Winter School of HCJRG-118

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The 2015 Winter School of the Helmholtz-CAS Joint Research Group 118 on "Integrated catalytic technologies for efficient hydrogen production" was scheduled to be one highlight of the half annual meetings of the international group.

Therefore, the School was focusing on the one hand on a scientific qualification program, consisting of lectures by KIT scientists, a colloquium on case examples referring to industrial establishment of compact chemical processes, excursions and round tours at two companies related to the group's research objectives – Linde AG Engineering Division at Pullach and Clariant Produkte (Deutschland) GmbH at Bruckmühl-Heufeld – in order to provide direct insights into engineering aspects of industrial catalytic processes and industrial R&D and production of catalysts. Furthermore, the program included a round tour at the Environmental Research Station Schneefernerhaus (UFS) from which KIT is a consortia partner and which is outstanding referring to its research abilities due to its geographic location at the top of Zugspitze.

On the other hand, a main objective of the School was the encouragement of the participants to free academic discussions for the purpose of intensification of the international collaboration. To ensure enough space for these interactions within the tight school schedule the facilities of UFS Schneefernerhaus were chosen as a kind of isolated venue for the lecture and colloquium part. Moreover, the program was rounded off by a snowshoe walking group activity at the top of Germany's highest mountain Zugspitze.

Scientific Qualification Program

The scientific qualification program, which was especially designed as a scientific accelerator for the PhD students, combined lectures by executive scientists from KIT's Institute for Micro Process Engineering (IMVT) on kinetics and heat and mass transfer effects in heterogeneous catalysis, held namely by Dr. Katja-Haas Santo and Prof. Roland Dittmeyer, as well as user-oriented introductions to in-operando X-Ray Absorption Spectroscopy (XAS) by lectures from renowned scientists from KIT's Institute of Catalysis Research and Technologie (IKFT), represented by Dr. Henning Lichtenberg, and KIT's Institute for Chemical Technology and Polymer Chemistry (ITCP), represented by Dr. Hudson Carvalho.

The case examples referring to industrial establishments of high-tech compact chemical processes were given on compact Fischer-Tropsch-systems by Prof. Peter Pfeifer, scientific leader of IneraTec (http://www.ineratec.de/index.php/en/), which is a spin-off from KIT-IMVT, and on a compact membrane reformer pilot plant for hydrogen production from methane by Dr. Benjamin Dittmar, research scientist at Linde AG Engineering Devision in Pullach (http://www.linde-engineering.com/en/process_plants/hydrogen_and_synthesis_gas_plants/gas_generation/steam_reforming/index.html).

Environmental Research Station Schneefernerhaus (UFS)
(http://www.schneefernerhaus.de/en/home.html)

The Schneefernerhaus of which atmosphere research is its main purpose was chosen as isolated-kind venue for the lecture and colloquium part of the winter school in order to encourage the participants to further scientific exchange in the late night hours after the scientific program. Furthermore, the numerous scientific posters on climate and atmosphere research at the venue got

a welcome occasion to appease the thirst of interdisciplinary knowledge for the participants and to start fruitful further discussions by pretzel and wheat beer.

Group activity – Snowshoe walking at the top of Germany

An undoubted highlight of the school was the snowshoe walking activity starting from Schneefernerhaus up-hill. This sweat-inducing and exhausting sportive action for the German and Chinese project members definitely strengthened the group solidarity as severe down-hill slips of the encouraged but partially unexperienced scientific coworkers evoke short-implementation of risk-averting measures above the cliffs. The final collective down-hill run from the reached plateau got a further unexpected fun for all participants.

Industry excursion to Clariant Produkte (Deutschland) GmbH

The industry excursion to Clariant Produkte GmbH at Bruckmühl-Heufeld took place on Friday, February 06, right after arrival of the Chinese coworkers at Munich Airport. The car ride to the research and production site also let time to pass by the head quarter of the famous international company located in Munich city. The company is renowned for, i.e., its production of catalysts, functional materials and pigments – like the violet milka color.

The introduction and round tour through the R&D facilities of the site were given by the head of R&D Dr. Reitzmann. We strongly appreciated the honest and detailed answers on all our numerous questions referring to modus operandi of R&D at Clariant which were given in the seminar room and, moreover, in the concrete R&D halls on nature and challenges of the processing and analytic devices and reaction setups as well as on our further questions referring to, e.g., applicability of new catalyst synthesis routes, the business model and the challenges in the international customer acquisition. The visit at the Clariant site was definitely one of the best industry excursions in our lifes.

Industry excursion to Linde AG Engineering Division

The excursion to Linde AG Engineering Division at Pullach near Munich provided direct insights far from the school bench to engineering aspects of industrial catalytic processes.
The introduction to the company and round tour through the complex division was given by research scientist Dr. Benjamin Dittmar who was graduating at KIT in 2014 on industrial applicable hydrogen membrane reactors. The highlight of the tour was the step-by at the new built meter tall compact membrane reformer pilot plant for hydrogen production from methane. Dr. Dittmar is directly involved in the built-up of the plant and its later operation so he was able to answer all our questions about the scale up, safety and legal prerequisites and the scheduled champagne in 3 shifts per day. The visit at Linde AG gave us a good insight in the more complex industrial requirements for the scale-up process.

Furthermore, we were taught about some challenging side aspects of the process engineering like corrosion incidents and their prevention in industrially applied pipes for water treatment in, e.g., heat exchangers which are also part of every scale of a catalytic process. Finally, Dr. Dittmar emerged, that these mentioned side aspects were well chosen as in Dalian, the working town of our Chinese colleagues, one of the biggest Linde AG production sites for heat exchangers is located. Thus, these information were completing the circle referring to the potential of a Chinese-German cooperation.