

Supporting Information

High-Quality Single-Crystalline MFI-Type Nanozeolites: A Facile Synthetic Strategy and MTP Catalytic Studies

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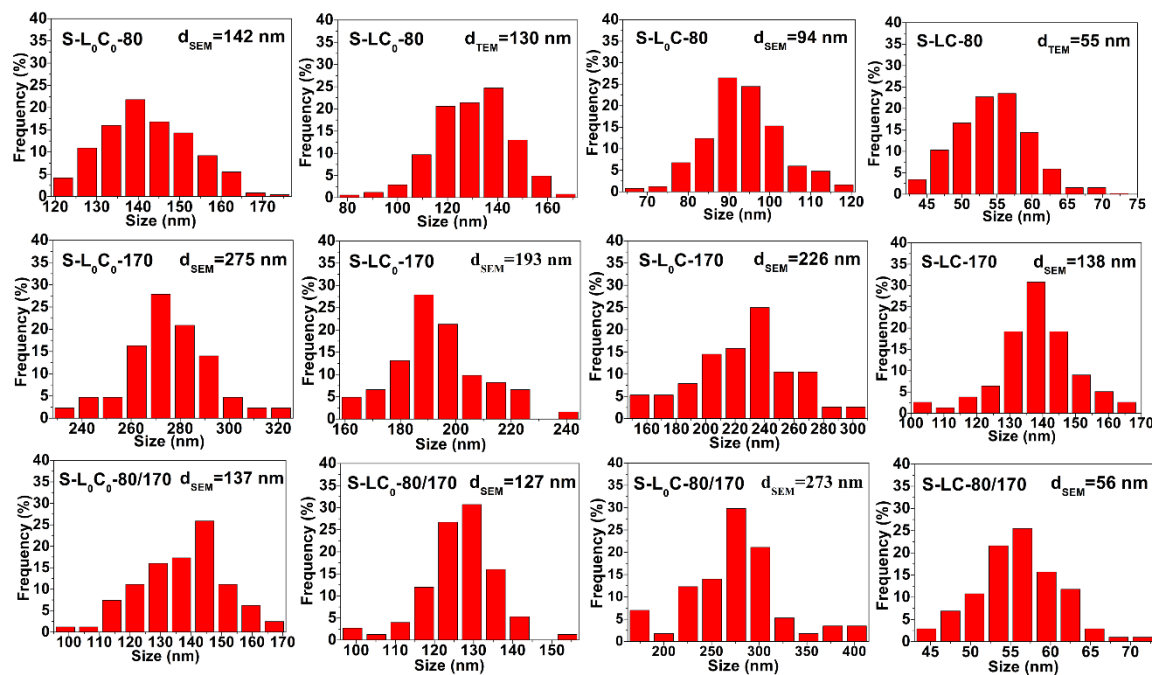


Figure S1. Size distributions of silicalite-1 samples synthesized under varied conditions.

