

Propane Dehydrogenation over Pt-Sn Supported on Supports with Various Si/Al Ratios

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Pt-Sn/Al-SBA-15 catalysts with various atomic ratios of Si to Al were prepared and applied to propane dehydrogenation using a fix-bed reactor at 600 °C for 4 h. N₂-sorption showed that all catalysts had mesoporous structures, and the addition of Al to SBA-15 lead to decrease in surface area, pore volume, and microporosity of SBA-15. Small angle XRD patterns exhibited that the hexagonally ordered pore structure of SBA-15 still remained after incorporating the Pt, Sn, and Al. Wide XRD patterns revealed that PtSn alloy was formed over all reduced catalysts except Pt-Sn/Al₂O₃ catalyst. Higher ratio of Si to Al resulted in weaker SnOx-support interaction, easier to form Pt-Sn alloys, and therefore higher catalytic stability. The coke amount over spent catalyst was proportional to Al content in Al-SBA-15 supports. However, the deactivation probably determined by the nature of metallic phases than acidity since both Pt/Al₂O₃ and Pt/SBA-15 catalysts showed similar deactivation rate although coke amount over spent Pt/Al₂O₃ catalyst was much higher than that over spent Pt/SBA-15 catalyst.