Ionothermal Synthesis of Triclinic SAPO-34 Zeolites

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Table S1. XRD date of different samples.

AlPO$_4$-34		S-Si-0.1		S-Si-0.3		S-Si-0.5	
2θ	d	2θ	d	2θ	d	2θ	d
9.61	9.19	9.82	9.00	9.70	9.11	9.73	9.08
15.77	5.61	15.98	5.54	15.82	5.59	15.86	5.58
25.74	3.46	25.95	3.43	25.87	3.45	25.95	3.43
30.87	2.90	31.05	2.87	31.02	2.87	31.01	2.88

Table S2. Structural parameters of SAPO-34 molecular sieves

Samples	Molar composition[a]	S^b_{BET} (m²/g)	S^c_{micro} (m²/g)	S^c_{ext} (m²/g)	V^c_{micro} (cm³/g)	V^d_{meso} (cm³/g)	D^e_{avg} (nm)
S-Si-0.1	$Al_{0.476}P_{0.518}Si_{0.006}O_2$	562.69	532.34	30.35	0.26	0.10	11.50
S-Si-0.3	$Al_{0.476}P_{0.505}Si_{0.019}O_2$	526.02	470.74	55.28	0.23	0.17	10.35
S-Si-0.5	$Al_{0.466}P_{0.511}Si_{0.023}O_2$	511.89	455.04	56.85	0.22	0.17	8.28

a Measured by energy dispersive spectrometry (EDS).
b S_{BET} (total surface area) calculated by applying the BET equation using the linear part (0.05 < P/P0 < 0.30) of the adsorption isotherm.
c S_{micro} (micropore area), S_{ext} (external surface area) and V_{micro} (micropore volume) calculated using the t-plot method.
d V_{meso} (mesopore volume).
e D_{avg} (average diameter) calculated using the BJH method (from desorption).

Table S3. Synthesis conditions in [EMIm]Cl

Sample	Raw material molar ratio	Crystallization Temperature	Crystallization Time
S1(150 °C)	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.1Si	150 °C	48 h
S1(180 °C)	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S1(200 °C)	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.1Si	200 °C	48 h
S1-Si-0.1	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S1-Si-0.3	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.3Si	180 °C	48 h
S1-Si-0.5	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.5Si	180 °C	48 h
S1-F-0	39[EMIm]Cl: 1TEA: 1Al: 3P: 0HF: 0.1Si	180 °C	48 h
S1-F-0.3	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.3HF: 0.1Si	180 °C	48 h
S1-F-0.7	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S1-F-1.0	39[EMIm]Cl: 1TEA: 1Al: 3P: 1.0HF: 0.1Si	180 °C	48 h
S1-3 h	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	3 h
S1-6 h	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	6 h
S1-12 h	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	12 h
S1-24 h	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	24 h
S1-48 h	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h

Table S4. Synthesis conditions in different ionic liquids

Sample	Raw material molar ratio	Crystallization Temperature	Crystallization Time
S-EM-C	39[EMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.1Si(op)	180 °C	48 h
S-EM-B	39[EMIm]Br: 1TEA: 1Al: 3P: 0.7HF: 0.1S(op)	180 °C	48 h
S-BM-C	21[BMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.1Si(cl)	180 °C	48 h
S-BM-B	21[BMIm]Br: 1TEA: 1Al: 3P: 0.7HF: 0.1Si(cl)	180 °C	48 h
S-EMM-B	39[EMMIm]Br: 1TEA: 1Al: 3P: 0.7HF: 0.1Si(cl)	180 °C	48 h
S-BMM-B	39[BMMIm]Br: 1TEA: 1Al: 3P: 0.7HF: 0.1Si(cl)	180 °C	48 h

