

Supplementary Information

Solvent-free Synthesis of SAPO-34 Zeolite with Tunable SiO₂/Al₂O₃ Ratios for Efficient Catalytic Cracking of 1-Butene

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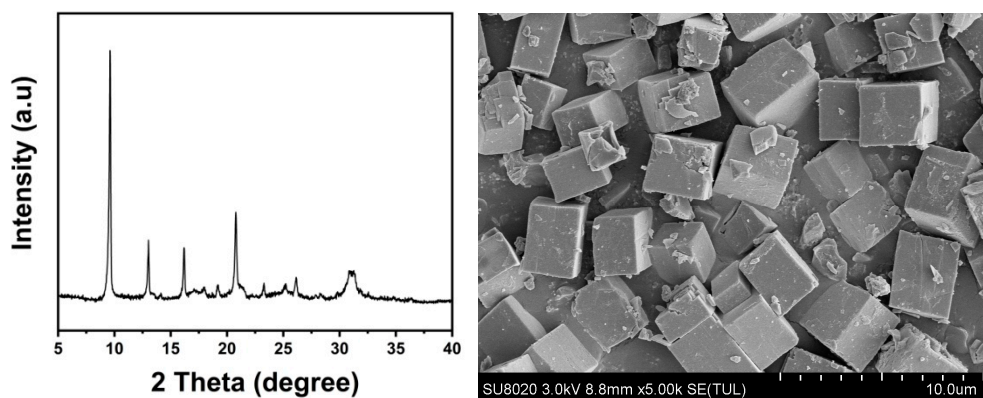


Figure S1. The XRD pattern (left) and SEM image (right) of commercial SAPO-34.

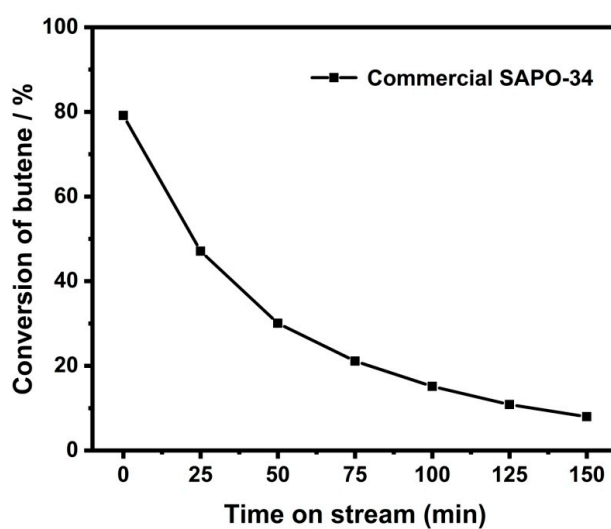


Figure S2. The conversion of 1-butene for commercial SAPO-34 catalysts with time on stream. Reaction conditions: WHSV=1.5 h⁻¹, P=0.1 Mpa, T=500 °C

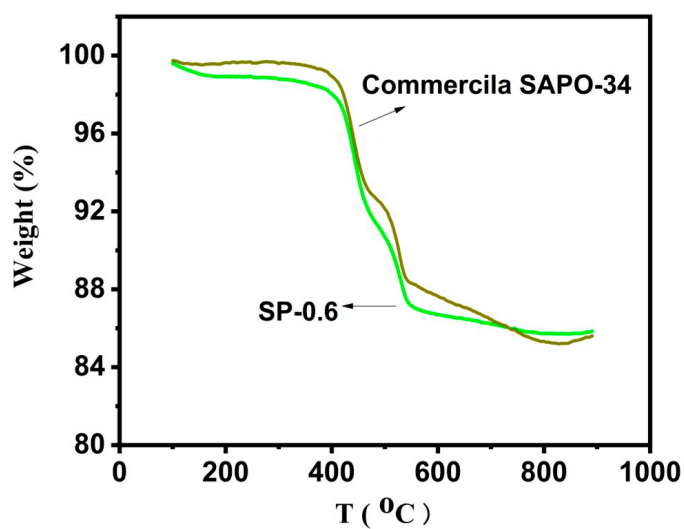


Figure S3. TG profiles of coked SP-0.6 catalyst and commercial SAPO-34 at 150 min.

Table S1. Product distribution of 1-butene catalytic cracking over commercial SAPO-34.

Catalysts	Conversion (wt%)	Selectivity (wt%)							HTC ¹	Mass conservation ²
		CH ₄ + C ₂ H ₆	H ₂	C ₂ H ₄	C ₃ H ₆	C ₃ H ₈ +C ₄ H ₁₀	C ₅ +			
Commercial SAPO-34	79.2	0.7	0.6	13.1	46.3	26.5	12.6	0.57		97.3%

Reaction conditions: WHSV=1.5 h⁻¹, P=0.1 Mpa, T=500 °C, TOS=10 min; ¹HTC: The hydrogen transfer coefficient was defined as the ratio of selectivity of C₃H₈ plus C₄H₁₀ with respect to selectivity of C₃H₆.

² **The calculation of mass conservation:** In this study, the H/C and N/C molar ratios of the 1-butene cracking products are calculated by formulas (1) and (2) to analysis the conservation of elements. When these two parameters are significantly lower than the theoretical values (H/C and N/C molar ratio of 1-butene), it indicates that there is obvious carbon atom loss and the undetectable C5+ fraction is formed.

$$\frac{H}{C} = \frac{\sum m(i)}{\sum n(i)} \quad (1)$$

$$\frac{N}{C} = \frac{2(N_2)}{\sum n(i)} \quad (2)$$

Where, (i) represent the mole composition analyzed by GC of i product in the output. (N₂) represents the mole composition analyzed by GC of nitrogen in the output. m and n represents the H atoms numbers and C atoms numbers of i product in the output, respectively.