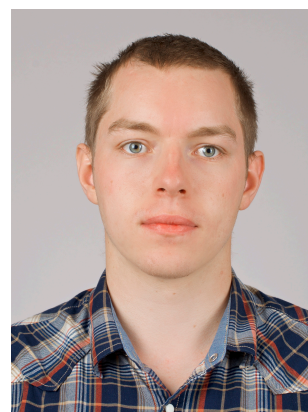


ICB PhD public presentations**FUNCTIONALIZATION OF LIGHT
ALKANES OVER COPPER-CONTAINING
ZEOLITES****Mikalai Artsiusheuski**

The van Bokhoven Group

Supervisor: Prof. Dr. Jeroen A. van Bokhoven

Co-examiners: Prof. Dr. Matthias Ernst (LPC),
Prof. Dr. Silvia Bordiga (University of Torino) and
Dr. Vitaly Sushkevich (Paul Scherrer Institute)



**13/04/2023, 9 am, Paul Scherrer Institute
OFLG/402 and on Zoom
(<https://ethz.zoom.us/j/64576007382>)**

Project Summary: Direct valorization of natural gas is highly desirable process from both economic and environmental perspectives. A promising approach in this field is stepwise oxidation over transition metal loaded zeolites. This thesis explores different aspects of functionalization of components of natural gas over copper-containing zeolites. A novel method to characterize copper-containing zeolites based on evaluation of kinetics of oxygen isotope exchange is proposed, showing that nature and amount of copper-oxo sites determine the rate of exchange of oxygen atoms in the zeolite framework. The evolution of different copper-oxo active sites in the course of reaction with methane is studied using in situ Cu K-edge X-ray absorption spectroscopy, revealing that the structure of copper(II) center governs that of formed copper(I) species. Equally, we study the fate of methane during conversion over copper-containing zeolites by means of in situ infrared and solid-state NMR spectroscopies, and show that the nature of products is determined by structure of active copper-oxo sites and reaction conditions. For the first time we demonstrate possibility for direct methane conversion to C₂+ hydrocarbons and establish the mechanism of C-C bond formation via methanol transformations over acid sites and Koch carbonylation reaction. Finally, we apply copper-containing zeolites for valorization of light alkanes beyond methane, in particular, ethane and propane.

CV: M. Artsiusheuski obtained his Specialist Degree in Physical Chemistry at Lomonosov Moscow State University in 2019. The same year, he joined the group of Prof. Dr. Jeroen A. van Bokhoven at ETH Zurich for his doctoral studies.