

Assessment of the mesopore wall catalytic activities of hierarchical MFI zeolite in bulky molecular reactions

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Various methods of zeolite synthesis were discovered so that the zeolites could have open mesopores (typically, 2-10 nm in diameter) through the microporous (< 1 nm) frameworks. These zeolites are called mesoporous zeolites or hierarchical zeolites. The presence of the mesopore walls with high surface area imparts the hierarchical zeolites the ability for catalytic conversion of bulky molecules that are difficult to enter micropores. The bulky molecular reactions require different acidities depending on the nature of the catalytic reactions. So far, however, there has been no proper assessment of the acidity of the mesopore walls. On this ground, we have characterized the surface acidity of the hierarchical MFI zeolites which were synthesized using organosilane surfactant as the mesoporous structure director. We have characterized the catalytic activities for various reactions involving bulky molecules such as the protection of benzaldehyde with pentaerythritol, the condensation of benzaldehyde with 2-hydroxyacetophenone, the esterification of benzylalcohol with hexanoic acid, and cracking of branched polyethylene. The reaction data have been analyzed for the assessment of the catalytic properties.