Catalysis Science & Technology

ARTICLE

Supporting Information

Creation of mesostructured hollow Y zeolite by selective demetallation of artificial heterogeneous Al distributed zeolite crystal

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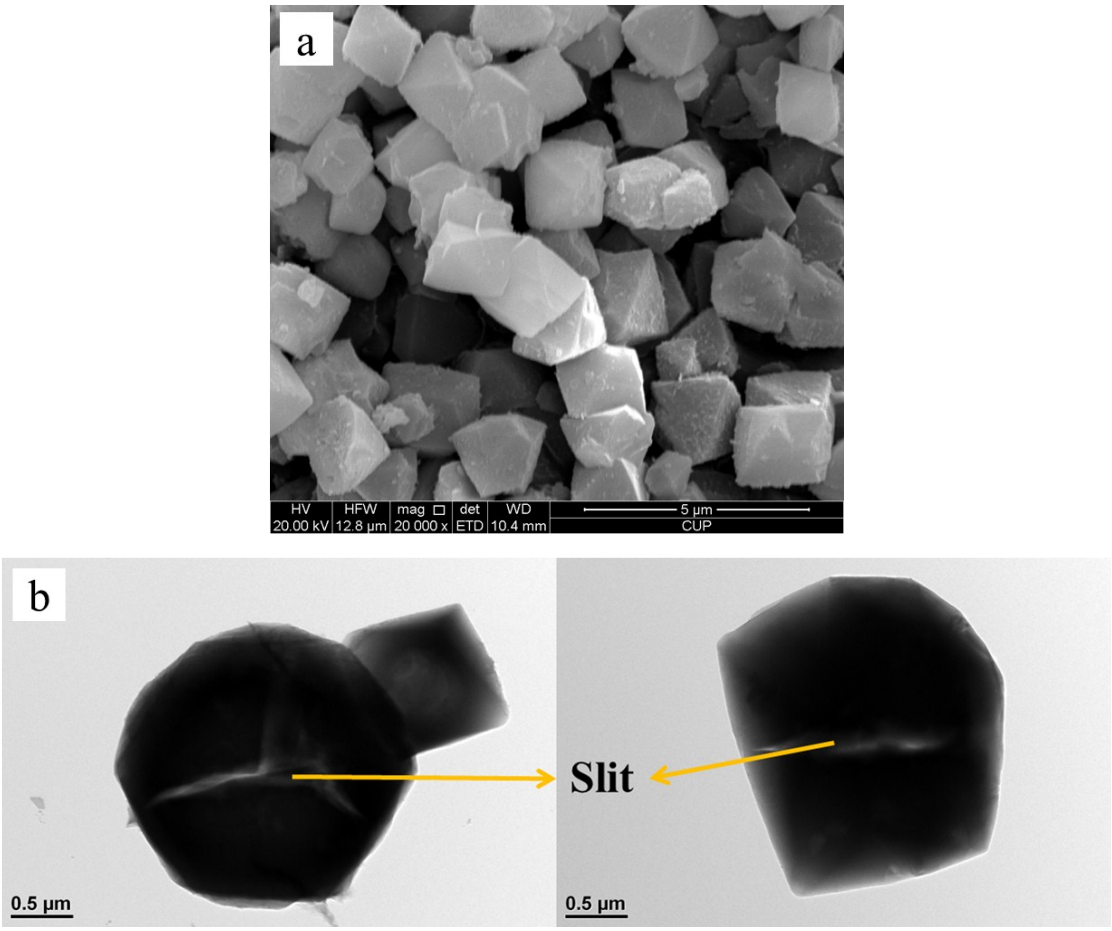

Figure S1. SEM image (**a**) and TEM images (**b**) of the ST-AT zeolite.

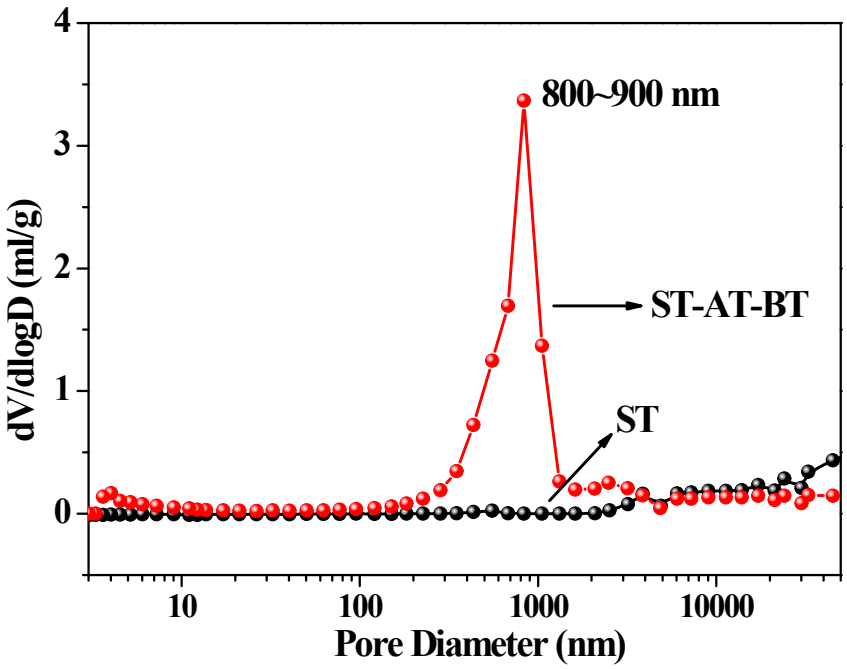

Figure S2. The pore size distribution derived from mercury intrusion.

