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Supporting information

Synthesis of nanosheet epitaxial growth ZSM-5 zeolite with increased diffusivity and its catalytic cracking performance

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Table S1. Textural properties of RP zeolite and N2 zeolite with different Si/Al ratio

Sample	S_{BET} ($m^2 \cdot g^{-1}$)	S_{Ext} ($m^2 \cdot g^{-1}$)	V_{Tol} ($cm^3 \cdot g^{-1}$)	V_{Micro} ($cm^3 \cdot g^{-1}$)	V_{Meso}/V_{Micro}
RP-120	387	147	0.444	0.123	2.61
S-120	355	106	0.439	0.129	2.40
RP-150	396	147	0.417	0.127	2.28
RP-200	400	168	0.433	0.112	2.87
RP-250	389	152	0.332	0.122	1.72
RP-300	349	128	0.362	0.112	2.23
N2-50	506	313	0.758	0.100	6.58
S-50	465	281	0.716	0.095	6.54
N2-120	319	119	0.462	0.103	3.48

Table S2. Acidity properties of RP and N2 zeolites with different Si/Al ratio

Sample	Si/Al[a]	Acidity by NH_3-TPD (mmol·g^{-1})		Total acid Amount (mmol·g^{-1})	Total acid Density[b] (mmol·m^{-2})	Acidity by Py-IR (μmol·g^{-1})				B acid Density[c] (μmol·m^{-2})
		Weak	Strong			B	L	150 °C-B/L	250 °C-B/L	
RP-120	129	0.080	0.111	0.19	0.49	63.4	40.3	1.6	5.5	0.16
RP-150	160	0.064	0.066	0.13	0.33	49.9	30.1	1.7	5.5	0.13
RP-200	204	0.056	0.069	0.13	0.31	32.9	67.2	0.5	na*	0.08
RP-250	225	0.048	0.051	0.10	0.25	23.4	56.8	0.4	na	0.06
RP-300	252	0.034	0.044	0.08	0.22	24.3	46.3	0.5	na	0.07
N2-50	50	0.177	0.263	0.44	0.87	69.9	24.2	2.9	2.9	0.14
N2-120	125	0.060	0.089	0.15	0.47	49.9	22.0	2.3	3.2	0.16

[a] Actual Si/Al ratio determined by inductively coupled plasma (ICP).

[b] The ratio of the total amount of acid to the specific surface area.

[c] The ratio of B acid amount to the specific surface area. The test temperature of Py-IR at 150 °C is used to calculate the B acid density.

*not available.

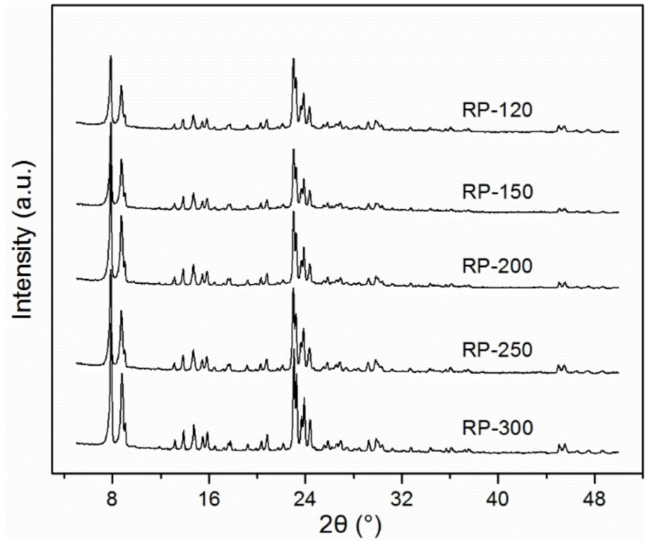

Fig. S1 XRD patterns of calcinated RP zeolite with different Si/Al ratio.