Table S5. Synthesis conditions in different templates

| Sample	Raw material molar ratio	Crystallization Temperature	Crystallization Time
S1-T-0	39[EMIm]Cl: 0TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S1-T-0.5	39[EMIm]Cl: 0.5TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S1-T-1.0	39[EMIm]Cl: 1.0TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S1-T-1.5	39[EMIm]Cl: 1.5TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S2-T-0	21[BMIm]Cl: 0TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S2-T-0.5	21[BMIm]Cl: 0.5TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S2-T-1.0	21[BMIm]Cl: 1.0TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S2-T-1.5	21[BMIm]Cl: 1.5TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S2-TME	21[BMIm]Cl: 1TEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S2-DEA	21[BMIm]Cl: 1DEA: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S2-MOR	21[BMIm]Cl: 1MOR: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S2-N-MIM	21[BMIm]Cl: 1N-MIM: 1Al: 3P: 0.7HF: 0.1Si	180 °C	48 h
S2-TEAOH	21[BMIm]Cl: 1TEAOH: 1Al: 3P: 0.7HF:0.1Si	180 °C	48 h
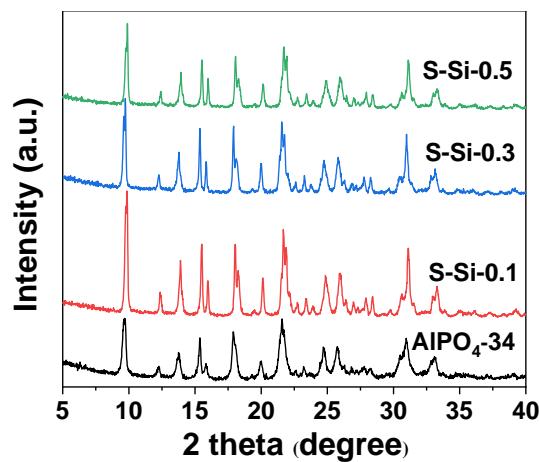
**Figure S1.** XRD patterns of samples under different molar amounts of Si.
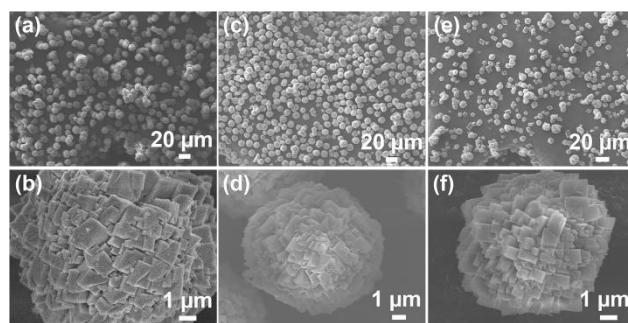
Figure S2. SEM images of samples under different molar amounts of Si (**a, b** for S-Si-0.1, **c, d** for S-Si-0.3, and **e, f** for S-Si-0.5).
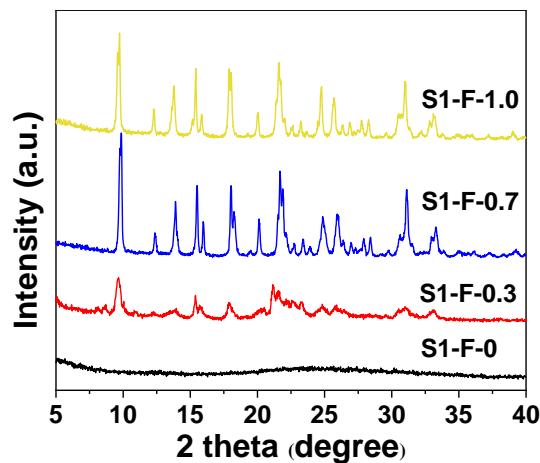

**Figure S3.** XRD patterns of samples under different molar amounts of HF.
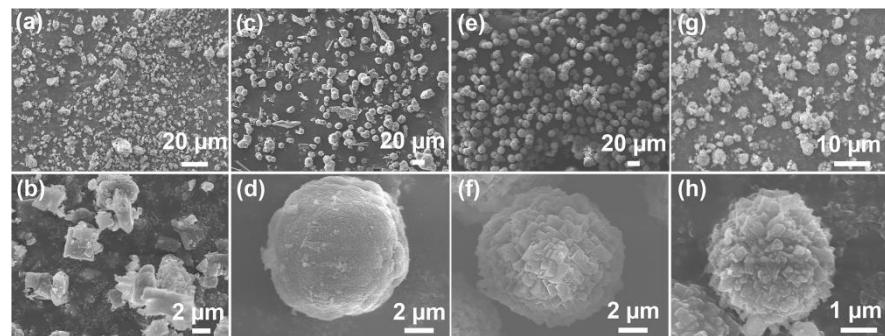
Figure S4. SEM images of samples under different molar amounts of HF (**a, b** for S1-F-0, **c, d** for S1-F-0.3, **e, f** for S1-F-0.7, and **g, h** for S1-F-1.0).
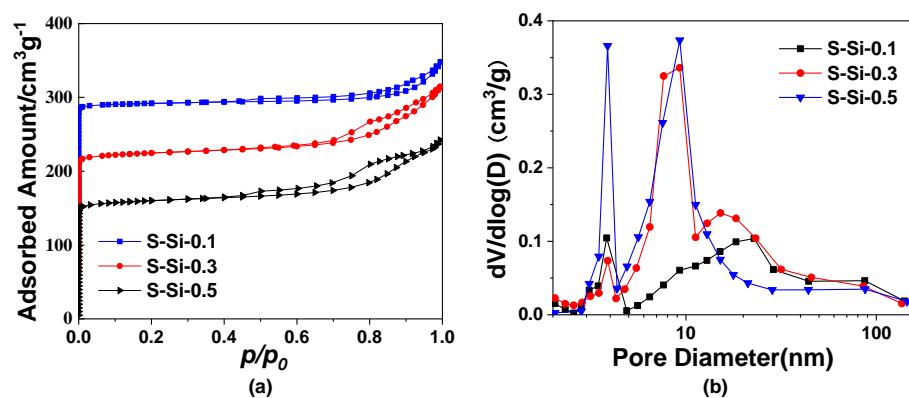