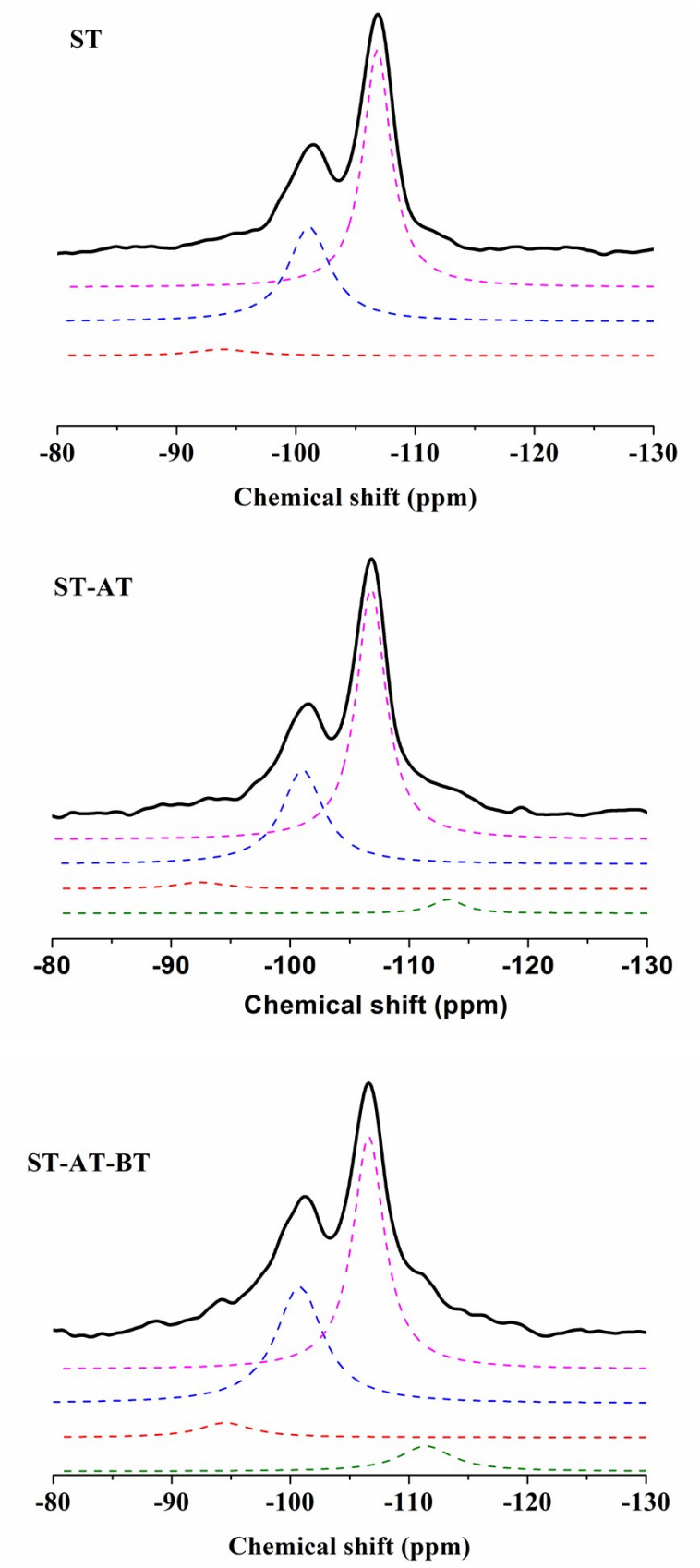

Figure S3. ^{29}Si MAS NMR spectra of Y zeolites at different stages of the sequential treatments. Solid lines: experimentally observed spectra; Dashed lines: resolved components.

