemical Engineering (GSCE). The GSCE consists of altogether 26 participating laboratories at four universities: Aalto University School of Chemical Technology, Lappeenranta University of Technology, the University of Oulu and Åbo Akademi. In 2011 41 students were participating in the activities of the GSCE, 14 of them from our Centre. We recently received the delightful news from the Academy of Finland that the GSCE was granted continued funding for the next four-year period 2012–2015. Our Centre continues to be the host of the coordination office of this Graduate School.

PCC SCIENTIFIC AND INDUSTRIAL ADVISORY BOARDS

SAB

Douglas Reeve | University of Toronto
Jiri Janata | Georgia Institute of Science and Technology
Jean-Claude Charpentier | CNRS/ENSIC/INPL Nancy

IAB

Örjan Andersson | Novia
Ilmo Aronen | Raisio
Stig-Erik Bruun | Chemigate
Heidi Fagerholm | Kemira
Håkan Gros | Danisco
Lars Gädda | Forestcluster
Markku Karlsson | UPM-Kymmene
Bertel Karlstedt | Nordkalk
Nina Kopola | Dynea
Eeva-Liisa Lakomaa | Vaisala
Heikki Laurila | Outotec
Timo Leppä | Chemical Industry Federation of Finland
Leena Paavilainen | Metla
Lars Peter Lindfors | Neste Oil
Ismo Reilama | Metsä-Botnia
Bengt-Johan Skrifvars | Top Analytica
Kenneth Sundberg | Tikkurila
Kari Toivonen | Elomatic
Petri Vasara | Pöyry

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, Åbo Akademi University:

- Combustion & Materials Chemistry (Prof. Mikko Hupa),
- Catalysis and Reaction Engineering (Academy Prof. Tapio Salmi),
- Process Analytical Chemistry (Prof. Ari Ivaska) and
- Wood and Paper Chemistry (Prof. Bjarne Holmbom).

In the year 2010, about 130 people (including 20 senior researchers) took part in the PCC activities with a total funding of approximately 7 million euros.

PCC EXECUTIVE BOARD

Prof. Bjarne Holmbom | email: bjarne.holmbom@abo.fi
Prof. Mikko Hupa | email: mikko.hupa@abo.fi
Prof. Ari Ivaska | email: ari.ivaska@abo.fi
Prof. Tapio Salmi | email: tapio.salmi@abo.fi

COORDINATING ASSISTANT

Maria Ljung | email: pcc@abo.fi
Biskopsgatan 8, 20500 Turku / Åbo, Finland

EDITOR IN CHIEF

Prof. Mikko Hupa | email: mikko.hupa@abo.fi

EDITOR

Dr. Andreas Bernas | email: andreas.bernas@abo.fi



PROCESS CHEMISTRY CENTRE