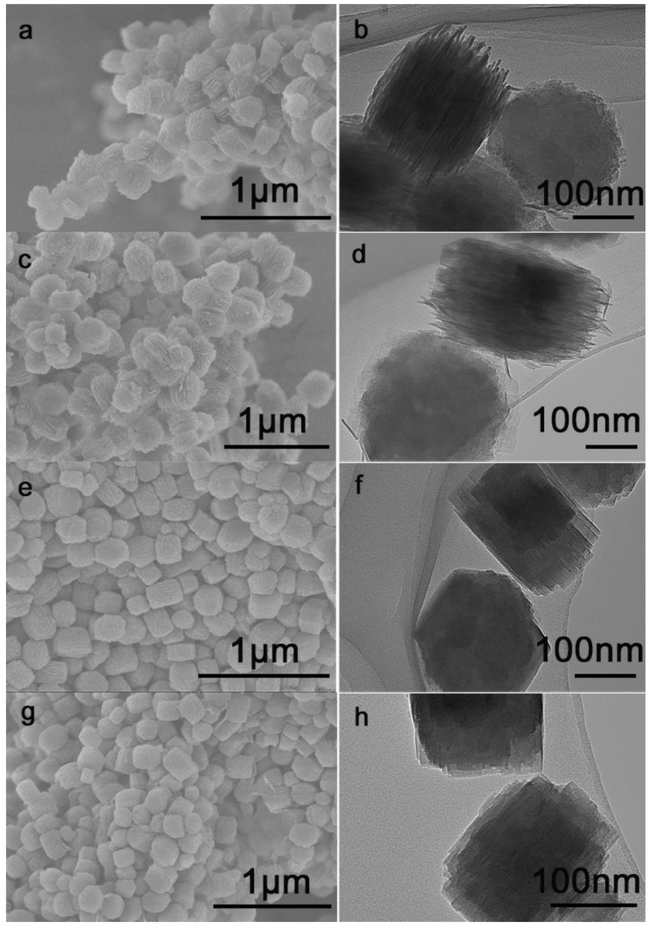

Fig. S2 SEM and TEM images of RP-150 (a, b), RP-200 (c, d), RP-250 (e, f), RP-300 (g, h).

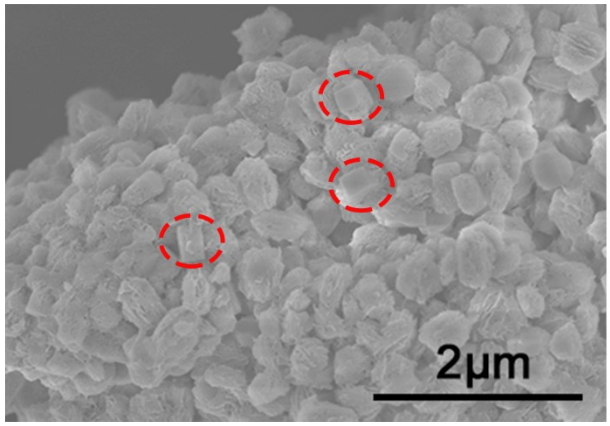

Fig. S3 RP zeolite synthesized with Si/Al ratio of 120 and water content of 4000. The synthesized material shows some bulk-shaped zeolite and phase separation.

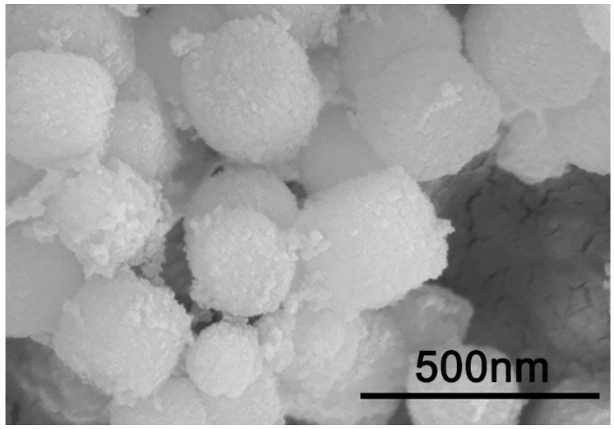

Fig. S4 RP zeolite synthesized with Si/Al ratio of 50 and water molar ratio of 800. The appearance of layered epitaxial growth is not shown when Si/Al=50.

