Electronic Supplementary Material (ESI) for Chemical Science.

Electronic Supporting Information
for
Conformation of intrazeolitic choline ions and framework topology of zeolite hosts

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Table S1 Choline (Ch^+)-mediated synthesis conditions for zeolites studied in this work[a]

Zeolite	IZA code	Gel composition	Crystallization temperature/ time (°C/days)	Ref.
Y	FAU	$7.2ChOH{\cdot}1.2NaCl{\cdot}1.2Al_2O_3{\cdot}5.0SiO_2{\cdot}132H_2O$	115/ 7	This work
UZM-4	BPH	$4.0ChOH{\cdot}0.25LiCl{\cdot}0.25NaCl{\cdot}0.5Al_2O_3{\cdot}5.0SiO_2{\cdot}150H_2O$	100/14	S1
UZM-22	MEI	$4.0ChOH{\cdot}0.15LiCl{\cdot}0.15Sr(NO_3)_2{\cdot}0.5Al_2O_3{\cdot}5.0SiO_2{\cdot}150H_2O$	100/14	S1,S2
Offretite	OFF	$4.0ChOH{\cdot}0.15KCl{\cdot}0.15Sr(NO_3)_2{\cdot}0.5Al_2O_3{\cdot}5.0SiO_2{\cdot}150H_2O$	100/14	S2
Ferrierite	FER	$4.0ChOH{\cdot}1.0NaCl{\cdot}0.125Al_2O_3{\cdot}5.0SiO_2{\cdot}150H_2O$	150/14	S3
Phillipsite	PHI	$2.0ChCl{\cdot}0.7Rb_2O{\cdot}0.3Na_2O{\cdot}0.5Al_2O_3{\cdot}5.0SiO_2{\cdot}100H_2O$	150/ 7	S4
EU-12	ETL	$2.0ChCl{\cdot}0.7Rb_2O{\cdot}0.3Na_2O{\cdot}0.25Al_2O_3{\cdot}5.0SiO_2{\cdot}100H_2O$	150/ 7	S4
Levyne[b]	LEV	$2.5ChOH{\cdot}1.0NaCl{\cdot}0.17Al_2O_3{\cdot}5.0SiO_2{\cdot}25H_2O$	125/14	S5

[a] Synthesis was performed under rotation (60 rpm) using colloidal silica (Ludox AS-40) and aluminum hydroxide ($Al(OH)_3{\cdot}H_2O$) as Si and Al sources, respectively, unless otherwise stated. [b] Synthesized using H-Y with Si/Al = 15 (Zeolyst) as Si and Al sources under static conditions.

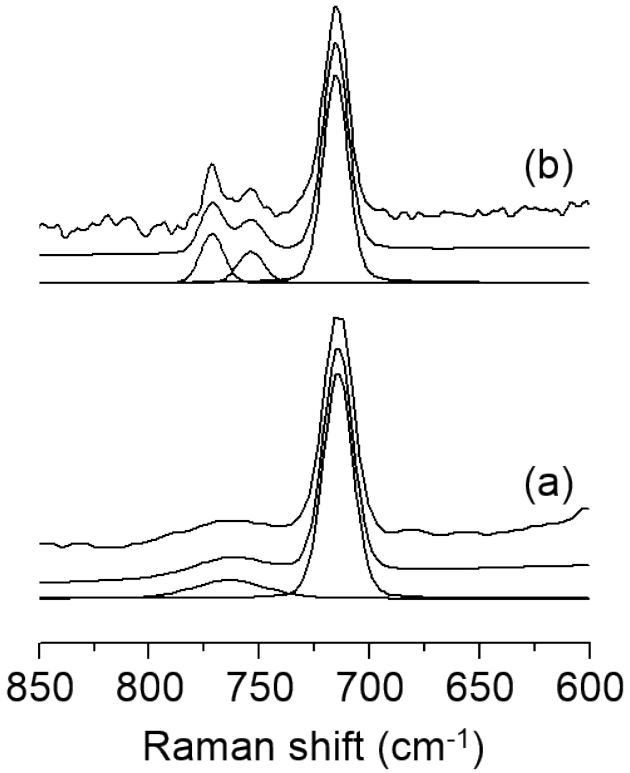

Fig. S1 Raman spectra in the 600-850 cm^{-1} region (from top to bottom: experimental, simulated and deconvoluted components) of (a) 0.5 M aqueous solution of ChCl and (b) as-made Y.

