130d M1 to M2 Phase Transformation in Mo-V-Te-O Catalysts for Selective (Amm)Oxidation of Propane

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Abstract

The interest in propane (amm) oxidation to acrylic acid has currently made the Mo-V-M-O (M=Te, Sb and/or Nb) catalytic system one of the most researched selective oxidation catalysts. Since their discovery in 1991, several reports and reviews have been published on these catalysts. It is now established that this catalyst system derives its functionality from the presence of two phases, namely M1 and M2, which possess the orthorhombic and pseudo-hexagonal crystal structures, respectively. In recent years, the research has focused on the synthesis of pure catalytic phases and understanding their roles in selective propane oxidation and ammoxidation to acrylic acid and acrylonitrile. Various synthesis routes have been investigated and reported for the preparation of pure M1 and M2 phases

This study reports the preparation of multi-component Mo-V-Te catalysts and the phase transformation from M1 to M2 phase during thermal treatment. These Mo-V-Te catalysts prepared at constant bulk composition will enable us to directly address the nature of the active and selective phase for propane (amm)oxidation. This study discusses the M1 phase synthesis, its solid state transformation to M2, their morphology and microstructures using Scanning Electron Microscopy (SEM), transmission electron microscopy (TEM), their phase compositions by energy dispersive x-ray spectroscopy (EDS), bulk elemental analysis by ICP, surface region compositions and oxidation states by X-ray photoelectron spectroscopy (XPS), and catalytic performance of the M1 and M2 phases in propane oxidation.