Supporting Information

Ultra-short contact time conversion of chloromethane to olefins over pre-coked SAPO-34: Direct insight into the primary conversion with coke deposition

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The molar composition of SAPO-34 is $Si_{0.11}P_{0.41}Al_{0.48}O_2$.

The pre-coked catalysts were prepared by contacting catalyst of SAPO-34 with a continuous flow of chloromethane at 723 K with WHSV=3.17 h^{-1} in a fixed-bed reactor. By varying the time on stream, the catalysts with different coke deposition were prepared. The coke amount was analyzed using a TA TGA2950 thermal analyzer in diluted air and the results are listed in Table S1.

Table S1 The coke amount of the SAPO-34 catalysts with various time on stream

Sample name	PC1	PC2	PC3	PC4	PC5	PC6	PC7
Time on stream (min)	0	1	2	3	6	10	20
Coke (wt%)	0	0.60	1.06	1.29	2.49	3.48	8.38

The ultra-short contact time chloromethane conversions were conducted on a pulse reaction system as presented in Catal. Commun. 2007, 8, 2248. Before reaction, the fresh or pre-coked SAPO-34 catalyst was loaded in the quartz reactor and calcined at 823 K for 1 h. Chloromethane pulse was performed onto the catalyst bed at 723 K. Each injection contained 0.28 mg chloromethane which is diluted by He with CH_3Cl partial pressure of 0.123. The contact time is 2.4 ms for each pulse. For comparison, methanol conversion over fresh SAPO-34 catalyst was also conducted on the same pulse reaction system and under almost identical conditions.

Table S2, Comparison in texture properties of the fresh catalyst and the pre-coked catalyst (8 wt.% coke deposition)

	SAPO-34 (fresh catalyst)	SAPO-34 (with coke)
BET surface area (m^2/g)	483	27
Total pore volume (cc/g)	0.30	0.05