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Low Temperature Synthesis of Styrene via Catalytic Dehydrogenation of Ethylbenzene Using Vanadia Support SnO_2 Catalysts

Authors : S. Said, Samira M. Abdel-Azim, Aya M. Matloob

Abstract : Nowadays, one of the most important industries is how to prepare a starting material like (styrene) which is used for the preparation of many petrochemical products in simple and inexpensive ways. Oxidative dehydrogenation of ethylbenzene (using CO2 as a soft oxidant) can solve this issue when using highly effective catalysts like SnO_2 and its nanocomposites (V_2Ox/SnO_2.) This study shows the effect of different synthesis methods of SnO_2, either by ethylene glycol or MOF, and then uses the impregnation method for the preparation of its nanocomposite catalysts (V_2Ox/SnO_2.). The prepared catalysts were characterized by using different analytical techniques like XRD, BET, FTIR, TGA, XPS, and H_2-TPR. Oxidative dehydrogenation experimental results demonstrated that the composite V loading of 1 and 5 wt.% V_2Ox/SnO_2 (MOF &EG) catalyst exhibited extraordinarily high catalytic performance with selectivity toward styrene formation > 90% at 500oC, which can be attributed to the superior surface, textural, and structural properties of nanocomposites catalysts.

Keywords : SnO_2, vanadium oxide, ethylbenzene dehydrogenation, styrene, CO_2
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