Figure S5. (**a**) N_2 adsorption-desorption isotherms and (**b**) BJH pore size distributions of triclinic SAPO-34 molecular sieves.
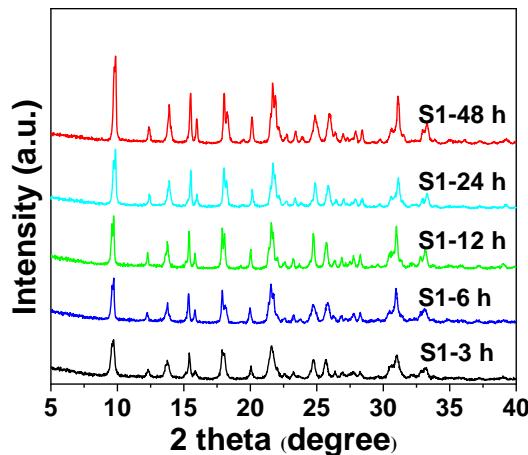
Figure S6. XRD patterns of samples at different crystallization times.
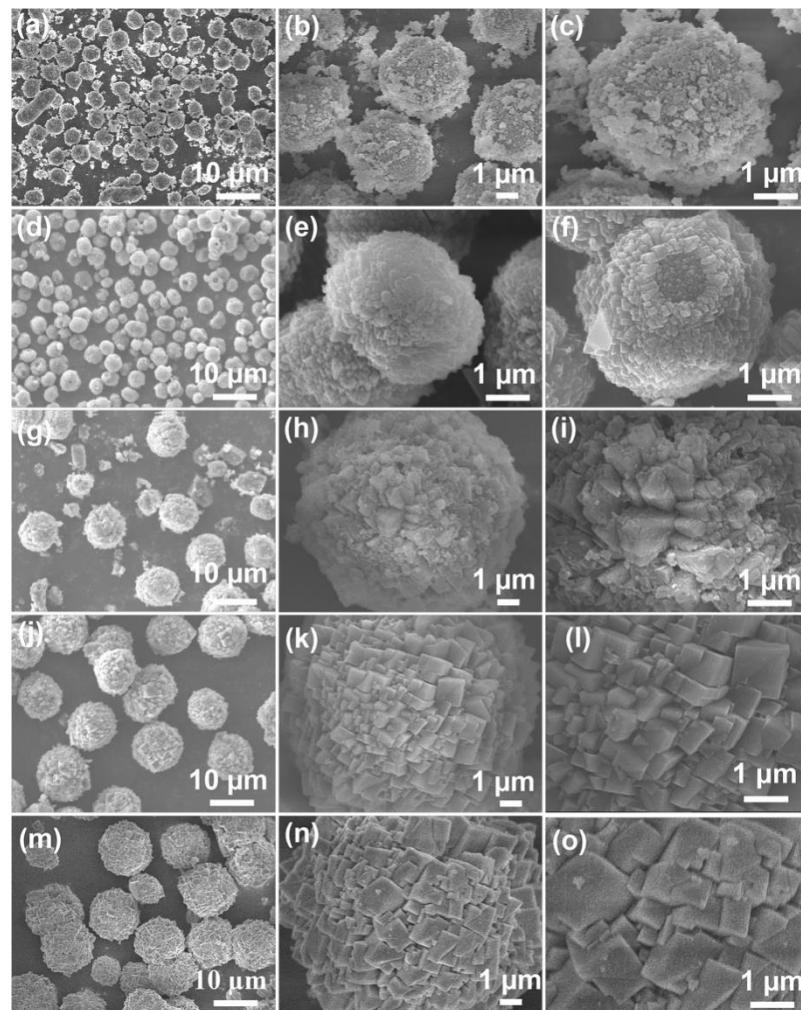
Figure S7. SEM images of samples at different crystallization times (**a~c** for S1-3 h, **d~f** for S1-6 