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Effect of ultrasonic irradiation and/or halogenation on the catalytic performance of γ-Al_2O_3 for methanol dehydration to dimethyl ether

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摘要 Dimethyl ether (DME) is amongst one of the most promising alternative, renewable and clean fuels being considered as a future energy carrier. In this study, the comparative catalytic performance of the halogenated γ-Al_2O_3 prepared from two halogen precursors (ammonium chloride and ammonium fluoride) is presented. The impact of ultrasonic irradiation was evaluated in order to optimize both the halogen precursor for the production of DME from methanol in a fixed bed reactor. The catalysts were characterized by SEM, XRD, BET and NH_3-TPD. Under reaction conditions where the temperature ranged from 200 to 400 ℃ with a WHSV =15.9 h^{-1} was found that the halogenated catalysts showed higher activity at all reaction temperatures. However, the halogenated alumina catalysts prepared under the effect of ultrasonic irradiation showed higher performance of γ-Al_2O_3 for DME formation. The chlorinated γ-Al_2O_3 catalysts showed a higher activity and selectivity for DME production than fluorinated versions.

关键词： ultrasonication methanol DME &gamma -Al_2O_3 Cl F

Abstract： Dimethyl ether (DME) is amongst one of the most promising alternative, renewable and clean fuels being considered as a future energy carrier. In this study, the comparative catalytic performance of the halogenated γ-Al_2O_3 prepared from two halogen precursors (ammonium chloride and ammonium fluoride) is presented. The impact of ultrasonic irradiation was evaluated in order to optimize both the halogen precursor for the production of DME from methanol in a fixed bed reactor. The catalysts were characterized by SEM, XRD, BET and NH_3-TPD. Under reaction conditions where the temperature ranged from 200 to 400 ℃ with a WHSV =15.9 h^{-1} was found that the halogenated catalysts showed higher activity at all reaction temperatures. However, the halogenated alumina catalysts prepared under the effect of ultrasonic irradiation showed higher performance of γ-Al_2O_3 for DME formation. The chlorinated γ-Al_2O_3 catalysts showed a higher activity and selectivity for DME production than fluorinated versions.

Key words： ultrasonication methanol DME & gamma -Al_2O_3 Cl F

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