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Combination of kinetic and structural studies of catalysts at the CAT-ACT X-ray spectroscopy beamline at KIT

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The CAT experimental station at the CATalysis-ACTinide wiggler beamline [1] at the Karlsruhe Institute of Technology (KIT) focuses on synchrotron based characterization of catalysts under realistic reaction conditions, e.g. in the fields of exhaust gas after-treatment, selective oxidation, energy related applications and sustainable fine chemical processes. A dedicated infrastructure including stationary reactive gas supply, gas dosing units and on-line product analysis as well as in-situ and operando cells for sample environments close to industrial reactors (temperature up to 950 °C, pressure up to 50 bar, liquid/gas phase, etc.) are essential aspects of CAT. The present X-ray absorption experiment at the CAT station can be combined with complementary characterization techniques like X-ray diffraction [2, 3] and infrared spectroscopy [4-6]. This allows complementing the analysis of the local molecular environment of catalytically active elements with information about long range order structures and adsorbed reaction species.

The unique possibilities for in-situ and operando studies of catalysts available at the CAT station will be illustrated by exemplary studies on direct synthesis of hydrogen peroxide from hydrogen and oxygen as well as methanol, dimethyl ether and Fischer-Tropsch synthesis.

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