Phase formation during the decomposition of Ammonium Heptamolybdate – An in situ XAFS and XRD Investigation

J. Wienold, R.E. Jentoft, T. Ressler

Fritz-Haber-Institut der MPG, Department of Inorganic Chemistry, Faradayweg 4-6, 14195 Berlin, Germany

Ammonium heptamolybdate (AHM) is a common precursor for the production of molybdenum trioxide (MoO_3) and partially reduced molybdenum oxides (MoO_{3-x}). These oxides constitute suitable model systems for the more complex mixed oxide systems ($Mo_x(V,W)_yO_3$) used extensively as partial oxidation catalysts for light alkenes. The decomposition of AHM is known to proceed via a number of stages. Gas phase composition influence the constitution of stages and the structure of the products, which can influence catalytic activity. Therefore, detailed structural studies are required to elucidate the short and long-range structure evolution of the corresponding decomposition species and, hence, to reveal correlations between structural characteristics and catalytic performance. In this work we present structural investigations of the decomposition of AHM in helium, air, propene and hydrogen. Two complementary methods, in situ X-ray absorption spectroscopy and in situ X-ray diffraction, are used. XRD is employed to identify the crystalline phases that are produced during AHM decomposition under different atmospheres. Thereafter, this information is used as a starting point for a detailed analysis of the short-range order. For that the in situ EXAFS data serve. A detailed represensation of the decompositions stages under the different atmospheres is presented. The elucidated short and long range order structure of the phases observed and apparent inconsistencies therein, are discussed.