

ICB PhD public presentations

FROM THE CATALYTIC PARTIAL OXIDATION OF METHANE TO LEWIS ACID SITES IN ZEOLITES

Manoj Ravi

The van Bokhoven Group

Supervisor: Prof. Dr. Jeroen Anton van Bokhoven

Co-examiner: Prof. Dr. Christophe Copéret

ETH Hönggerberg, 11/02/2020

HCI D 8, 11.00 h



Project Summary: The direct partial oxidation of methane has been a long sought-after approach to utilize methane available in decentralized oil fields, instead of its flaring to carbon dioxide. We identify 'product protection' as an indispensable concept to engineer a high-yield methane-oxidation process. We explore the use of transition metals, including copper, iron and cobalt to catalyze the conversion of methane to methanol and methyl derivatives. Furthermore, we explicate the possibility to catalytically convert methane over aluminum-containing zeolites with hydrogen peroxide. We develop structure-property relationships for the catalytically active aluminum species, uncovering the Lewis acidic nature of framework-associated aluminum in zeolites. By presenting a conceptual advance on the relationship between aluminum coordination and acidity in zeolites, and highlighting diverse promising catalytic systems for methane-oxidation, the thesis adopts a material-, as well as, a process-oriented approach.

CV: Manoj received his B.Tech in Chemical Engineering from AC Tech, Anna University Chennai in India. He completed his M.Sc. in Chemical & Bioengineering at ETH Zurich, where he was the recipient of the Willi-Studer award. In 2016, he started his Ph.D. research in the group of Prof. van Bokhoven.