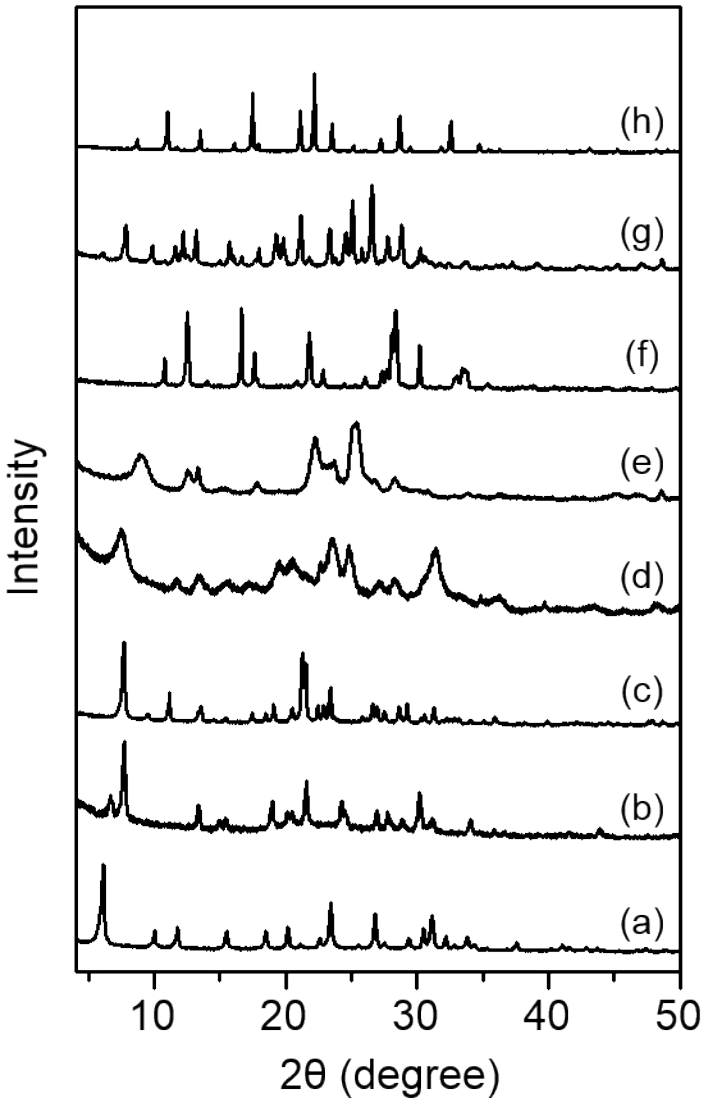

Fig. S2 Powder XRD patterns of the as-made form of eight zeolites with different framework topologies synthesized using Ch^+ as an organic structure-directing agent (OSDA): (a) Y, (b) UZM-4, (c) UZM-22, (d) offretite, (e) ferrierite, (f) phillipsite, (g) EU-12 and (h) levyne.