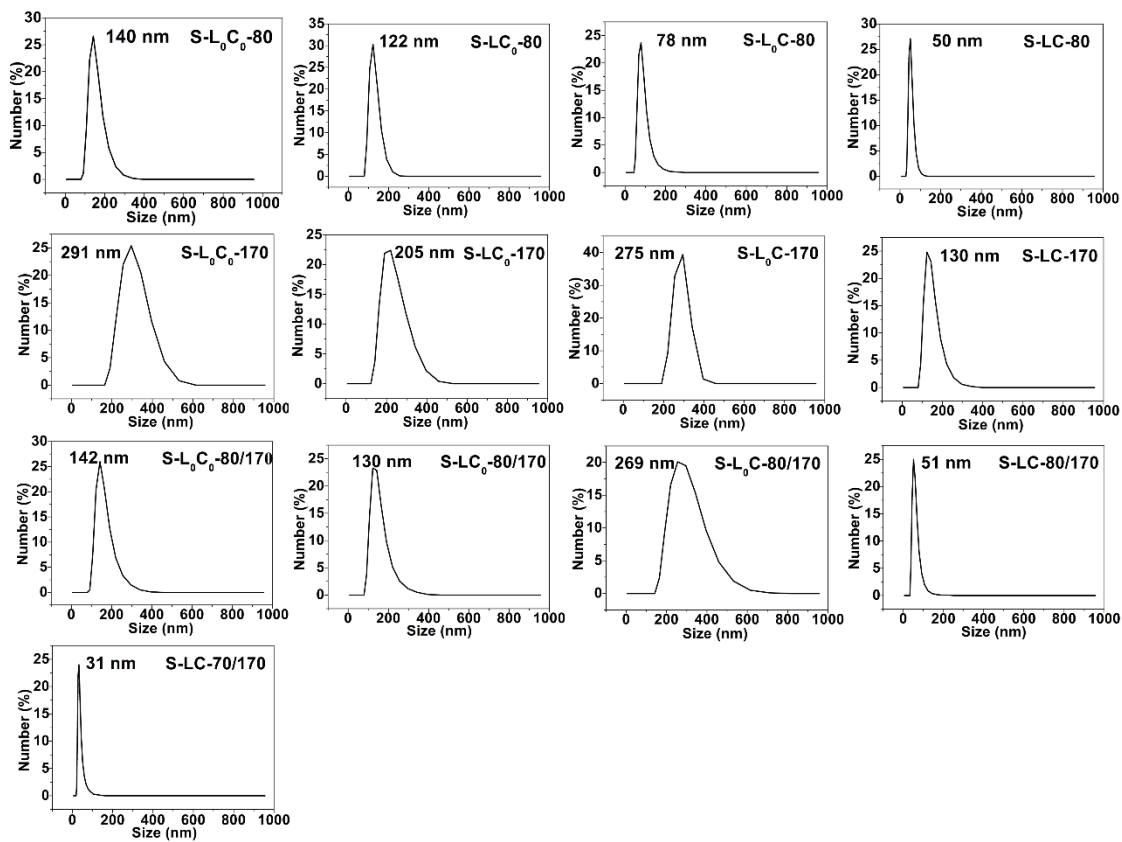


Figure S2. DLS curves of silicalite-1 samples synthesized under varied conditions.

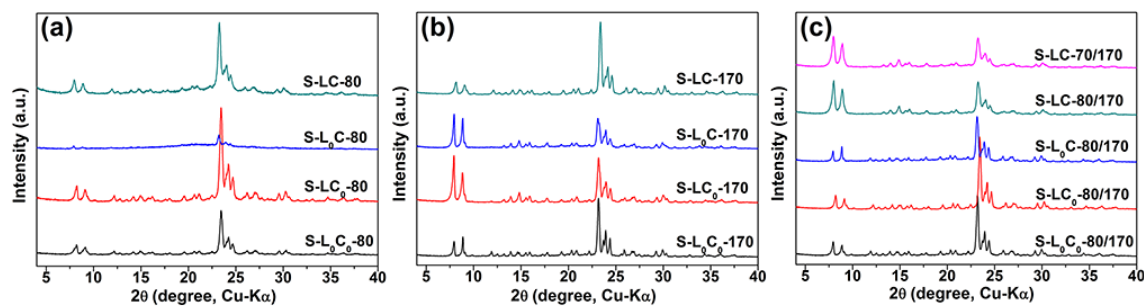


Figure S3. XRD patterns of silicalite-1 samples synthesized under varied conditions.

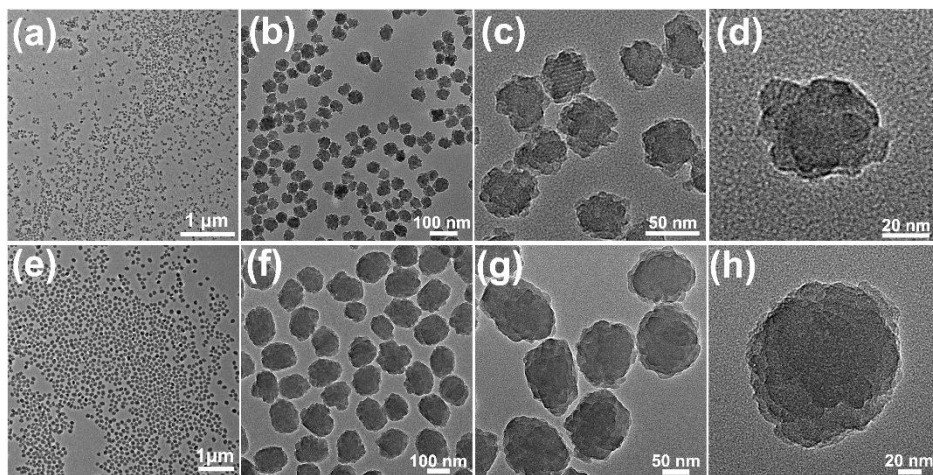


Figure S4. TEM and HRTEM images of (a-d) S-LC-8o, (e-h) S-L₆C₆-8o.

