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CORRELATED OPERANDO ELECTRON MICROSCOPY AND PHOTOEMISSION SPECTROSCOPY IN PARTIAL OXIDATION OF ETHYLENE OVER NICKEL

Claudiu Colbea

The van Bokhoven Group
Supervisor: Prof. Dr. Jeroen A. van Bokhoven
Co-examiners: Prof. Dr. Marc G. Willinger (TUM) and Dr. Luca Artiglia (PSI)

10/10/2023, 9 am, ETH Hönggerberg
HCI J 143 and on Zoom
(https://psich.zoom.us/j/8738516515)

Project Summary: The solid-gas interface in heterogeneous catalysis has been shaping our society over the past 120 years. Achieving and maintaining balance in the reaction conditions on this interface is a non-trivial task, requiring precise control over the reaction conditions. This work investigates the hydrocarbon partial oxidation, with a focus on ethylene partial oxidation to syngas using oxygen in a self-sustained oscillation mode, catalyzed by polycrystalline nickel foils and nickel nanoparticles. To shed light on the complex phenomena governing the solid-gas interface, a combination of integral, near ambient pressure X-ray photoelectron spectroscopy (NAPXPS), online mass spectrometry (MS), and localized, environmental scanning electron microscopy (ESEM), and environmental transmission electron microscopy (ETEM) was employed. This work not only offers new insights into the complex interplay between the catalyst structure, surface orientation, and performance but also directly visualizes the chemical dynamics that are present on the solid-gas interface.

CV: Claudiu Colbea earned a M.Sc in Chemistry from University of Bucharest- Faculty of Chemistry in 2019. At ETH Zürich, he continued his studies jointly at the Department of Applied Biosciences and Chemistry (DCHAB) and Scientific Center of Optical and Electron Microscopy (ScopeM). Supervised by Prof. Jeroen Anton van Bokhoven and Prof. Marc Georg Willinger, his research highlighted the complex dynamics governing the solid-gas interface under reactive conditions.

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