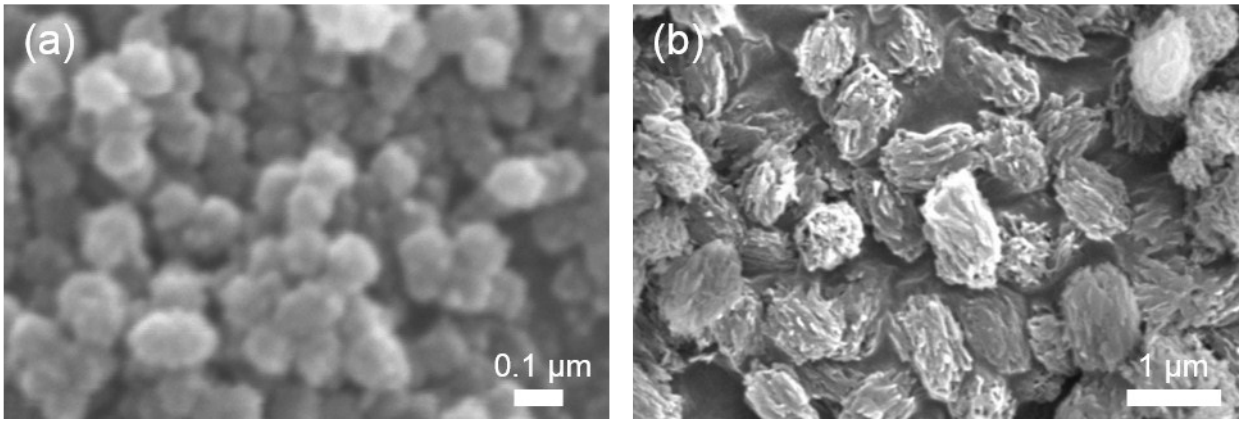

Fig. S3 SEM images of the as-made form of (a) offretite and (b) ferrierite synthesized using Ch^+.

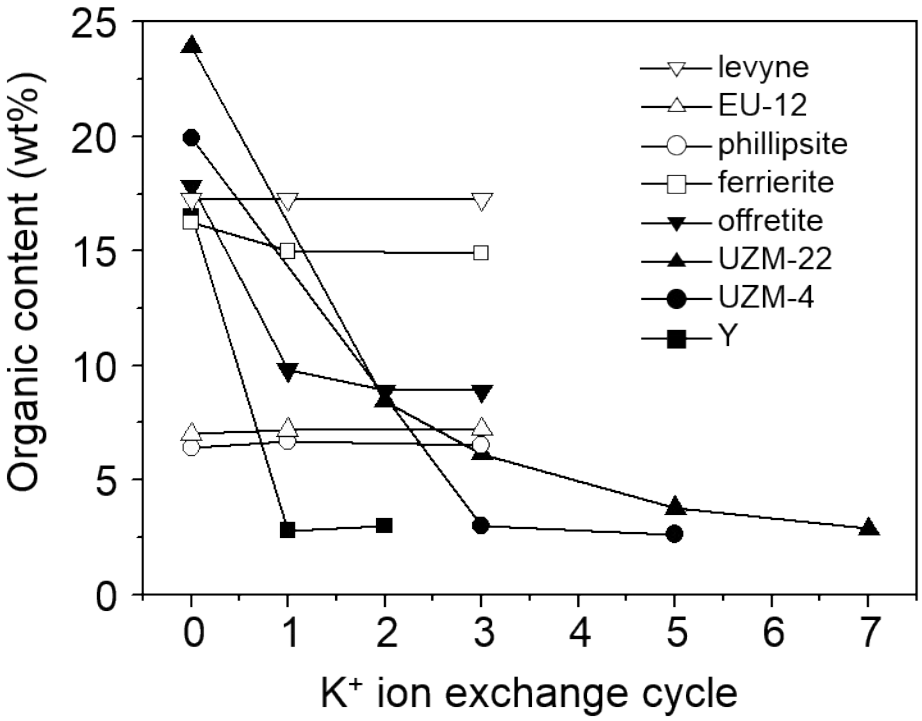

Fig. S4 Changes in the organic content (the exothermic weight losses determined by TGA/DTA at 200 - 800 °C for Y and 250 - 800 °C for the others) of as-made zeolites synthesized using Ch^+ as an OSDA followed by repeated ion exchange in 2.0 M KNO_3 solutions at 80 °C for 8 h.

