

Incorporation of Hierarchical Porosity over Mo/HZSM-5 via Alkali Treatment and its Effect Towards Methane Dehydroaromatization Reaction

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ABSTRACT

The effect of hierarchical porosity of Mo/HZSM-5 generated via alkali treatment (0.1 M and 0.3 M NaOH solution) on the catalytic activity towards methane dehydroaromatization (MDA) reaction was studied. Alkali treated HZSM-5 and prepared corresponding Mo/HZSM-5 catalysts were extensively characterized using various spectroscopic and microscopic techniques, such as XRD, BET, FTIR, FESEM-EDX, HR-TEM, NH₃-TPD, H₂-TPR, ²⁷Al MAS NMR, RAMAN and TGA analysis. From catalytic activity results, it was observed that benzene formation rate over alkali treated catalysts was higher as compared to the conventional Mo/HZSM-5. Increased activity with alkali treated HZSM-5 was attributed to enhanced acid site concentration due to lowering in Si/Al ratio as confirmed from NH₃-TPD and elemental analysis. Moreover, the introduction of mesopores along with micropores overcome the diffusion limitations with desired products and reduced the deactivation rate of the catalysts.

Keywords: Mo/ZSM-5, alkali treatment, hierarchical HZSM-5, methane dehydroaromatization (MDA).

