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水热法Fe-Mn催化剂制备及其合成气制低碳烯烃催化活性

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Preparation of Fe-Mn catalyst by hydrothermal method and its catalytic activity for the synthesis of light olefins from CO hydrogenation

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摘要 以水热合成法制备了K原位改性的Fe-Mn催化剂,考察了其CO加氢合成低碳烯烃催化活性。采用SEM、TEM、XRD、H_2-TPR和FT-IR等手段对催化剂进行了表征。结果表明,制备的催化剂前驱体呈50~70 nm的球形颗粒,表面富含羰基和羟基,物相组成以Fe_3O_4为主,用于反应后有Fe_5C_2和$MnCO_3$相生成。与共沉淀法制备催化剂相比,在设定的反应条件下,不同K含量改性的催化剂均具有较高的活性,以原料配比Fe:Mn:C_6:K=3:1:5:0.10的催化剂性能最佳,CO转化率达95.02%,总低碳烯烃收率为62.86 g/m^3(H_2+CO),CH_4和CO_2选择性分别为13.88%和13.98%。

关键词： Fe-Mn催化剂　水热法　CO加氢　低碳烯烃

Abstract： A series of potassium modified Fe-Mn catalysts were prepared by hydrothermal method and applied to the catalytic synthesis of light olefins from CO hydrogenation. The catalyst samples were characterized by SEM, TEM, XRD, H_2-TPR and FT-IR techniques. Results showed that the prepared sample particles were spherical with 50~70 nm size and the carbonyl and hydroxy groups were observed on their surfaces. The bulk composition was mainly Fe_3O_4 before the reaction. Fe_5C_2 and $MnCO_3$ were formed after the reaction. The prepared samples showed high activity and olefin selectivity under the given reaction conditions. Using the sample S_3 (Fe:Mn:C_6:K=3:1:5:0.10), the CO conversion and the olefin productivity reached 95.02% and 62.86 g/m^3 (H_2+CO), respectively. Compared with the catalyst prepared with co-precipitation method, the S_3 catalyst had lower CH_4 selectivity(13.88%) and CO_2 selectivity(13.98%).

Key words： Fe-Mn catalyst　hydrothermal method　CO hydrogenation　light olefins

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