# Chemical Reactions on Metal Oxide Surfaces Investigated by Vibrational Spectroscopy

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## Abstract

The most successful method to unravel the microscopic mechanisms governing reactions in heterogeneous catalysis is the "surface science" approach which is based on well-controlled studies on model catalysts (usually single crystal surfaces) under ultrahigh vacuum (UHV) conditions [G. Ertl, Angew. Chem. 47 (2008) 3524]. In this review our recent vibrational spectroscopic studies on selected model reactions at various single-crystalline metal oxide surfaces are summarized. Two vibrational spectroscopic methods, high resolution electron energy loss spectroscopy (HREELS) and Fourier-transform infrared spectroscopy (FTIRS), were applied to characterize the adsorbed species and to elucidate the elementary processes of chemical reactions at oxide surfaces ranging from well-defined single crystals to modified surfaces with deliberately introduced defects. The combination of both methods allows us to extend the vibrational spectroscopic studies from ideal to complex systems.

Keywords: Vibrational spectroscopy; Surface chemical reaction; Electron energy loss spectroscopy; Infrared spectroscopy; Oxide; Catalysis

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