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ZSM-5/MCM-41复合分子筛的合成与表征

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Synthesis and characterization of ZSM-5/MCM-41 composite molecular sieves

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摘要　以碱处理的ZSM-5浆液为硅铝源,通过水热自组装过程合成了介孔-微孔复合孔道结构的分子筛,并采用XRD、BET、HRTEM、Py-IR和水热处理等手段对合成分子筛进行了表征。结果表明,碱处理ZSM-5时的苛刻程度是影响复合分子筛合成的重要因素,适宜的碱处理条件为NaOH浓度1 mol/L、80℃时处理1 h。表征结果表明,复合分子筛具有规整互通的微孔-介孔梯级复合孔道结构,孔容、比表面积和平均孔径分别为0.63 mL/g,684 m^2/g和3.76 nm,属典型的MCM-41结构;与MCM-41相比,复合分子筛的B酸(尤其是强B酸)酸量明显增强,水热稳定性显著提高。

关键词:　微孔-介孔复合分子筛　ZSM-5　MCM-41　水热合成

Abstract:　ZSM-5/MCM-41 composite molecular sieves with multiple micro-mesoporous structure were hydrothermally synthesized via self-assembly by using the alkali-treated ZSM-5 seriflux as the source of silica and aluminum. The as-synthesized molecular sieves were characterized by XRD, N_2 adsorption, HRTEM, Py-IR, and hydrothermal treatment methods. The results showed that the crystallinity of the as-synthesized molecular sieves is dependent on the intensity of the alkali-treatment; the suitable alkali treatment conditions for ZSM-5 are 80℃ for 1 h with a NaOH concentration of 1 mol/L. The composite molecular sieves obtained exhibit a typical MCM-41 structure, with a hierarchical micro-mesoporous structure and large specific surface area. Compared with MCM-41, the ZSM-5/MCM-41 composite molecular sieves show higher quantity of Bronsted acid sites (especially strong ones) and higher hydrothermal stability.

Key words:　micro-mesoporous composite molecular sieve　ZSM-5　MCM-41　hydrothermal synthesis

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