h, **g~i** for S1-12 h, **j~l** for S1-24 h, and **m~o** for S1-48 h).
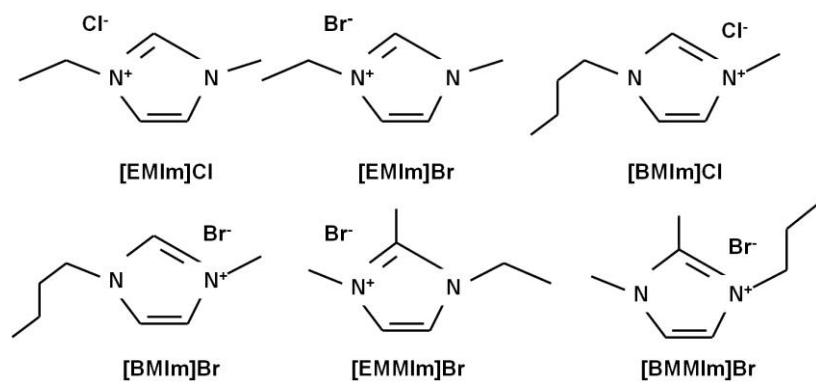
Figure S8. Structure of ionic liquids.
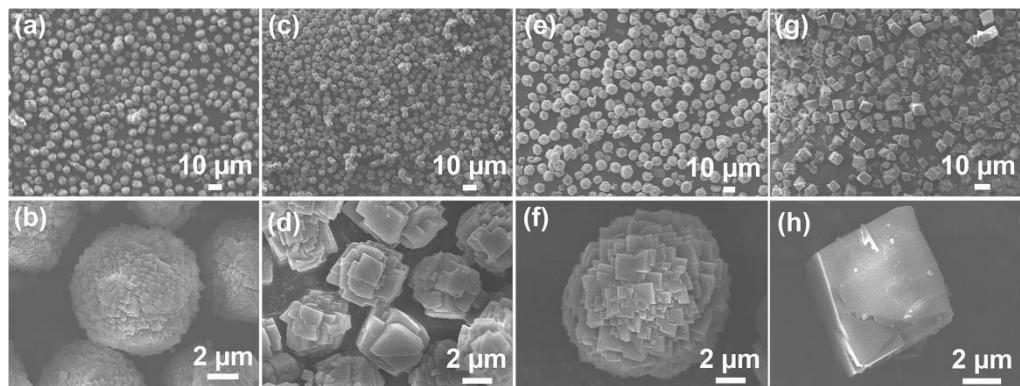
Figure S9. SEM images of samples under different molar amounts of TEA (**a, b** for S1-T-0, **c, d** for S1-T-0.5, **e, f** for S1-T-1.0, and **g, h** for S1-T-1.5).
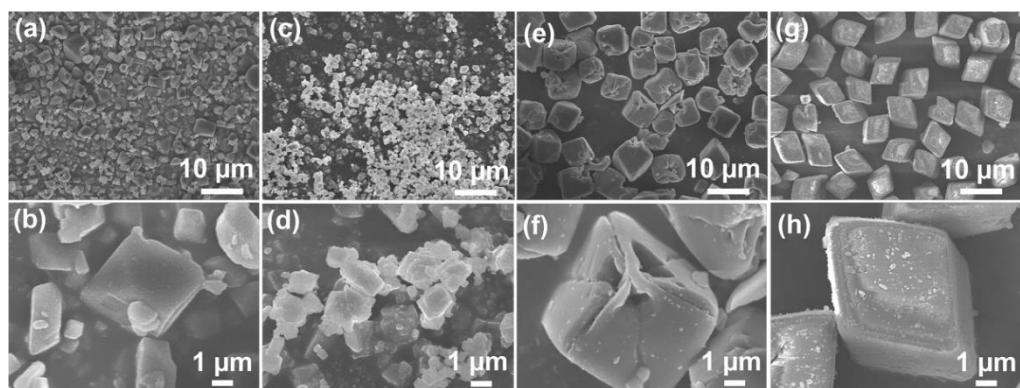

