

Effect of mechanochemical treatment on VOPO₄·2H₂O to produce vanadyl pyrophosphate catalysts

Abstract

Two vanadyl pyrophosphate catalysts were prepared via dihydrate route (VPD method) by applying mechanochemical treatment performed on VOPO₄·2H₂O in different duration of time, i.e. 30 and 60 min in ethanol medium. Both catalysts with the unmilled catalyst produced were characterized by x-ray diffraction (XRD), chemical analysis, scanning electron microscopy (SEM) and temperature programmed reduction (H₂-TPR). Catalytic evaluation for partial oxidation of n-butane to maleic anhydride (MA) was also being carried out using microreactor. XRD patterns of all VPO catalysts showed the main peaks of pyrophosphate phase. TPR profiles showed that the mechanochemical treated VPO catalyst for 30 min (VPDM30) removed the active oxygen species at lower temperature. Furthermore, from the catalytic test result, the graph of the catalytic performance as a function of the duration of mechanochemical treatment demonstrates that VPDM30 is the most active catalyst. This suggested that the mechanochemical treatment of the VOPO₄·2H₂O for the synthesis of pyrophosphate catalyst (VPDM30) is highly potential to enhance the catalytic properties for n-butane oxidation towards maleic anhydride.

Keyword: Mechanochemical treatment; Butane oxidation; Vanadyl pyrophosphate