

Real Reaction Intermediates of Ethylbenzene Disproportionation over Large-Pore Zeolites

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Disproportionation of Ethylbenzene (EB) to benzene (B) and the three diethylbenzene (DEB) isomers is of particular importance, because *p*-DEB is a highly value-added species in some petrochemical processes. This reaction can also distinguish between medium- and large-pore zeolites, based on the occurrence of an induction period, which has led the Catalysis Commission of the International Zeolite Association to recommend it as a test reaction for the characterization of zeolite acidity.

In present study we shows that not only monoethylated diphenylethane species but also diethylated ones are indeed formed inside the LaNa-Y cavities during the ethylbenzene disproportionation. By flushing the exactly same amount (50 mg) of used catalyst with pure N₂ and monitoring the GC/MS intensity changes, we were able to confirm that these species play a role as real intermediates of this reaction. Our work also provides clear experimental evidence that the latter diphenylethane derivatives play a more crucial role as reaction intermediates of ethylbenzene disproportionation, which leads us to propose a new dual-cycle mechanism for diethylbenzene formation over large-pore zeolites.