Figure S10. SEM images of samples at different molar amounts of TEA (**a, b** for S2-T-0, **c, d** for S2-T-0.5, **e, f** for S2-T-1.0, and **g, h** for S2-T-1.5).
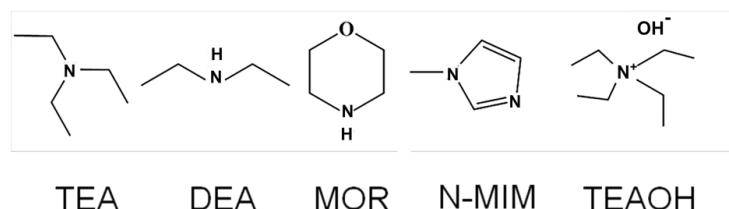

**Figure S11.** Structure of different templating agents.
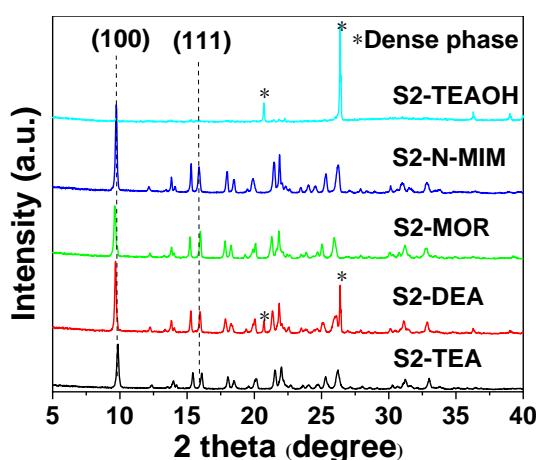
**Figure S12.** XRD patterns of samples under different types of template.
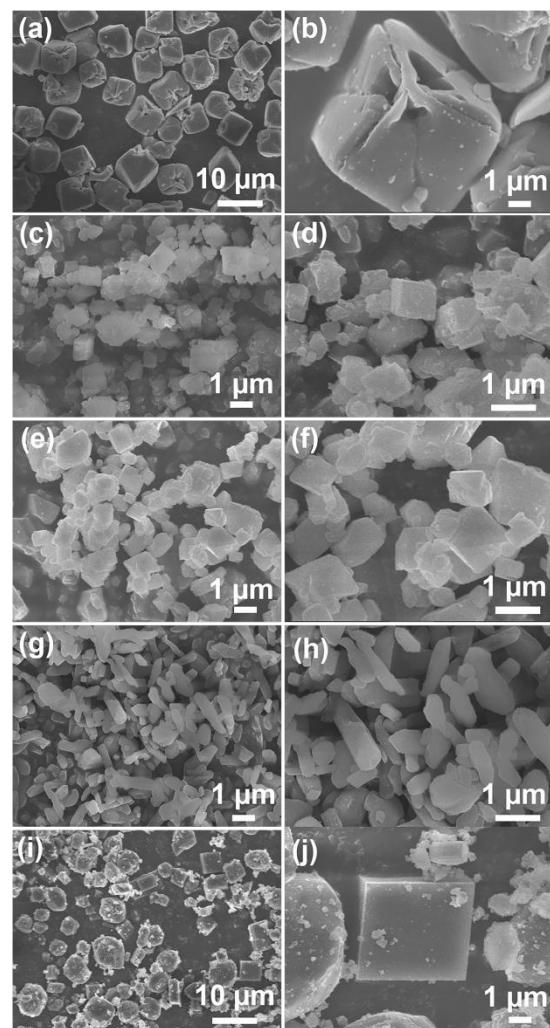
Figure S13. SEM images of samples under different types of template (**a, b** for S2-TEA, **c, d** for S2-DME, **e, f** for S2-MOR, **g, h** for S2-N-MIM, and **i, j** for S2-TEAOH).
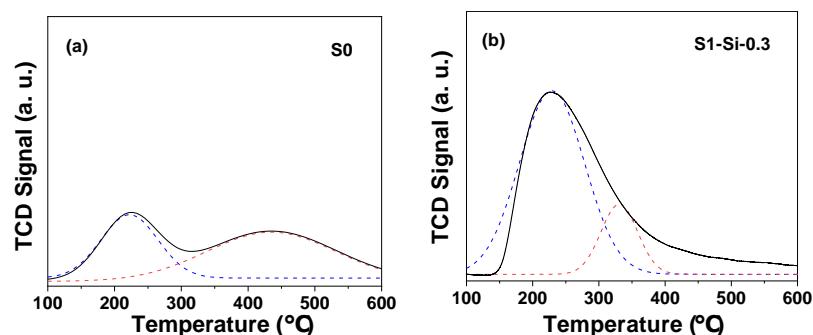

Figure S14. NH_3-TPD patterns of SAPO-34 molecular sieves.