

Supporting Information

Nanosized Al-rich MFI zeolite synthesized by zeolite hydrothermal conversion in the presence of zeolite nanosheet seeds

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Table S1. Synthesis conditions of MFI zeolites prepared with SPP seeds.

Sample no.	Synthesis conditions ^a						Product	
	Starting Si & Al sources	Seed	Si/Al	H ₂ O/Si	Na/Si	Temp / °C	Time / day	Yield / % Phase
1	FAU zeolite SPP seed		15.6	5	0.4	125	4	46.6 MFI, MOR
2			15.6	10	0.4	125	4	57.3 MFI, MOR
3			15.6	20	0.4	125	4	62.9 MFI, MOR
4			15.6	40	0.4	125	4	62 MFI, MOR
5			15.6	50	0.4	125	4	98.9 MFI, amorphous
6			12.9	50	0.4	125	4	82 MFI, MOR, amorphous
7			14	50	0.4	125	4	75.1 MFI, MOR
8			22	50	0.4	125	4	75.4 MFI
9			23.5	50	0.4	125	4	73 MFI
10			15.6	50	0.4	130	2	71 MOR, amorphous
11			22	50	0.4	130	2	71.3 MFI
12			23.5	50	0.4	130	2	72.5 MFI
13			15.6	50	0.4	130	4	76.7 MFI, MOR
14			22	50	0.4	130	4	76.8 MFI
15			23.5	50	0.4	130	4	72.9 MFI
16			15.6	50	0.4	140	2	70.6 MFI, MOR
17			22	50	0.4	140	2	68.6 MFI
18			23.5	50	0.4	140	2	70.8 MFI
19			15.6	50	0.4	140	4	73.2 MFI, MOR
20			22	50	0.4	140	4	76.7 MFI
21			23.5	50	0.4	140	4	74.1 MFI
22			15.6	50	0.4	150	2	71.3 MFI, MOR
23			22	50	0.4	150	2	75.7 MFI
24			23.5	50	0.4	150	2	80 MFI
25			22	50	0.1	140	2	98.8 amorphous
26			22	50	0.2	140	2	94.4 amorphous
27			22	50	0.3	140	2	85.9 MFI, amorphous
28			22	50	0.35	140	2	81.6 MFI, amorphous
29			22	50	0.45	140	2	68.2 MFI
30			22	50	0.5	140	2	64.5 MFI

^a seed = 5 wt%, rotation speed = 30 rpm.

Table S2. Synthesis conditions of MFI zeolites.

Sample no.	Synthesis conditions ^a					Product	
	Starting Si & Al sources	Seed	Si/Al	H ₂ O/Si	Na/Si	Yield / %	Phase
49	HS-40, NaAlO ₂	SPP seed	22	50	0.3	56.6	MFI
50			22	50	0.35	67	MFI
51			22	50	0.4	77.7	MFI, amorphous
52			22	50	0.45	37.1	amorphous
53			22	50	0.5	29	MFI, amorphous
54	HS-40, NaAlO ₂	TPAOH seed	22	50	0.1	28	amorphous
55			22	50	0.2	50	amorphous
56			22	50	0.3	49	MFI
57			22	50	0.4	38	amorphous
58	FAU zeolite	TPAOH seed	22	50	0.35	73	amorphous
59			22	50	0.4	71	amorphous
60			22	50	0.45	64	amorphous
61			22	50	0.5	60	amorphous

^a seed = 5 wt% of silica, temperature = 140 °C, time= 2 days, rotation speed = 30 rpm.

Table S3. Synthesis conditions and yields of the MFI zeolite samples.

