Shining (Swiss) synchrotron light on metal-zeolite catalysts

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In the quest to develop advanced functional materials for applications in energy storage and conversion, catalysis, and electronics, it is increasingly recognized that understanding of the structure of the as-synthesized materials does not suffice. Often, the structure responsible for activity or selectivity are only (temporarily) present under operating conditions. Synchrotron-based X-ray tools are powerful for probing the electronic and structural properties of functional materials in situ/operando, providing insights that are often unattainable through traditional characterization methods. As a Swiss researcher you have access to the Swiss Light Source, a state-of-the-art synchrotron facility providing X-ray tools for studying advanced functional materials.
This talk will highlight the necessity of employing synchrotron-based X-ray techniques, especially X-ray absorption spectroscopy, under operando conditions, emphasizing its ability to reveal dynamic changes in the active site structure including oxidation states, coordination environments and local structures during real-time operation. As an example, I will show our recent work on metal loaded zeolites used for the ammonia-assisted selective catalytic reduction of nitrogen oxides (NH_3-SCR)[1,2] and for the liquid phase partial oxidation of methane to oxygenates.

1. Wierzbicki, D., Clark, A.H., Kröcher, O., Ferri, D., Nachtegaal. M., *J. Phys. Chem. C* **2022,** *41***,** 17519
2. A.H. Clark, R.J.G. Nuguid, P. Steiger, A. Marberger, A.W. Petrov, D. Ferri, M. Nachtegaal O. Kröcher, *ChemCatChem* **2020,** *12*, 1429.