

## **GeCatS-Infotag “Katalytische Oxidation als Schlüsseltechnologie“ am 16. November 2015 im DECHEMA-Haus, Frankfurt am Main**

*Report by Christoph Sprung*

Stefan Schunk (hte GmbH, Heidelberg) opened the GeCatS-Infoday on “catalytic oxidation as a key technology” at the DECHEMA-house in Frankfurt/Main with a brief welcome address to the audience of about 90 participants. He introduced the title topic, which was summarised and presented in a ‘position paper’, stating the importance and demand of research in the field of catalytic oxidation.

The first talk was given by Gabriele Centi (University of Messina, Italy), presenting a comprehensive overview on the current state of selective oxidation catalysis and its future perspective. Clearly, the selective oxidation is of widespread importance, since the majority of intermediates and products in chemical industry undergo one or several oxidation steps in their process chain. The production capacities for selective oxidation products, in particular, increased during the last years, underline its relevance. Additionally, the issue of feedstock variety was addressed, picturing several process routes to desired products employing crude oil based feedstock, natural gas and renewable sources.

Martin Muhler (Ruhr-University Bochum, Germany) led the audience into a detailed insight into the role of water during catalytic oxidation of aqueous alcohol solutions. Firstly, he presented theoretical calculations of well-defined gold clusters and the importance metal-support interactions. The latter was a key parameter to understand the performance of differently loaded TiO<sub>2</sub> supports with uniformly sized gold nanoparticles. Furthermore, results for a Pd-catalyst on carbon-nano-tubes (CNTs) were presented and evidence for the mobile active phase by dissolution and re-deposition of Pd.

Industry was represented on stage by Christian Walsdorff (BASF SE, Ludwigshafen, Germany), looking at selective oxidation processes from an industrial point of view. The yield of about 100 million tons of products from selective oxidation processes underlines once more the global significance of the title topic. During his talk, he presented furthermore characteristics and challenges of such catalytic processes.

The following lunch break provided the opportunity for lively networking and discussion of the topics presented during the first part of the day. The afternoon session was opened by Horst-Werner Zanthoff (Evonik Technology & Infrastructure GmbH, Marl, Germany), who led through the program.

A bridging talk between homogeneous and heterogeneous catalysis was given by Matthias Beller from Leibniz Institute for Catalysis (Rostock, Germany). He presented a large variety of oxidation reactions involving metal organic complexes as catalysts and their improved reactivity and selectivity. In specific examples, he showed processes both for the production of bulk and fine chemicals.

Frederic W. Patureau (TU Kaiserslautern, Germany) presented his vision and experimental examples for the utilisation of gaseous oxygen as an oxidant for C-H-bond functionalisation.

Frank Hollmann (Delft University of Technology, The Netherlands) approaches selective oxidation reactions by enzyme catalysis, presenting the variety and diversity of products and reactions, which may be performed by enzymes. As he discussed, the cost of enzymes depends predominantly on the scale of their production. Thus, such catalyst systems become reasonably prized when produced in large quantities. Secondly, he compared turn-over-numbers and categorised them into economically feasible ranges for fine and bulk chemicals. He left the audience with an optimistic impression on the future application of enzymes for the production of bulk chemicals.

After a short coffee break, Robert Schlögl (Fritz Haber Institute of the Max Planck Society, Berlin & Max Planck Institute for Chemical Energy Conversion, Mülheim a.d. Ruhr, Germany) presented detailed insight into the nature of active sites for different catalyst systems. He specifically expressed the necessity of the characterisation under reaction conditions, underlined by experimental evidence. Among his presented methods were conductivity and calorimetric measurements, as well as spectroscopic and microscopic investigations. His conclusions stated: 'we know a lot, but not enough'.

Reinhard Schomäcker (TU Berlin, Germany) was chairman of this last session. He briefly introduced the key topics presented and discussed in the 'position paper', before he invited selected speakers to join a discussion panel on stage. The key topics were (i) secure and increase funding for selective oxidation catalysis, (ii) secure the interest of young researchers in this field, and (iii) how to facilitate mutual interest of academic research and industrial relevance.

Each of the panel members expressed his opinion on the mentioned topics, finding largely common ground. Funding was named as a significant parameter; however, this "money" shall also be filled with ideas. The future perspective was discussed in light of the expected retirement wave in this field and concerns were expressed about the number of upcoming young academics filling these positions. The interest of young academics in fundamental aspects is required, rather than catchy science. It was admitted by the panel, that fundraising for the former is considered more difficult and may be a significant hurdle. Linking together industrial and academic research interests remains challenging, further efforts need to be made to find a mutual language. The panel discussion was complemented by comments from the audience. The panel closed the session by expressing the relevance and their optimism for future research in oxidation catalysis, intending to spark their enthusiasm to funding agencies and young academics.

All in all, the GeCatS-Infoday on "Oxidation Catalysis as a Key Technology" was a success, bringing together about 90 established and young researchers from academia and industry. Especially the high share of participants from industry (about 40 %) shows the importance and overall interest in this field.