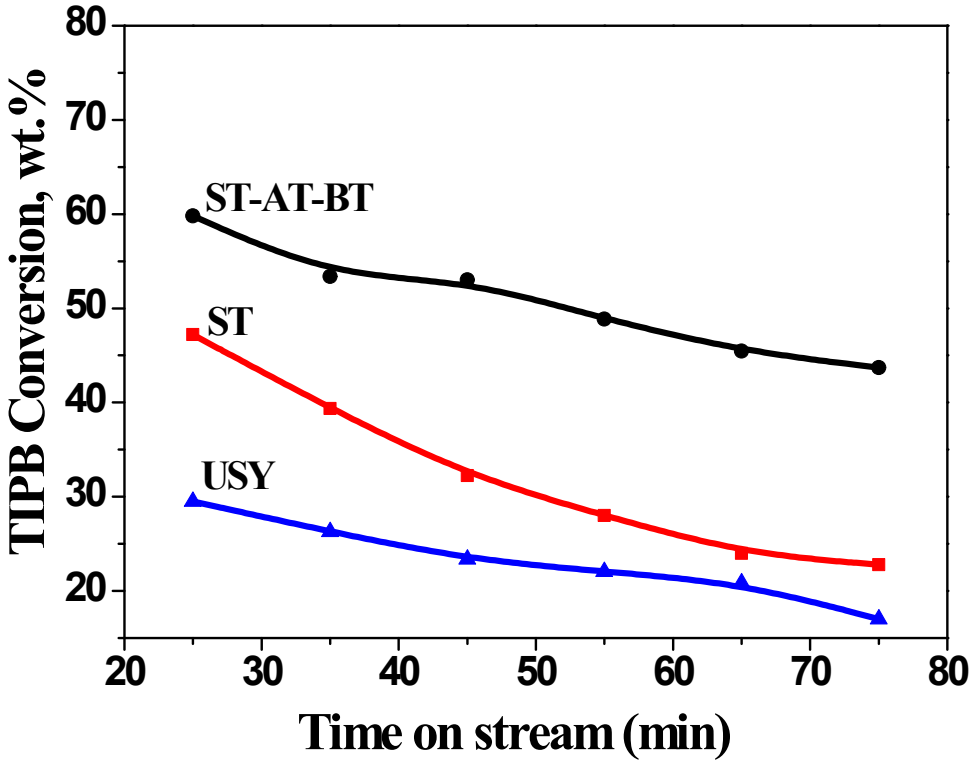

Figure S4. 1,3,5-Triisopropylbenzene conversion versus time on stream for the ST-AT-BT, ST and USY zeolites.

Table S1. Notation of samples obtained by $SiCl_4$ treatment.

Treatment code	Temperature/K	Time/h	Si/Al [a]	Si/Al [b]
ST	703	1	6.4	3.4
ST2	703	1.5	9.8	4.2
ST3	703	3	15.9	8.1

[a] Determined by XRD; [b] Determined by XRF.

Table S2. Notation of acid and base treatment conditions.

Treatment code	Temperature/K	Time/h	Concentration/mol/L	Reagent
AT	363	1	0.5	HCl
AT1	363	1	0.2	HCl
AT2	363	1	1.0	HCl
OT	363	1	0.2	Oxalic acid
ET	363	1	0.1	H_4EDTA
BT	338	1	0.2	NaOH
BT1	338	1	0.1	NaOH
BT2	338	1	0.4	NaOH
BT3	338	1	0.05	NaOH

Table S3. Texture properties of Y zeolites with different treatment.

Samples	S_{BET} [a)] m^2g^{-1}	$S_{external}$ [b)] m^2g^{-1}	V_{pore} [c)] cm^3g^{-1}	V_{micro} [b)] cm^3g^{-1}	V_{meso} [d)] cm^3g^{-1}
ST	595.0	52.9	0.33	0.25	0.04
ST-AT	640.4	61.5	0.34	0.27	0.04
ST-AT1	508.4	54.2	0.28	0.21	0.05
ST-BT	563.1	34.9	0.29	0.24	0.04
ST-BT2	692.9	47.7	0.40	0.30	0.08
ST2	547.8	44.6	0.31	0.25	0.04
ST2-AT	563.0	56.5	0.29	0.22	0.06
ST2-AT1	563.0	57.9	0.30	0.23	0.06
ST2-AT2	498.5	61.5	0.27	0.20	0.05
ST2-BT	520.6	70.8	0.30	0.21	0.07
ST2-BT2	411.4	69.0	0.29	0.16	0.11
ST2-AT-BT	685.0	235.2	0.52	0.22	0.27
ST3	533.0	34.9	0.31	0.25	0.05
ST3-BT1	257.0	204.0	0.22	0.02	0.17
ST3-BT3	514.4	68.2	0.29	0.21	0.06
ST3-AT-BT	585.3	224.3	0.40	0.17	0.21

[a)] BET method; [b)] *t*-plot method; [c)] Volume adsorbed at p/p_0=0.99. [d)] Calculated from BJH, V_{meso}= Volume in pores between 2-50 nm.

Table S4. Chemical composition of the filtrates upon different treatments of Y sample from ICP-OES analyse.

Sample	$(Si/Al)_{filtrate}$ (mol/mol)	$[Si]_{filtrate}$ (ppm)	$[Al]_{filtrate}$ (ppm)
ST	-	-	-
ST-AT	0.1	139.5	2531.4
ST-AT-BT	166.9	5792.9	34.7

Table S5. Properties of the Dalian vacuum gasoil.

Item	Dalian vacuum gasoil
Density (20 ^{o}C), g/cm^3	0.93
Kinematic viscosity at 100 ^{o}C, mm^2/s	13.84
Residual coke, wt%	4.19
Saturates, wt%	64.68
Aromatics, wt%	28.44
C, wt%	86.76
H, wt%	11.63