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The dynamic redox properties of MoV oxide catalysts for the selective oxidation of alkanes studied by in-situ microwave cavity perturbation — •Christian Heine, Maik Eichelbaum, Annette Trunschke, and Robert Schlögl — Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin, Germany

The semiconducting M1 phase MoVNbTeOx is a selective catalyst for the direct oxidation of propane yielding about 50% acrylic acid. During the redox reaction a charge transfer between the catalyst and the chemisorbed reactants takes place. To study the interaction between the gas phase and the catalyst surface, we developed a method based on the microwave cavity perturbation technique enabling the investigation of (di)electric properties of powder catalysts under operation in a contact-free manner, thus completely avoiding contact resistance and electrode-related problems (Eichelbaum et al., PCCP, DOI 10.1039/C1CP23462E). This method offers the possibility to probe the electronic structure of the catalyst under reaction conditions. It is known from in-situ photoelectron spectroscopy studies that the surface of the M1 phase behaves dynamically and changes its electronic and geometric structure during the catalytic reaction, which is associated with a modification of the surface density of states. As a consequence, the equilibrium between surface and bulk states is shifted modifying the surface states-induced band bending. The impact of the surface electronic structure on the electrical conductivity of the catalyst will be discussed.