

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、H₂-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Fe₃O₄为主,用于反应后有Fe₅C₂和MnCO₃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:C₆: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/m³(H₂+CO),CH₄和CO₂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, H₂-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 Fe₃O₄ before the reaction. Fe₅C₂ and MnCO₃ were formed after the reaction. The prepared samples showed high activity and olefin selectivity under the given reaction conditions. Using the sample S₃ (Fe:Mn:C₆:K=3:1:5:0.10), the CO conversion and the olefin productivity reached 95.02% and 62.86 g/m³ (H₂+CO), respectively. Compared with the catalyst prepared with co-precipitation method, the S₃ catalyst had lower CH₄ selectivity(13.88%) and CO₂ selectivity(13.98%).

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

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