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**New look at the active surface of nanostructured molybdenum-vanadium oxides  
for selective oxidation of propane to acrylic acid**

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Selective oxidation of alkanes to valuable oxygen-containing intermediates in petrochemical industry has advantages over conventional multi-step processes starting from olefins with respect to raw material costs, energy consumption and environmental impact. Reducible transition metal oxides are known to be active in paraffin oxidation. Simultaneous activation of C-H bonds and insertion of oxygen atoms requires surface polyfunctionality and a close proximity of the corresponding active sites to avoid desorption of intermediates. Consequently, the catalysts have evolved into materials with high degree of structural and chemical complexity with large unit cells comprising a multitude of atomic positions. In particular, MoVTaNb oxides are active and selective in the oxidation of propane to acrylic acid. We have studied the synthesis of such complex multi-metal oxides with the focus on preparation of phase-pure materials to elucidate the role of cooperation effects of different phases on the catalytic performance. Furthermore, we have addressed the importance of structure sensitivity, i.e., the reactivity of specific crystal faces, and the function of crystallinity by synthesis of model catalysts and catalysts with high specific surface areas. Electron microscopy has been used to investigate the surface topography of the materials. The chemistry of the catalyst surface changes as a function of the operating conditions of propane oxidation as shown by in-situ photoelectron spectroscopy. The various aspects of catalyst structure, surface and interaction with the gas phase will be discussed in view of the overall process of propane transformation over MoV oxides.