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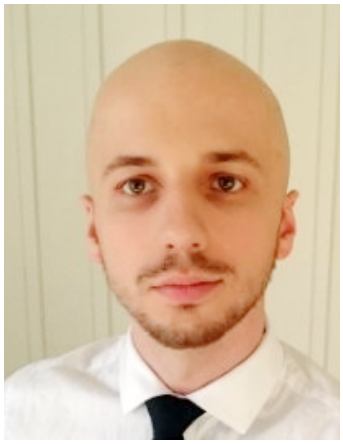
## ICB PhD public presentations

# FE SITES ON THE SURFACE OF SILICA AND THEIR REACTIVITY IN NON-OXIDATIVE METHANE COUPLING

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Co-examiner: Prof. Dr. Christoph Copéret


**ETH Hönggerberg, 19/03/2019**
**HCI D2, 15.30 h**


Project Summary: The transformation of methane into higher hydrocarbons is a very attractive route for valorization of natural gas, but it faces many challenges such as rapid deactivation of the catalyst, low activity and low selectivity. In the last five years, several studies with promising results fought against these issues by the use of the supported catalysts with single site dispersed metal atoms on the surface. Motivated by these reports, we set to prepare well-defined single iron sites on the surface of the silica and to investigate their structure, stability and ability to activate methane. These materials were prepared by the means of the surface-organometallic chemistry approach and investigated by a variety of optical, X-ray and nuclear spectroscopic techniques. The results revealed unexpected stability of the isolated iron(II) sites under inert gas or vacuum, as well as their undercoordinate character. Catalytic tests show that already a bare silica is highly active in the methane transformation, but it promotes rather methane decarbonization, producing only hydrogen and carbon. The presence of single iron sites on the surface during catalytic tests leads to the formation of iron(0) nanoparticles, which mediate the activity of the silica: it decreases the activity and increases the selectivity towards hydrocarbon-based products (20-30 %).


CV. Petr received his MSc degree in Pharmaceutical Engineering (2015) from University of Chemistry and Technology in Prague. In the same year, he started his PhD studies in the group of Prof. van Bokhoven at ETH in collaboration with Prof. Copéret.