Acidic Properties of High-Silica LTA Zeolites

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Brønsted acid sites in zeolites are formed when protons counterbalance the negative framework charges created by Al substitution for Si in crystallographically distinct tetrahedral sites and thus are part of bridging Si-OH-Al groups. Here we investigate the acidic properties of the proton form (H-LTA) of a series of high-silica LTA zeolites with framework Si/Al ratios ranging from 7.8 to 110 by using IR with adsorbed NH3, temperature-programmed desorption of NH_3, multinuclear solid-state NMR, and first-principles DFT calculations. Unlike the other higher-silica materials, H-LTA with Si/Al = 7.8 was found to have Brønsted acid sites with considerable acid strength where the framework Al atoms interact with extraframework octahedral Al species, thus being in a distorted environment, as well as the normal Brønsted acid sites pointed into the lta cages and centered at the single 6-rings of sod cages.