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STRUCTURE-ACTIVITY RELATIONSHIPS OF HETEROGENEOUS CATALYSTS FROM TIME-RESOLVED X-RAY ABSORPTION SPECTROSCOPY

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Abstract

Knowing the composition and the evolution of the bulk structure of a heterogeneous catalyst under working conditions (in situ) is a prerequisite for understanding structure-activity relationships. X-ray absorption spectroscopy (XAS) can be employed to study a catalytically active material in situ. In addition to steady-state investigations, the technique permits experiments with a time-resolution in the sub-second range to elucidate the solid-state kinetics of the reactions involved. Combined with mass spectrometry, the evolution of the short-range order structure of a heterogeneous catalyst, the average valence of the constituent metals, and the phase composition can be obtained. Here we present results obtained from time-resolved studies on the reduction of MoO3 in propene, and in propene and oxygen.

Keywords

Molybdenum, EXAFS spectroscopy, heterogeneous catalysis, structure-activity relationships, alkenes, X-ray absorption, solid-state reactions