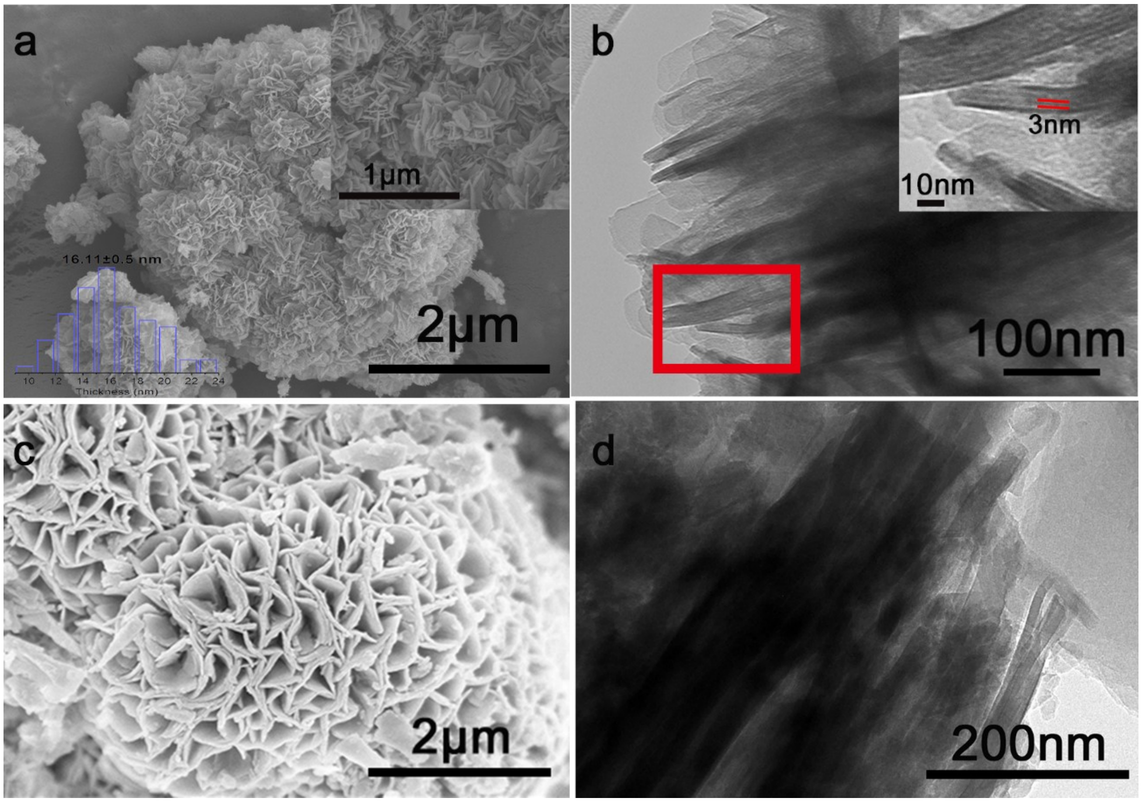

Fig. S5 SEM and TEM images of N2-50 (a, b) and N2-120 (c, d).

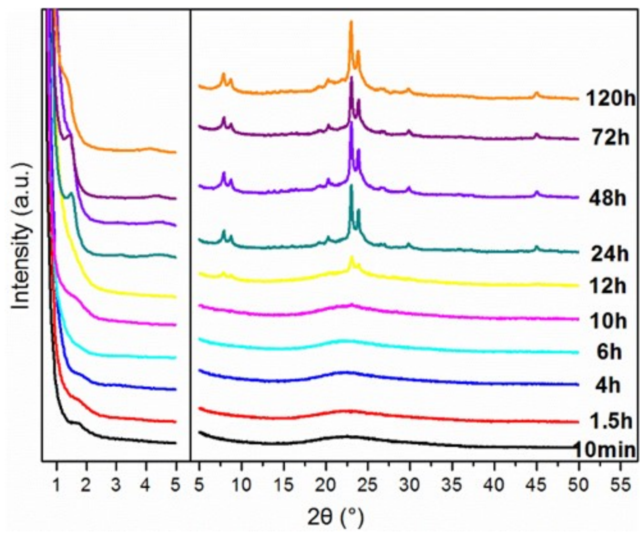

Fig. S6 The low-angle and high-angle XRD patterns of N2-50 with different synthesis time.

