

The effect of dealumination on the framework stability, acidity, and catalytic performance of SAPO-11 molecular sieves

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This study focused on the framework stability, acidity, and catalytic performance of dealuminated SAPO-11 molecular sieve. The framework of SAPO-11 with AEL structure was stably maintained after 48 h dealumination. The dealuminated SAPO-11 molecular sieves exhibited higher activation energies on dehydration and ammonia desorption compared with untreated SAPO-11. The NH₃-TPD test confirmed that the acid site decreased; otherwise, the acidity was slightly stronger. It was assumed that acid sites on the external surface decreased more compared with that on the internal surface. To support this result, t-butyl benzene combustion was done. The combustion performance for t-butyl benzene decreased on dealuminated samples. In result of MTHC process, the methanol conversion increased more in the case of dealuminated SAPO-11. In particular, for the 48 h dealuminated sample, 90% methanol conversion remained until 4 h. Therefore, in this study, it was confirmed that the increase of Si/Al ratio in SAPO-11 by dealumination accompanied a decrease of the number of acid sites and an increase in the strength of Bronsted acid.