Sample no.	Synthesis conditions ^a							Product	
	Starting Si & Al sources	Seed	Si/Al	H ₂ O/Si	Na/Si	Temp °C	/Time /hour	Yield / %	Phase
31	FAU zeolite	SPP seed	22	50	0.4	140	0	65.6	amorphous
32			22	50	0.4	140	1	74.5	amorphous
33			22	50	0.4	140	3	77.5	amorphous
34			22	50	0.4	140	6	70.6	amorphous
35			22	50	0.4	140	12	72.3	amorphous
36			22	50	0.4	140	24	71	amorphous
37			22	50	0.4	140	32	67.7	MFI
38			22	50	0.4	140	40	70.7	MFI
39			22	50	0.4	140	44	69.2	MFI
17 SPP(FAU)_0.4			22	50	0.4	140	48	68.6	MFI
40	HS-40, NaAlO ₂	TPA seed	22	50	0.30	140	0	48.7	amorphous
41			22	50	0.30	140	1	45.5	amorphous
42			22	50	0.30	140	3	36.8	amorphous
43			22	50	0.30	140	6	48	amorphous
44			22	50	0.30	140	12	45.1	amorphous
45			22	50	0.30	140	24	46.8	amorphous
46			22	50	0.30	140	32	45.8	MFI
47			22	50	0.30	140	40	44.8	MFI
48			22	50	0.30	140	44	47	MFI
TPA(Amor.)			22	50	0.30	140	48	49.3	MFI

^a seed = 5 wt% of silica, rotation speed = 30 rpm.

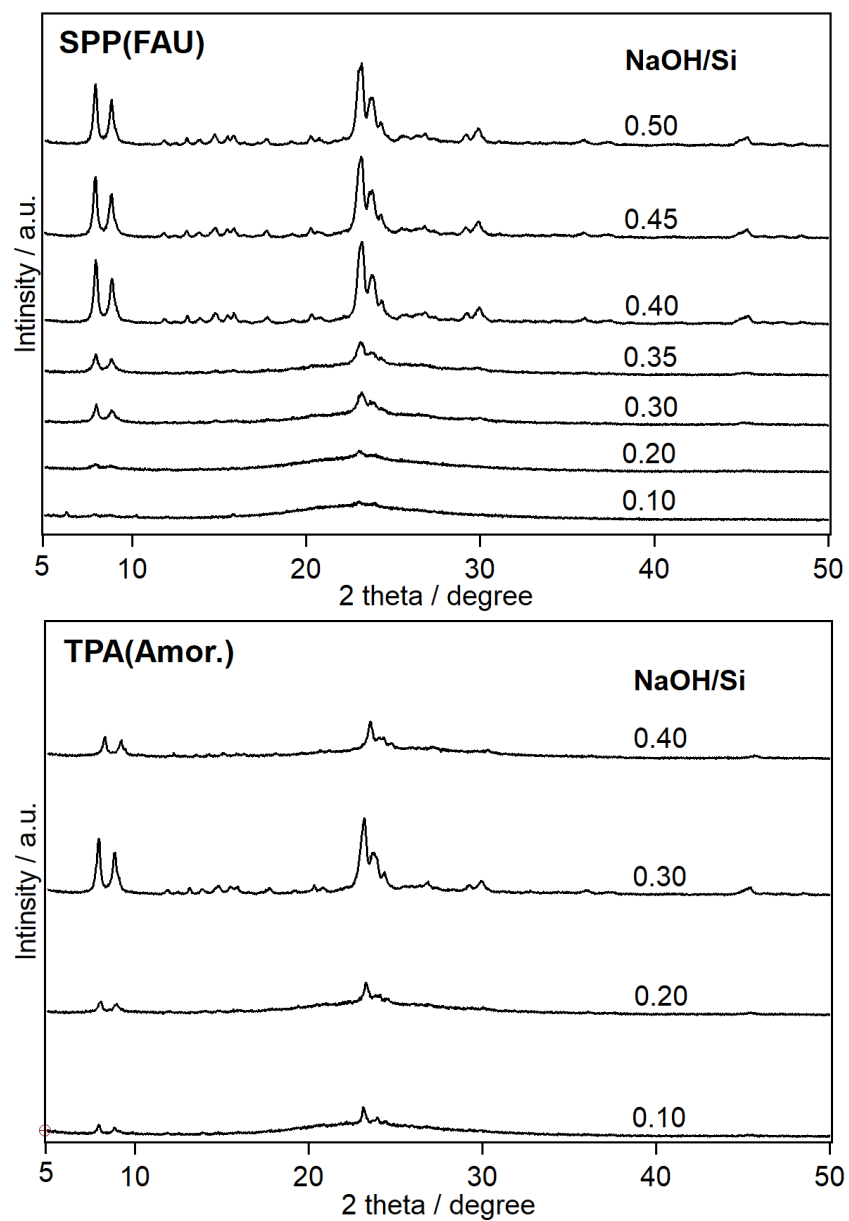


Fig. S1. Powder XRD patterns of SPP(FAU) and TPA(Amor.) samples at various NaOH/Si ratios.

