

Effect of Cr and Co promoters addition on vanadium phosphate catalysts for mild oxidation of n-butane

Abstract

In this study, Cr and Co promoted, as well as unpromoted vanadium phosphate (VPO) catalysts were synthesized by the reaction of V_2O_5 and $o\text{-H}_3\text{PO}_4$ in organic medium followed by calcination in n-butane/air environment at 673 K. The physico-chemical properties and the catalytic behavior were affected by the addition of Cr and Co dopants. H_2 -TPR was used to investigate the nature of oxidants in the unpromoted and promoted catalysts. The results showed that both the Cr and Co promoters remarkably lowered the temperature of the reduction peak associated with V^{5+} . The amount of oxygen species originated from the active phase, V^{4+} , removed was significantly increased for Co and Cr-promoted catalysts. Both Cr and Co dopants improve strongly the n-butane conversion without sacrificing the MA selectivity. A good correlation was observed between the amount of oxygen species removed from V^{4+} phase and the activity for n-butane oxidation to maleic anhydride. This suggested that $V^{4+}\text{-O}$ was the center for the activation of n-butane.

Keyword: n-butane oxidation, VPO, promoter, maleic anhydride, TPR