

Comparative Studies of Hydrocarbon Conversions over Pt, Pd, and Ni Modified TNU-9 and ZSM-5 Zeolites: Effects of Zeolite Cavity

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The catalytic roles of 12-membered ring (MR) cavities in the medium-pore zeolite TNU-9 are investigated by comparing the catalytic performance of TNU-9 (parent, Pt-, Pd-, and Ni-loaded) zeolites in three representative test reactions (i.e., m-xylene isomerization and disproportionation, toluene disproportionation, and n-decane hydrocracking) with those observed for the corresponding types of ZSM-5 zeolites with two intersecting 10-ring channels. TNU-9 and its metal impregnated analogs were found to exhibit superior catalytic activity to ZSM-5 counterparts when these reactions occur via a bimolecular pathway requiring large reaction spaces or when the reaction intermediates (bulky tertiary alkylcarbenium) can be easily formed within 12-MR cavities. These results suggest that the 12-MR cavities of TNU-9 zeolites play a key role in catalytic performance of these hydrocarbon conversions.