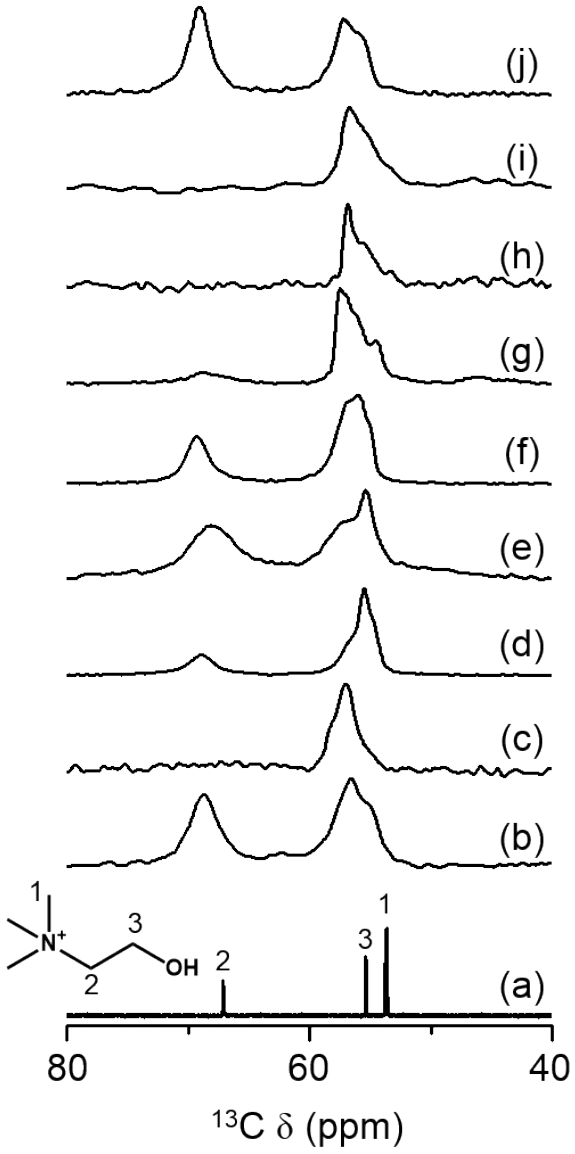

Fig. S5 (a) ^{13}C NMR spectrum in D_2O solution of ChCl, showing the assignment of each resonance, and ^{1}H-^{13}C CP MAS NMR spectra of as-made (b) Y, (c) K-Y, (d) UZM-4, (e) UZM-22, (f) offretite, (g) ferrierite, (h) phillipsite, (i) EU-12 and (j) levyne prepared using Ch^+ as an OSDA.

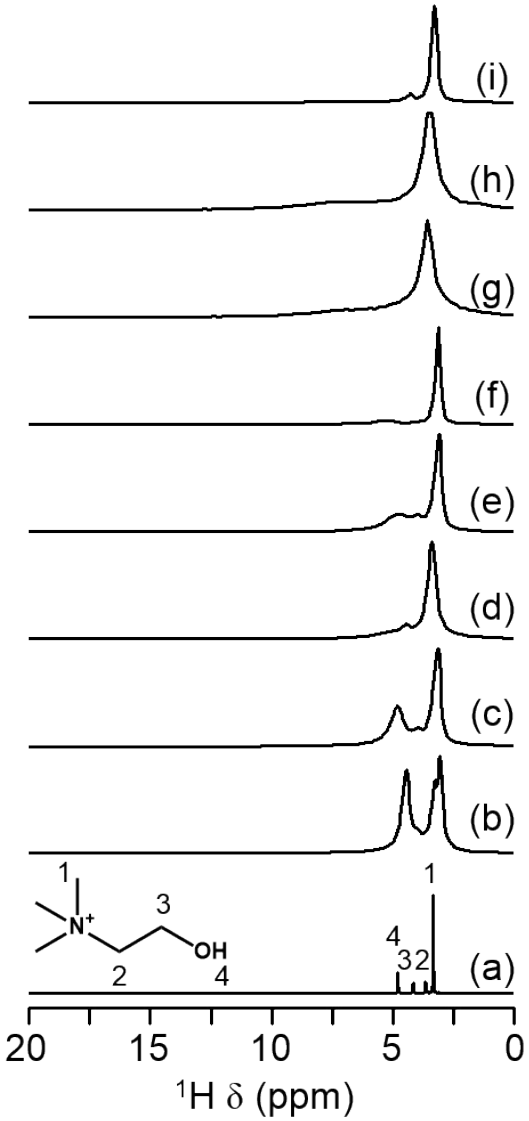

Fig. S6 (a) ^{1}H NMR spectrum in D_2O solution of ChCl, showing the assignment of each resonance, and ^{1}H MAS NMR spectra of as-made (b) Y, (c) UZM-4, (d) UZM-22, (e) offretite, (f) ferrierite, (g) phillipsite, (h) EU-12 and (i) levyne prepared using Ch^{+} as an OSDA.

