

Transient X-ray spectroscopy to provide insight in the catalytic active site

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Recent developments in synchrotron radiation facilities and X-ray optics have further expanded the X-ray analytical toolbox for operando studies. These X-ray tools allow to follow the structure of the catalytic active site in action and include X-ray absorption and emission spectroscopy, diffraction and total scattering. One of these tools, quick scanning X-ray absorption spectroscopy (with sub second time-resolution) in combination with transient experimentation provides a unique platform for determining the nature of the catalytic active site and the rate limiting steps of a reaction and with that elucidate reaction mechanisms.

In this talk, I will give an overview of the X-ray toolbox for catalysis research available at the Swiss Light Source and focus on one technique, quick scanning X-ray absorption spectroscopy (XAS) and how this was leveraged to provide new insights into relevant catalytic processes under operating conditions: heterogeneous Wacker oxidation of ethylene for the production of acetaldehyde, the oxygen evolution reaction and NO_x reduction in automotive gas after treatment systems.