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研究论文

气相转移法合成ZSM-5/SAPO-5复合分子筛

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摘要 以磷酸、拟薄水铝石和硅溶胶为原料, 三乙胺为模板剂, 采用气相转移法合成了一系列ZSM-5/SAPO-5复合分子筛. 产物经X射线衍射、扫描电镜、X射线能量散射谱、红外光谱及N2 静态吸附法等手段对其进行了表征, 证明合成材料是以ZSM-5为核、SAPO-5为壳的双结构分子筛. 实验结果表明, 干胶制备条件及液相组成都影响复合分子筛的结晶. 晶化温度的提高和晶化时间的延长有利于分子筛结晶度的提高. VPT法可以减小SAPO-5和复合分子筛颗粒的直径, 改善SAPO-5在ZSM-5分子筛表面的分布. 重油裂化结果表明, 核壳结构复合分子筛对生成低碳烯烃的性能优于机械混合的样品.

关键词 ZSM-5 SAPO-5 核壳结构分子筛 气相转移法

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ZSM-5/SAPO-5 Composite Molecular Sieves Synthesized by Vapor-phase Transport Technique

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Abstract The main drawback of the synthesized ZSM-5(core)/$AlPO_4$-5(shell) binary structure zeolites is large numbers of self-existent $AlPO_4$-5 zeolites and low acidity of the aluminophosphate molecular sieve. In order to overcome these problems, a series of ZSM-5(core)/SAPO-5(shell) binary structure zeolites were synthesized by vapor-phase transport technique(VPT). Phosphoric acid, pseudoboehmite, and silica sol were used as phosphorus, aluminum and silicon sources, respectively. Triethylamine(TEA) was used as the template. These synthesized samples were characterized by means of X-ray diffraction, scanning electron microscope, X-ray energy dispersive spectroscopy, Fourier transformed infrared spectroscopy and N_2-adsorption, respectively. The results indicate that the synthesized samples belong to binary structure zeolies with a ZSM-5 core and a SAPO-5 shell. The condition for preparing dry-gel and composition of liquid phase affect the crystallization of zeolites. Crystallinity of the synthesized samples increases as the crystallization temperature increased and the crystallization time is protracted. Using VPT technique for the synthesis of binary structure zeolites could reduce the SAPO-5 and composite molecular sieves size, and improve the distribution of SAPO-5 on the ZSM-5 surface. The experiments of heavy oil cracking show that the core/shell binary structure zeolite samples were more favourable for formation of light olefins than the mechanical mixture.

Key words ZSM-5 SAPO-5 Core-shell binary structure zeolite Vapor-phase transport technique

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