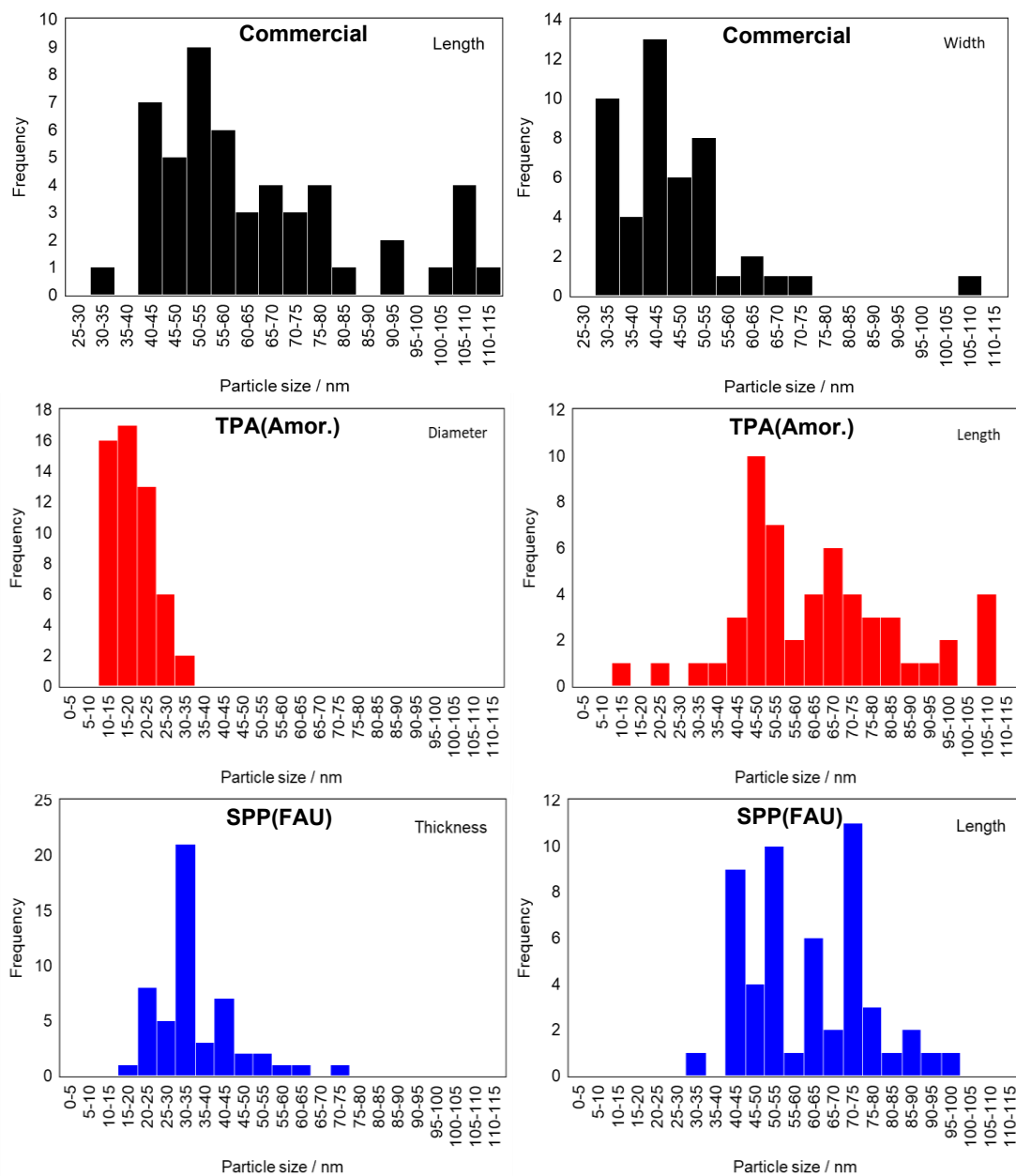


Fig. S2. The particle size distribution histogram of the obtained samples.

