

New Advances in the Synthesis and Application of Hierarchical Zeolites

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Hierarchical pore structures are defined by the different porosity levels in multiple length scales. Such structures are found ubiquitously in nature and human works, such as the circularly systems of organisms, the cellular shells of diatoms, animal nerve systems, and man-made architectures. These are naturally or artificially designed for accommodation of maximum functions in a limited volume or area, and also achievement of their maximum efficiencies (e.g., mass transfer or transportation). By employing the hierarchical structure in catalyst design, it is expected that maximization of catalyst performance is possible. In the present work, recent progresses on synthesis and applications of new zeolite materials possessing micro-/mesoporous hierarchical structure are reviewed. The hierarchical zeolites are composed of zeolite nanocrystals that are 3-dimensionally interconnected to exhibit intra- or intercrystalline mesoporosity. Due to the fast molecular transport, the hierarchical zeolites provide significantly enhanced catalytic activity, selectivity and catalyst lifetime compared to solely microporous zeolites.