



不同方法制备的磷钨杂多酸功能化3DOM-SiO₂材料性能研究 Properties of Three-Dimensional Ordered Macroporous Heteropolyacid H₃PW₁₂O₄₀ Functionalized Materials Prepared by Different Methods

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中文关键词: H₃PW₁₂O₄₀; 3DOM材料; 聚苯乙烯胶晶模板; 烷基苯

英文关键词: H₃PW₁₂O₄₀; 3DOM material; polystyrene colloid crystal; alkylbenzene

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中文摘要:

磷钨杂多酸功能化的 3DOM-SiO₂ 材料以直接浸渍和溶胶凝胶-胶晶模板法制备, 前一方法的模板去除分别采用了溶剂萃取和高温煅烧工艺。通过 SEM、TEM、BET、EDXS测试, 考察了大孔材料的孔结构特征及孔壁组成, 所制备大孔材料均显示了良好的三维规整性, 尤其是煅烧样品, 它不但孔结构优异, 且孔壁粒子堆积致密、比表面积较大, 强度较高。XRD、FTIR 表征显示以溶胶凝胶法制备的样品中, 杂多酸与载体间存在的化学作用, 导致杂多酸特征峰发生一定的位移, 但仍保持杂多酸Keggin结构。吡啶吸附表明所得样品均存在B酸中心, 并以苯和十二烯的烷基化催化反应表征了所得样品的催化活性及再使用性, 结果显示所有样品均具有良好的催化活性, 按单位杂多酸计算, 浸渍样品催化活性最高, 但杂多酸易脱落, 再使用性差; 煅烧样品具有最佳的催化活性和再使用性。

英文摘要:

Heteropolyacid H₃PW₁₂O₄₀ functionalized three-dimensional ordered macroporous (3DOM) materials were prepared by direct impregnation, templating via in-situ sol-gel transformation, followed by extraction and calcination to remove the templates. The nature of the functionalized materials has been characterized by SEM, TEM, BET, EDXS, XRD, FTIR and pyridine adsorption. The results showed that the macroporous materials were arrayed highly periodically, especially for the calcinated sample which shows excellent regulation with compact walls and relatively larger surface area. Heteropolyacids in the samples remained primary Keggin structure, but the characteristic vibrations were affected by chemical interaction between H₃PW₁₂O₄₀ and the support for the extracted and calcinated samples. Brønsted acid could be found in all the samples, and they demonstrated fine catalytic activity for the alkylation of benzene and 1-dodecene. The impregnated sample showing a weak reuse as heteropolyacids could be easily lost from the support, while the calcinated sample showed the best catalytic activity and would be a benign catalyst for recycle.

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