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微波条件下杂原子MCM-41介孔分子筛的合成

姜廷顺¹, 殷广明², 赵 谦¹, 殷恒波¹, 唐雅静¹

(1. 江苏大学 化学化工学院, 镇江 212013;
2. 齐齐哈尔大学 化学化工学院, 齐齐哈尔 161006)

摘 要:以十六烷基三甲基溴化铵(CTAB)为模板剂, 硅酸钠、氯化镍、氯化钴和氯化铜为原料, 通过微波辐射法合成纯硅MCM-41和Ni (Co、Cu) MCM-41介孔分子筛。采用X射线衍射、透射电子显微镜、Fourier变换红外光谱和比表面积孔径分析等测试手段对所合成的介孔分子筛进行表征。考察了分别将杂原子Ni、Co和Cu引入MCM-41介孔分子筛对其介孔有序性、比表面积及孔径大小的影响。结果表明: 在微波条件下可以合成出纯硅MCM-41和掺杂Ni (Co、Cu) MCM-41介孔分子筛, 样品经550 °C焙烧后模板剂被有效去除, 合成样品的介孔结构没有被破坏; 杂原子Ni (或Co、Cu)引入纯硅MCM-41介孔分子筛后, 其比表面积和平均孔径均增大, 且介孔有序性变好。

关键字: 介孔分子筛; 微波合成; 表征; 比表面积

Synthesis of hetero-atom MCM-41 mesoporous molecular sieve under microwave condition

JIANG Ting-shun¹, YIN Guang-ming², ZHAO Qian¹, YIN Heng-bo¹, TANG Ya-jing¹

(1. School of Chemistry and Chemical Engineering, Jiangsu University, Zhenjiang 212013,
2. School of Chemistry and Chemical Engineering, Qiqihaer University, Qiqihaer 161006, China)

Abstract: Silica MCM-41 and Ni (Co or Cu) MCM-41 mesoporous molecular sieve were synthesized by microwave irradiation method using cetyltrimethyl ammonium bromide as template and sodium silicate, nickel chloride, cobalt chloride and cooper chloride as raw materials, respectively. The synthesized samples were characterized by X-ray diffractometry, transmission electron microscopy, specific surface area analysis, Fourier transform infrared spectroscopy and N₂ physical adsorption. After hetero-atom (Ni, Co or Cu) was introduced into silica MCM-41 mesoporous molecular sieve, the effects of hetero-atom (Ni, Co or Cu) on its specific surface area, mesoporous ordering and pore size were also investigated. The results show that silica MCM-41 and Ni (Co or Cu) MCM-41 mesoporous molecular sieves are synthesized. The template is effectively removed from the samples after calcinations at 550 J, and the pore structure of the synthesized samples is not

damaged. After hetero-atom Ni (Co or Cu) is introduced into silica MCM-41 mesoporous molecular sieve, its specific surface area and average pore size increase and mesoporous order becomes good.

Key words: mesoporous molecular sieve; microwave synthesis; characterization; specific surface area

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地 址：湖南省长沙市岳麓山中南大学内 邮编： 410083

电 话： 0731-8876765, 8877197, 8830410 传真： 0731-8877197

电子邮箱： f-ysxb@mail.csu.edu.cn