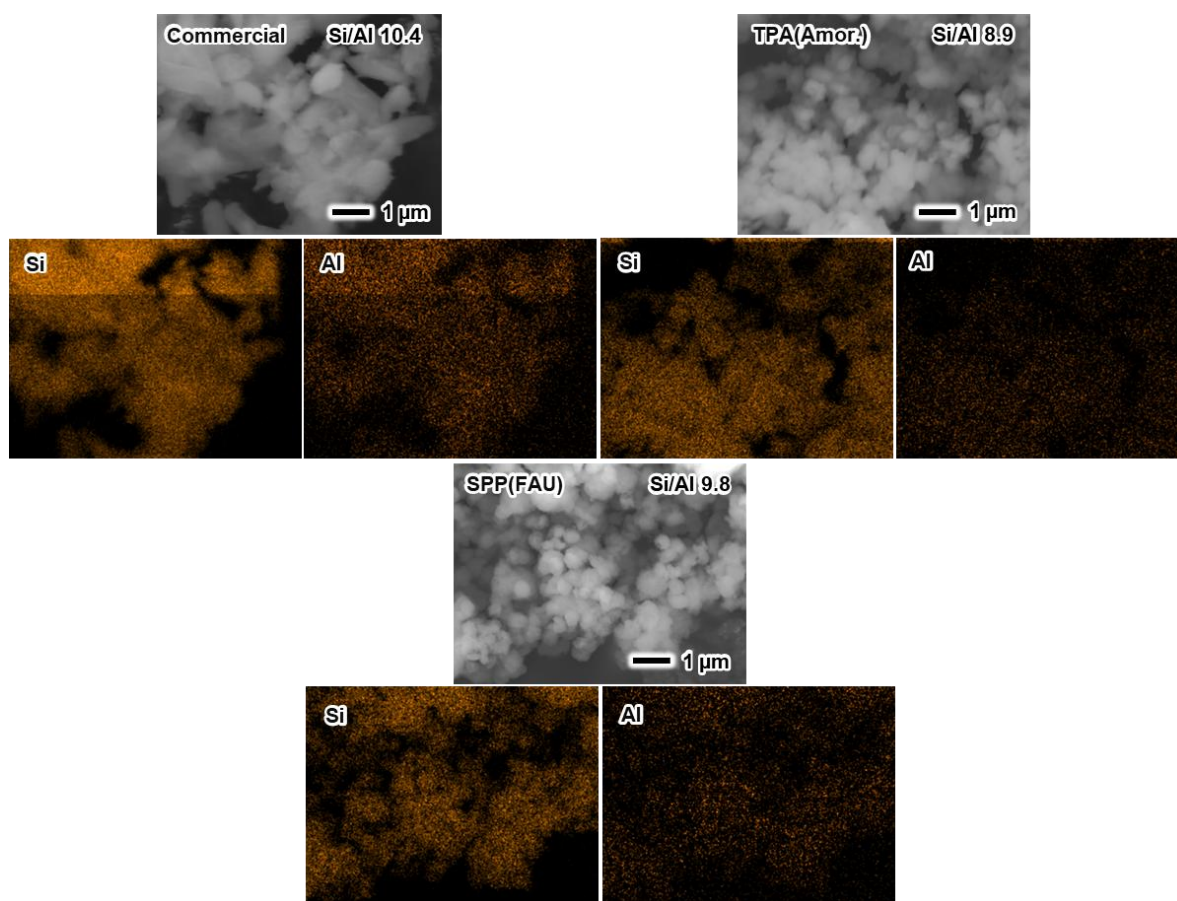


Fig. S3 SEM images of the obtained zeolite and the corresponding Si and Al elemental mappings. The value on the SEM indicates the Si/Al ratio calculated from EDX analysis.

