Transalkylation of xylene and benzene over ZnO/SiO$_2$ catalyst

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Abstract

Liquid phase transalkylation of mixture of xylene and benzene was investigated over ZnO/SiO$_2$ catalyst in a batch reactor under continuous stirring using a magnetic stirrer with a temperature regulator. The prepared ZnO/SiO$_2$ was characterized using Brunauer-Emmet-Teller Surface Area Analysis (BET), X-Ray Diffraction (XRD), and Fourier Transform InfraRed Spectroscopy (FTIR). Also, the effect of catalyst loading, reaction temperature and time were studied. The BET results obtained shows that there is an increase in the surface area of ZnO/SiO$_2$ when compared to that of the parent SiO$_2$. Impregnation of ZnO unto the SiO$_2$ does not affect the parent structure of the SiO$_2$ as depicted by the XRD result. Ethylbenzene is the product obtained from the transalkylation reaction and its yield is favored at a lower catalyst loading of 0.4 wt% as compared to 0.7 wt% and 1.0 wt% weight of xylene. A study of the effect of reaction temperature at 45 minutes on the yield shows that the yield is likely to increase with temperature. The maximum ethylbenzene yield obtained was approximately 62% at 60 $^\circ$C and 75 minutes.

Keywords: Transalkylation, ZnO/SiO$_2$, Catalysis, Aromatics, Zinc Oxide, Silica

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