Electronic Supplementary Information

Dual template-directed synthesis of SAPO-34 nanosheet assemblies with improved stability in the methanol to olefins reaction

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Synthesis of conventional SAPO-34

Pseudoboehmite, water, phosphoric acid, silica sol, and DEA were mixed in sequence with a gel composition of 2.0 \text{ DEA}:1.0 \text{ Al}_2\text{O}_3:1.0 \text{ P}_2\text{O}_5:0.55 \text{ SiO}_2:50 \text{ H}_2\text{O}. The crystallization was conducted in a stainless steel autoclave at 200 °C for 24 h under rotation. The product was filtrated, washed thoroughly and dried in air. The composition of the product is \text{ Al}_{0.480}\text{ P}_{0.362}\text{ Si}_{0.158}\text{ O}_2. The XRD pattern and SEM image are shown in Fig. S1 and S2.
Fig. S1 XRD pattern of as-synthesized conventional SAPO-34.
Fig. S2 SEM image of as-synthesized conventional SAPO-34.
Fig. S3 XRD patterns of samples synthesized with TPOAC/TEOS of 1/3 at different crystallization time.
Fig. S4 SEM images of samples synthesized with TPOAC/TEOS of 1/3 at different crystallization times: 12 h (a), 24 h (b), 48 h (c), and 72 h (d).
Fig. S5 XRD patterns and SEM images of synthesized samples without (a) and with (b) TPOAC crystallized for 24h.
Fig. S6 IR spectra of NH$_3$ adsorbed on conventional SAPO-34 (a), sample 6 (b), sample 7 (c) and sample 8 (d) at varied temperatures.
Fig. S7 IR spectra of pyridine adsorbed on conventional SAPO-34 (a), sample 6 (b), sample 7 (c) and sample 8 (d) at varied temperatures.

The bands at 1545 and 1455 cm$^{-1}$ can be assigned to pyridine adsorbed on Brönsted and Lewis acid sites, respectively$^1$. Comparing the spectra of the four samples at 100 °C and 300 °C, it is concluded that the strength of acid sites on the external surface of sample 7 and 8 is larger than conventional SAPO-34 and sample 6.

Fig. S8 $^1$H NMR spectrum of calcined sample 7 and conventional SAPO-34.
Fig. S9 $\text{C}_3\text{H}_8/\text{C}_3\text{H}_6$ variation with time-on-stream over sample 6, 7, 8 and conventional SAPO-34.