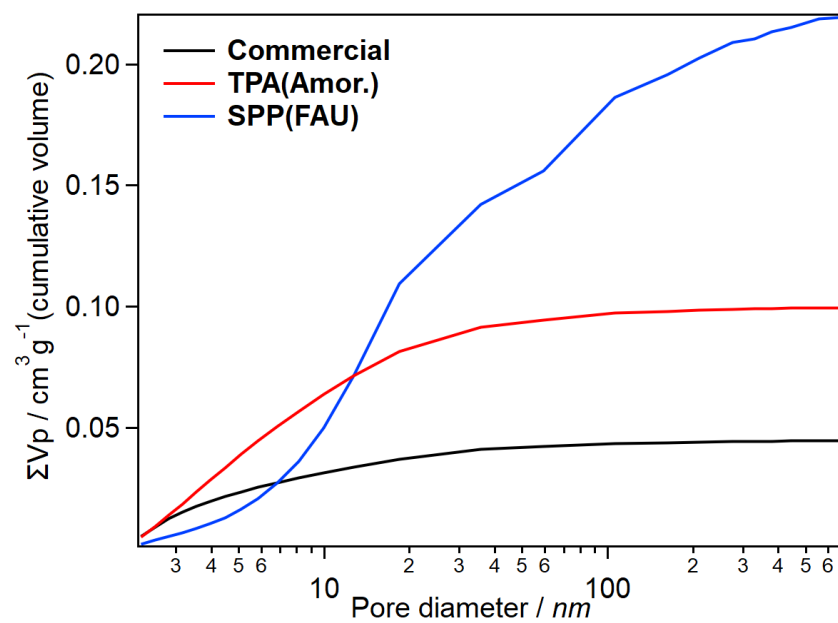


Fig. S4. Cumulative pore volume of the samples calculated using from N₂ adsorption isotherm by the BJH method.

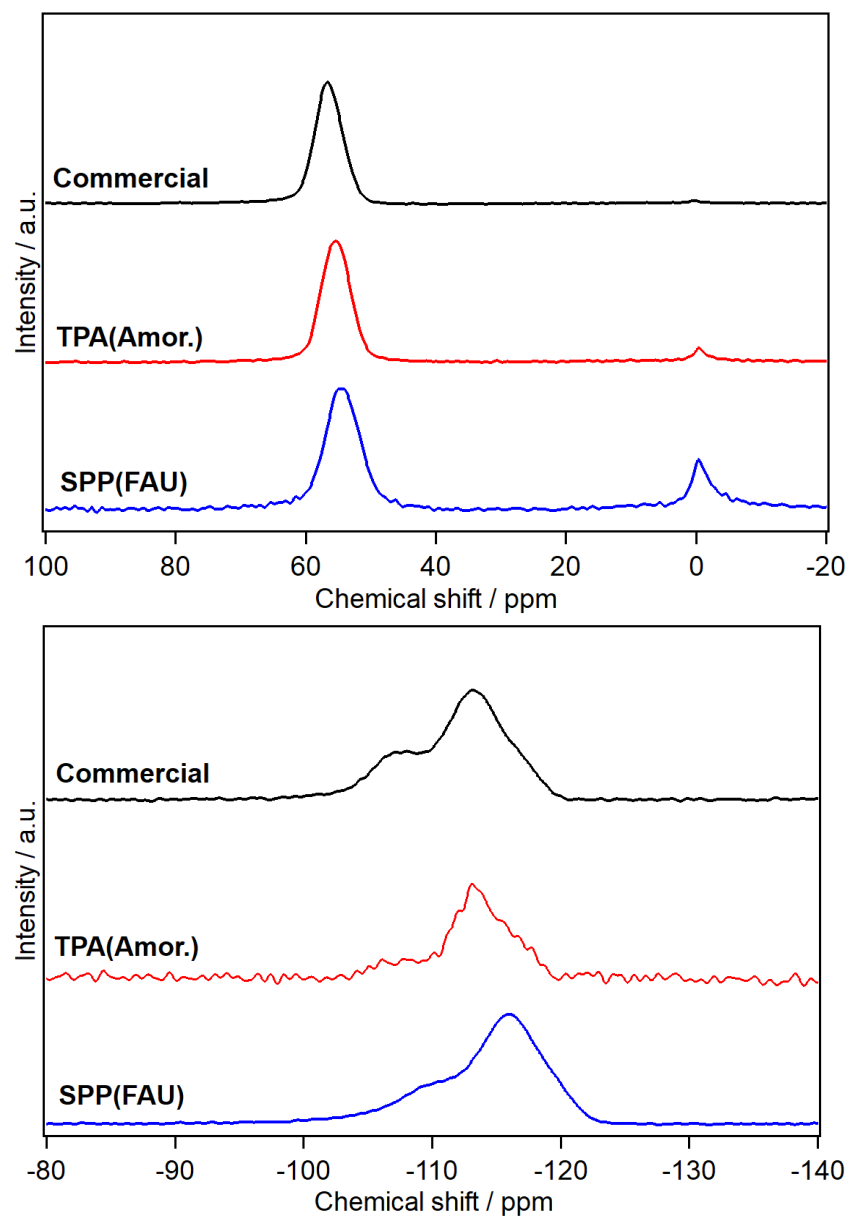


Fig. S5. ^{27}Al MAS NMR and ^{29}Si MAS NMR spectra of the studied zeolites.

