

催化、动力学与反应器

载体酸处理对 $(\text{SiO}_2)\text{-O-AlCl}_2$ 催化剂烷基化反应性能的影响

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摘要

以盐酸浸泡的方法处理 SiO_2 载体, 采用两步气相法制备 $(\text{SiO}_2)\text{-O-AlCl}_2$ 催化剂, 考察了其在苯与长链烯烃 ($\text{C}_{10}\sim\text{C}_{13}$) 烷基化反应中的活性、选择性及稳定性, 并同未经酸处理 SiO_2 载体制备的催化剂进行了比较。结果表明, 采用盐酸处理过的 SiO_2 制备的 $(\text{SiO}_2)\text{-O-AlCl}_2$ 催化剂稳定性提高, 在烯烃完全转化的情况下可以循环使用 17 次, 而未经盐酸处理过的 SiO_2 制备的催化剂仅使用 11 次。IR、TGA 及化学分析的结果发现, 酸处理后 SiO_2 载体表面的羟基浓度显著提高, 并使催化剂上氯化物的固载量从 11.18% (质量) 提高到 15.67% (质量)。但是经酸处理后 SiO_2 产生的表面羟基稳定性较差, 较高的催化剂制备温度不利于提高催化剂表面氯化物含量。在 200~300℃ 范围内, 200℃ 制备的催化剂稳定性较好。

关键词 [\$\(\text{SiO}_2\)\text{-O-AlCl}_2\$](#) [酸处理](#) [烷基化反应](#) [长链混合烯烃](#)

分类号

Influence of support acid-treatment on catalytic performance of $(\text{SiO}_2)\text{-O-AlCl}_2$ catalyst in alkylation reaction

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Abstract

SiO_2 support was pretreated by hydrochloric acid solution and used to prepare $(\text{SiO}_2)\text{-O-AlCl}_2$ catalyst by the two-step vapor method. Its catalytic performance of activity, stability and selectivity in the alkylation reaction of benzene with mixed long chain olefins ($\text{C}_{10}\sim\text{C}_{13}$) were tested, and compared with that obtained over the catalyst of AlCl_3 immobilized on untreated SiO_2 support. The catalyst using acid-treated SiO_2 as support exhibited the stability of 17 cycles, which was much higher than that of the catalyst of AlCl_3 immobilized on untreated SiO_2 . The results of IR, TGA and chemical analysis indicated that the concentration of hydroxyl and the amount of halide on the surface of SiO_2 were increased by the acid-treatment process, which was beneficial to the lifetime of $(\text{SiO}_2)\text{-O-AlCl}_2$ catalyst. Moreover, the immobilization temperature of AlCl_3 on the SiO_2 support pretreated by hydrochloric acid solution influenced the lifetime of $(\text{SiO}_2)\text{-O-AlCl}_2$ catalyst. The $(\text{SiO}_2)\text{-O-AlCl}_2$ catalyst prepared at 200℃ was better.

Key words [\$\(\text{SiO}_2\)\text{-O-AlCl}_2\$](#) [acid-treatment](#) [alkylation reaction](#) [long chain olefins](#)

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