A solvent evaporation route towards fabrication of hierarchically porous ZSM-11 with highly accessible mesopores

A solvent evaporation route towards fabrication of hierarchically porous ZSM-11 has been paved via solvent evaporation induced self-assembly assisted by hexadecyltrimethoxysilane to produce a preformed dry gel, followed by its subsequent transformation into zeolite via steam-assisted-crystallization. The crystallization in dry gel has been found to undergo an orientated attachment growth mechanism whereby hexadecyltrimethoxysilane directs the formation of auxiliary mesopores and inhibits the fusion of primary nucleates. Measurements such as XRD, SEM, TEM, N2-physisorption, and TEM for an inverse replica of Pt derived from hierarchical ZSM-11 have been conducted to characterize the textural properties of the material. Ammonia temperature-programmed-desorption (NH3-TPD) measurements and infrared spectra using probe molecules such as pyridine (Py-IR) and 2,4,6-collidine (Coll-IR) have been collected to investigate the acidic properties as well as the accessibility of the acid sites. The hierarchical ZSM-11 possesses more acid sites on the mesopore surfaces that are accessible towards large probe molecules such as 2,4,6-collidine. This improvement together with the enhanced pore-connectivity brings about an increase in 1,3,5-triisopropylbenzene cracking activity and benzene selectivity with respect to a conventional counterpart.