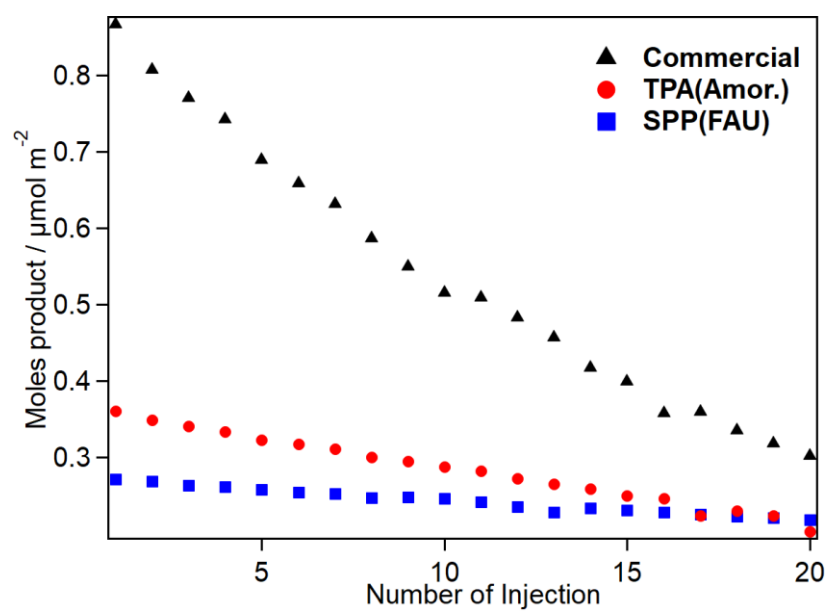


Fig. S6. Conversion of TiPBz per m² over the catalysts.

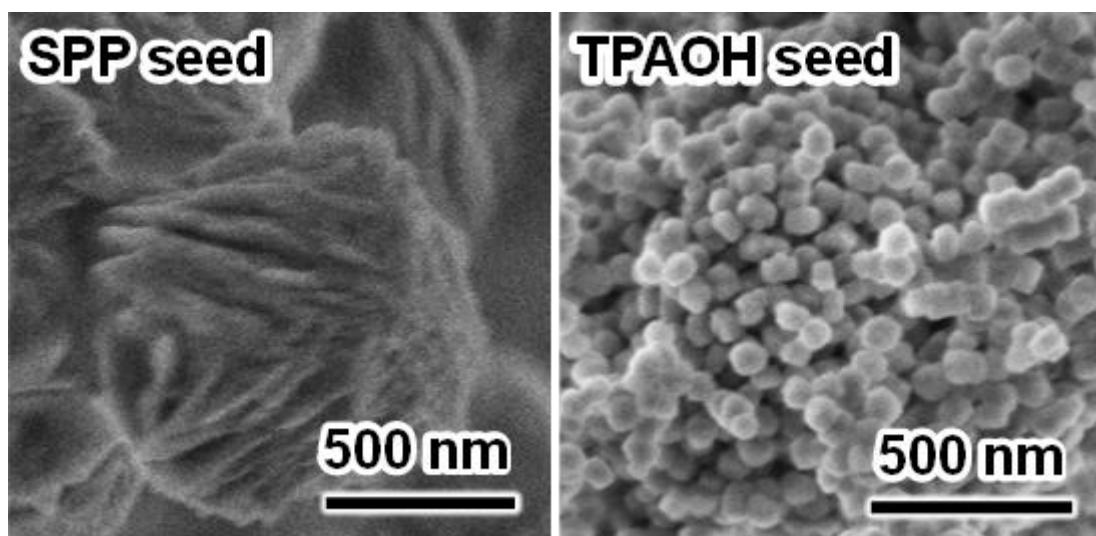


Fig. S7. SEM images of seed zeolites.