Synergistic Alkylation of Toluene with Syngas over Bifunctional Catalyts: Effect of Methanol Synthesis Catalysts

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The conversion of syngas into liquid hydrocarbons has attracted significant attention as an alternative route for exploitation of natural gas, coal and biomass. Two different catalysts have been used for methanol synthesis from syngas: Cu/ZnO/Al2O3 and Cr2O3/ZnO catalysts for low and high pressure processes, respectively. In this study, an in-situ alkylation of toluene was studied over bifunctional catalytic system comprised of physical mixture of metallic component from methanol synthesis catalysts and acidic component from HZSM-5. The in-situ alkylation was carried out in a fixed bed flow reactor in the temperature range of 400-500oC and under the total pressure of 460 psig. The in-situ alkylation over bifunctional catalyst exhibited synergistic effects on toluene conversion and xylene yield over toluene disproportionation on HZSM-5. The use of different methanol synthesis catalysts in the bifunctional in-situ alkylation and their effects on thermodynamic limitations for methanol synthesis, catalytic activity and product selectivity are to be presented.