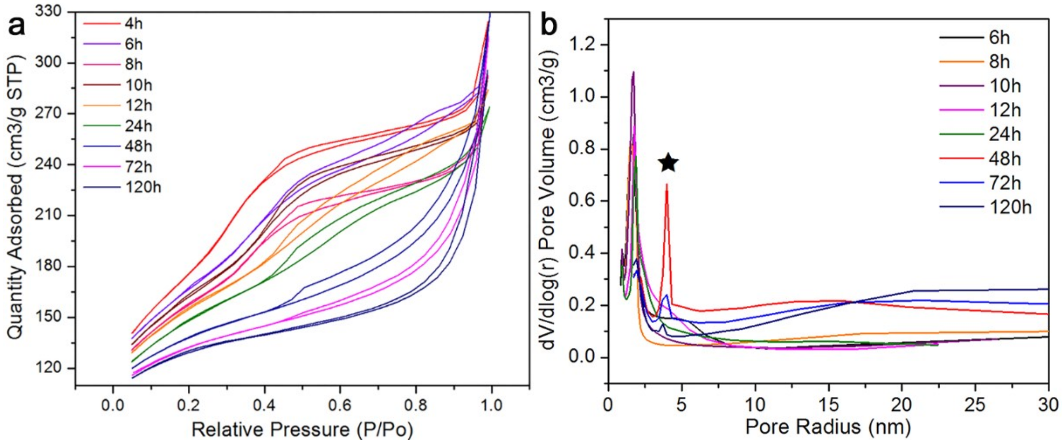

Fig. S7 (a) N_2 physisorption isotherms of RP-120 with different hydrothermal time. The curves have appropriate offsets for intuitiveness**.** After 24 h of hydrothermal treatment, the high-pressure hysteresis loop has changed from H4 to H3 type, indicating the formation of slit-shaped mesopores. (b) BJH pore size distribution of RP-120 with different hydrothermal treatment time.

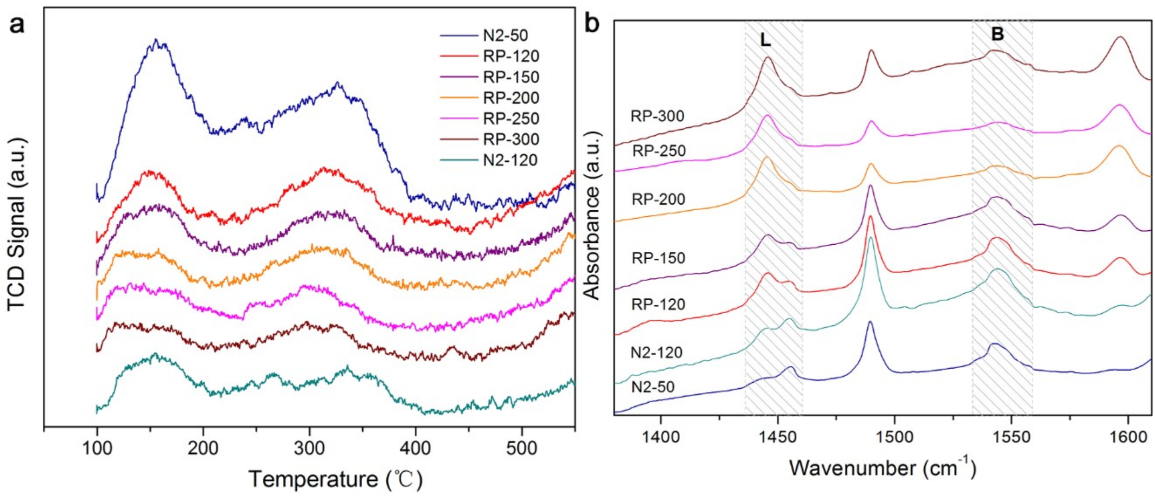

Fig. S8 (a) NH_3-TPD curves of RP and N2 zeolites, confirming the presence of weak and strong acids; (b) FTIR spectra of adsorbed pyridine.

