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THE STRUCTURAL TRANSFORMATION OF METAL-METAL OXIDE CATALYSTS IN REACTIVE ENVIRONMENTS

Arik Malte Beck
The van Bokhoven Group
Supervisor: Prof. Dr. Jeroen A. van Bokhoven
Co-examiners: Prof. Dr. Marc G. Willinger,
Prof. Dr. Christoph Müller, Prof. Dr. Emiel Hensen

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Project Summary: Heterogeneous catalysts are the backbone of large-scale chemical synthesis. The active catalyst has to be a meta-stable substance, which alters its chemical structure in the catalytic cycle. This property makes a catalyst transform in changing environments. Two archetypical catalysts - platinum supported on reducible oxides and the copper-zinc-alumina catalyst - were investigated using in-situ characterization methods. In industrial application, both catalysts are exposed to hydrogen-containing atmospheres, during the activation process and in catalyzed (de-)hydrogenation reactions. Therefore, the work focuses on the induced hydrogen effects on the catalyst structure. The phenomena described as strong metal-support interaction (SMSI) and hydrogen spillover are studied using in-situ electron and X-ray microscopy and spectroscopic methods.

CV: Arik Beck started research in catalysis with a research stay in the group of Matteo Cargnello at Stanford University in 2017 and continued the work in the group of Jan-Dierk Grunwaldt from Karlsruhe Institute of Technology (KIT). In 2018, he graduated as chemical engineer (M. Sc.) at the KIT. Since then, he is pursuing his doctorate under the supervision of Jeroen A. van Bokhoven at the Institute of Chemical and Bioengineering of ETH Zürich.