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Alkylation of Benzene with 1-Decene Using Silica Supported Preyssler Heteropoly Acid: Statistical Design with Response Surface Methodology

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摘要 The response surface method (RSM) was applied to study the liquid phase alkylation of benzene with 1-decene catalyzed by means of silica supported preyssler heteropoly acid. A three step experimental design was developed based on the central composite design (CCD). Catalyst loading, catalyst percent, and benzene to 1-decene molar ratio were used to optimize 1-decene conversion and linear alkylbanzene (LAB) yield. The results indicated that the quadratic model was significant for these two responses. The experimental results revealed that all variables had positive effect on 1-decene conversion. While increasing the catalyst loading tends to decrease LAB yield. Benzene to 1-decene molar ratio was found to be the most important factor that influenced LAB yield with a positive effect. Design expert software suggested several optimized solutions, among them the best choice was to use 31% catalyst loading, benzene to 1-decene molar ratio of 13, and catalyst percent of 3.6wt% for obtaining 100% conversion and 88% LAB production yield.

关键词：　linear alkylbenzene　heteropoly acid　preyssler　silica supported catalyst　response surface method

Abstract： The response surface method (RSM) was applied to study the liquid phase alkylation of benzene with 1-decene catalyzed by means of silica supported preyssler heteropoly acid. A three step experimental design was developed based on the central composite design (CCD). Catalyst loading, catalyst percent, and benzene to 1-decene molar ratio were used to optimize 1-decene conversion and linear alkylbanzene (LAB) yield. The results indicated that the quadratic model was significant for these two responses. The experimental results revealed that all variables had positive effect on 1-decene conversion. While increasing the catalyst loading tends to decrease LAB yield. Benzene to 1-decene molar ratio was found to be the most important factor that influenced LAB yield with a positive effect. Design expert software suggested several optimized solutions, among them the best choice was to use 31% catalyst loading, benzene to 1-decene molar ratio of 13, and catalyst percent of 3.6wt% for obtaining 100% conversion and 88% LAB production yield.

Keywords：　linear alkylbenzene,　heteropoly acid,　preyssler,　silica supported catalyst,　response surface method

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