

磷酸铝基Zn/HZSM-11催化剂用于苯和二甲醚烷基化反应

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Aluminophosphate Bound Zn/HZSM-11 Catalyst for Benzene Alkylation with Dimethyl Ether

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摘要 在Zn/HZSM-11中添加不同磷/铝摩尔比 ($n(\text{P})/n(\text{Al})$)的磷酸铝黏结剂制备了系列催化剂 (ZnZPAIO- x), 并对其进行 N_2 吸附-脱附、 NH_3 -TPD和 O_2 -TPO表征, 同时用于催化苯和二甲醚烷基化反应。结果表明, ZnZPAIO- x 催化剂的比表面积以及酸量均随其 $n(\text{P})/n(\text{Al})$ 的增加而降低。与含氧化铝黏结剂的催化剂(ZnZAI)相比, ZnZPAIO- x 催化剂的苯转化率及产物选择性更高; 反应后两者的积炭类型相似, 但后者的积炭量更低。ZnZAI和ZnZPAIO-0.8 ($n(\text{P})/n(\text{Al}) = 0.8$) 催化醚烷基化反应的苯转化率随反应温度变化呈现不同规律, 尤其在450℃高温条件下存在明显差异。

关键词: 磷酸铝黏结剂; 二甲醚; 苯; 烷基化 Zn/HZSM-11; 积炭

Abstract: A series of catalysts (ZnZPAIO- x) were prepared by using Zn/HZSM-11 and aluminophosphate binder with different $n(\text{P})/n(\text{Al})$. The prepared catalysts were characterized by means of X-ray powder diffraction, N_2 adsorption-desorption, NH_3 -TPD and O_2 -TPO, respectively, and were used as catalysts in benzene alkylation with dimethyl ether. The BET surface areas, total volumes and acid amounts of the catalysts declined with increase of $n(\text{P})/n(\text{Al})$. Compared to the ZnZAI catalyst with pure Al_2O_3 as binder, ZnZPAIO- x showed high benzene conversion and selectivity to benzene methylation products, and the coke amount on ZnZPAIO- x lower, though the coke types were similar on both ZnZAI and ZnZPAIO- x . In addition, benzene conversions on ZnZAI and ZnZPAIO 0.8 ($n(\text{P})/n(\text{Al}) = 0.8$) catalysts presented different principles with reaction temperature especially at high reaction temperature of 450℃, obvious difference of benzene conversion existed.

Keywords: aluminophosphate binder, dimethyl ether, benzene, alkylation, Zn/HZSM-11;Coke

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