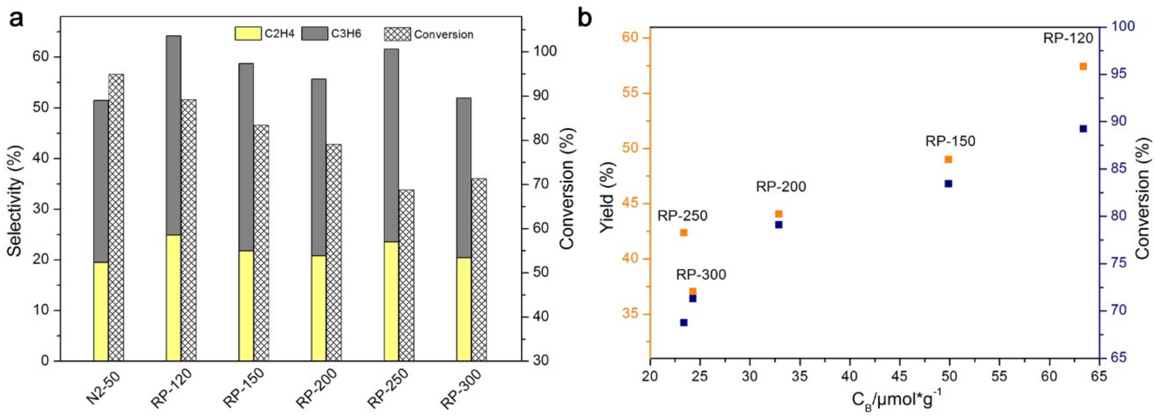

Fig. S9 (a) The conversion of n-heptane and the selectivity of ethylene and propylene of RP zeolite; (b) The conversion and total yield of ethylene and propylene as a function of B acid amount.

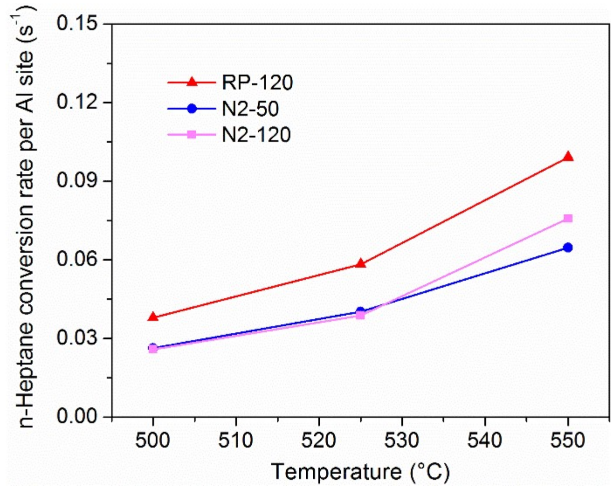

Fig. S10 n-Heptane conversion rate per Al site of the three zeolites. The reaction is measured at 100 h^{-1} WHSV, and the conversion rate of n-heptane is within 10%.

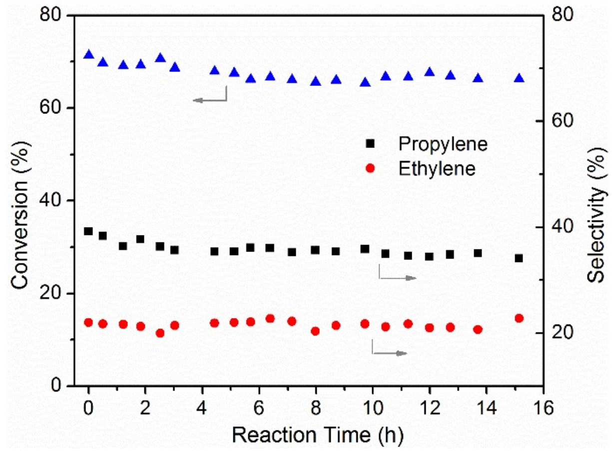

Fig. S11 The stability evaluation of N2-120 zeolite.

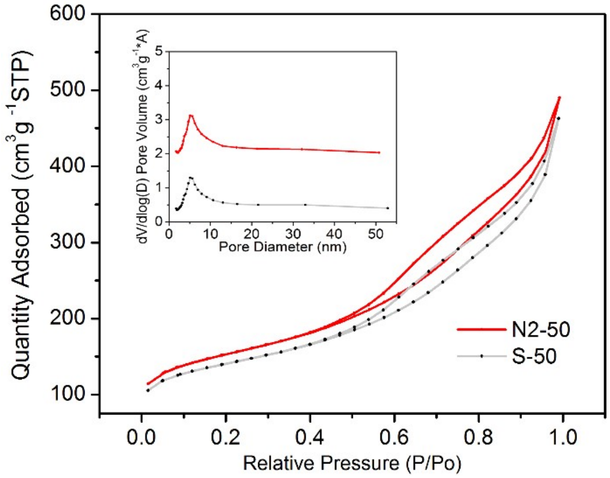

Fig. S12 N_2 physisorption isotherms and pore size distributions for N2-50 and S-50 zeolites.