63f Effect of Surface Promoters (Te, Nb and Sb) on Propane Oxidation to Acrylic Acid over Model Bulk Mixed Mo-V-O Catalysts

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The current abundance and low environmental impact of propane as a feedstock has generated considerable interest in oxidative catalytic conversion of propane to acrylic acid and acrylonitrile. Recently discovered multi-component Mo-V-Te-Nb-O catalysts have shown great promise in propane oxidation to acrylic acid and ammoxidation to acrylonitrile. These mixed-phase catalysts contain so-called “M1” and “M2” phases with orthorhombic and hexagonal structures, respectively, proposed to be active and selective in propane oxidation to acrylic acid and ammoxidation to acrylonitrile. However, the catalytic roles of the constituent elements of these catalysts are not yet understood. A simple model system for elucidating the molecular structure-activity/selectivity and role of constituent elements in propane oxidation to acrylic acid is presented in this work. This study reports the preparation of Mo-V-O catalysts with orthorhombic M1 structure and their surface modification by promoting metallic species (Te, Sb and Nb) on the surface at sub-monolayer coverages. This study discusses the atomic structures of Mo-V-O catalysts by high-resolution transmission election microscopy (TEM), elemental analysis by ICP and EDS, and surface compositions by low energy ion scattering (LEIS). Further this study investigates the chemical properties like electronegativity, hardness etc. of surface species and discusses them with the performance of the Mo-V-O catalysts in selective propane oxidation to acrylic acid.