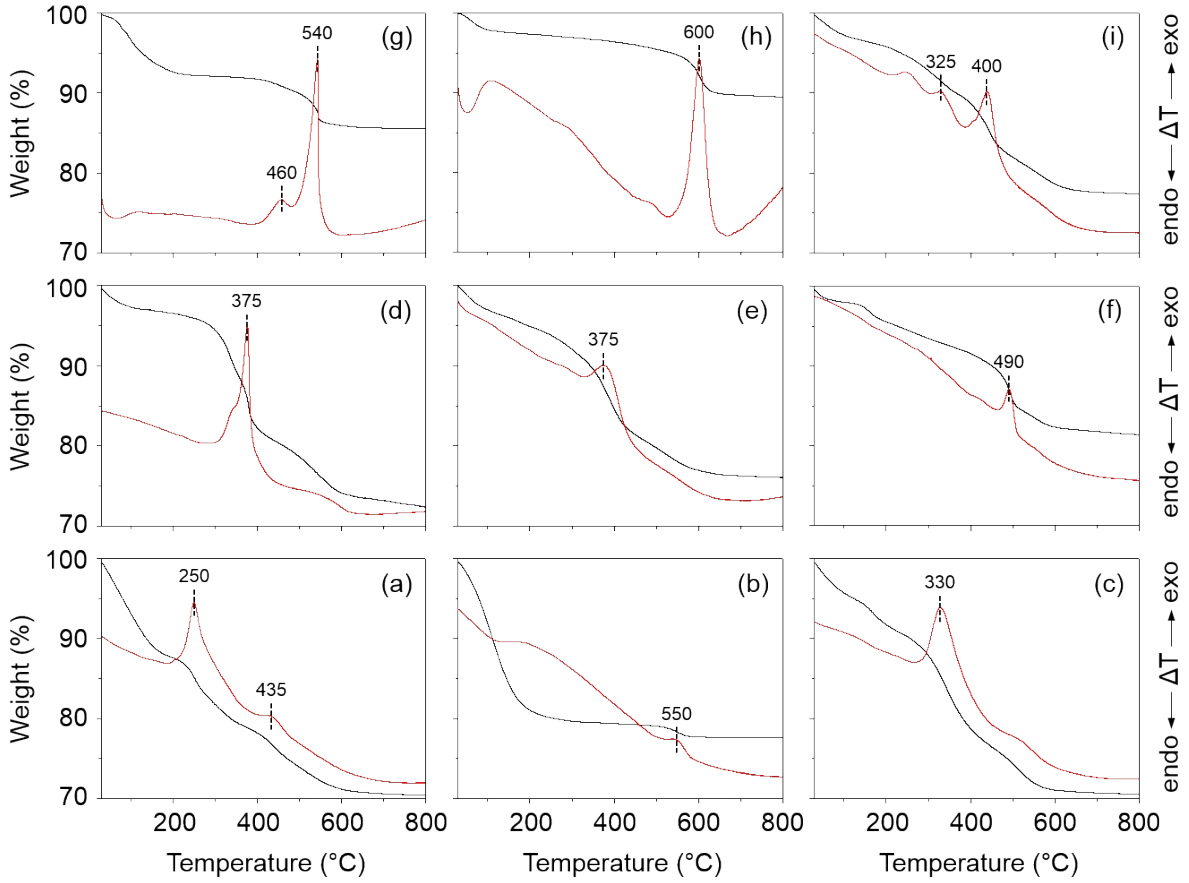

Fig. S7 TGA/DTA (black/red) profiles of as-made (a) Y, (b) K-Y, (c) UZM-4, (d) UZM-22, (e) offretite, (f) ferrierite, (g) phillipsite, (h) EU-12 and (i) levyne.

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