Physico-chemicals and catalytic properties of manganese-promoted vanadium phosphate (VPO) catalyst

Abstract

The addition of 1% Mn promoter to vanadium phosphate catalyst led to doubling of the specific surface area from 20.3 (unpromoted) to 39.4 m² g⁻¹. The XRD pattern of the Mn-promoted catalyst gave only the characteristics of the \((\text{VO})_2\text{P}_2\text{O}_7\) phase, indicating that the Mn was incorporated into the crystal lattice of the catalyst. The Mn-promoted catalyst was also twice as active in removing the total amount of oxygen. However, since the only oxygen species related to \(\text{V}^{4+}\) being removed and no oxygen species associated with \(\text{V}^{5+}\) was observed, the \(\text{n-butane}\) conversion was not much improved as compared to the unpromoted counterpart. A necessary amount and distribution of the \(\text{V}^{5+}\) phase in a well crystalline \(\text{V}^{4+}\) phase is essential in order to enhance the catalytic performance in the mild oxidation of \(\text{n-butane}\) to maleic anhydride.

Keyword: Vanadium phosphate, Mn, butane oxidation, maleic anhydride