Synthesis and Characterization of Ni-Doped Vanadium Phosphorus Oxide Catalysts

Abstract

The effect of Ni doping (1%, 2%, and 5%) on vanadium phosphate catalysts prepared via VOPO4·2H2O was described and discussed. At low levels, the Ni dopant significantly enhanced the amount of the active lattice oxygen species O− and lowered the reduction peak temperature corresponding to the reduction of V5+ and V4+ phases. A combination of powder X-ray diffraction, temperature-programmed reduction, and chemical analysis data shows that at higher levels, Ni doping induced the formation of the V5+ phase and suppressed the presence of the V4+ phase. Previous studies have indicated that a large amount of oxygen species associated with V5+ inhibit the n-butane conversion but promote the selectivity for maleic anhydride.

Keyword: vanadyl pyrophosphate, nickel, n-butane, oxidation, maleic anhydride