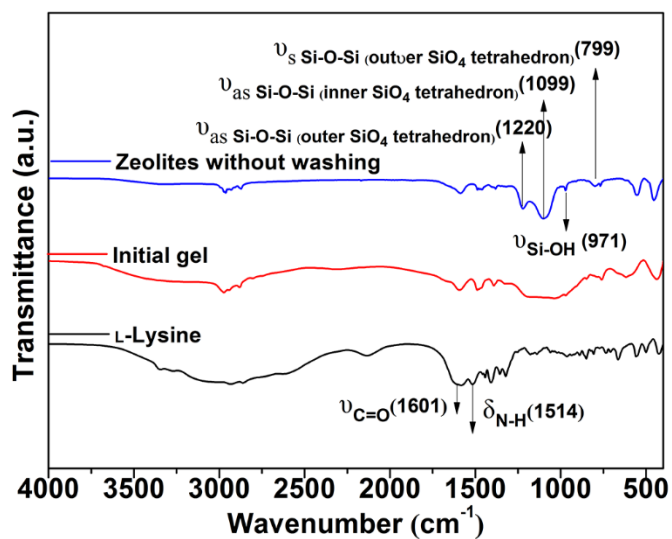


Figure S5. FTIR spectra of L-lysine, dried initial synthesis gel, and dried silicalite-1 samples without washing.

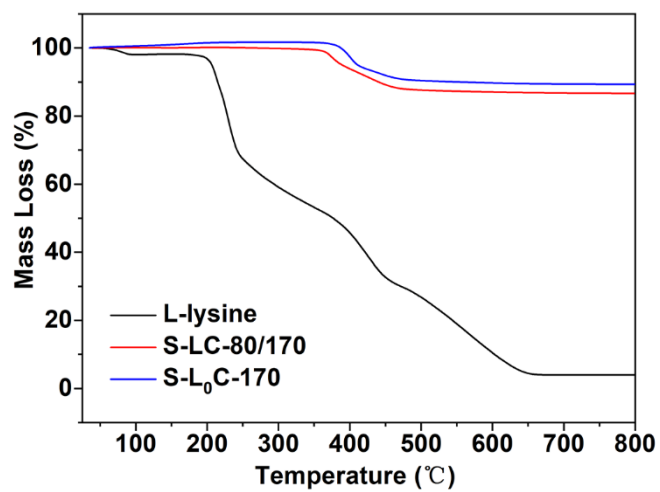


Figure S6. TG curves of silicalite-1 samples and L-lysine.

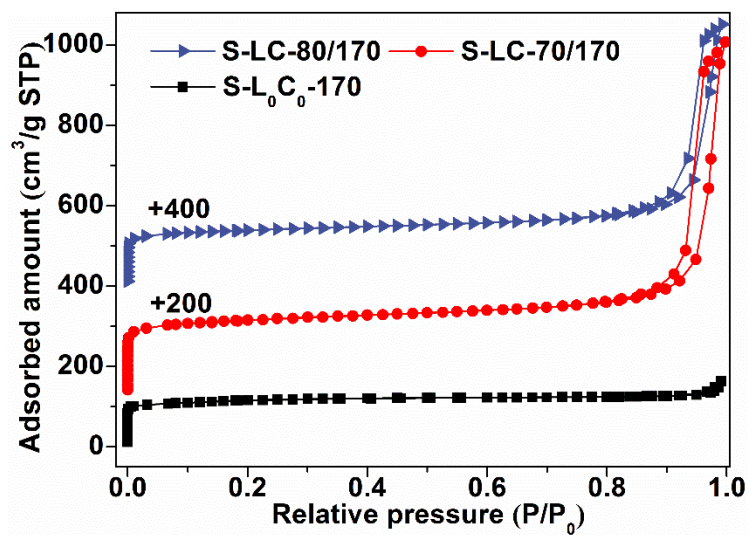


Figure S7. N₂ adsorption/desorption of selected silicalite-1 samples.

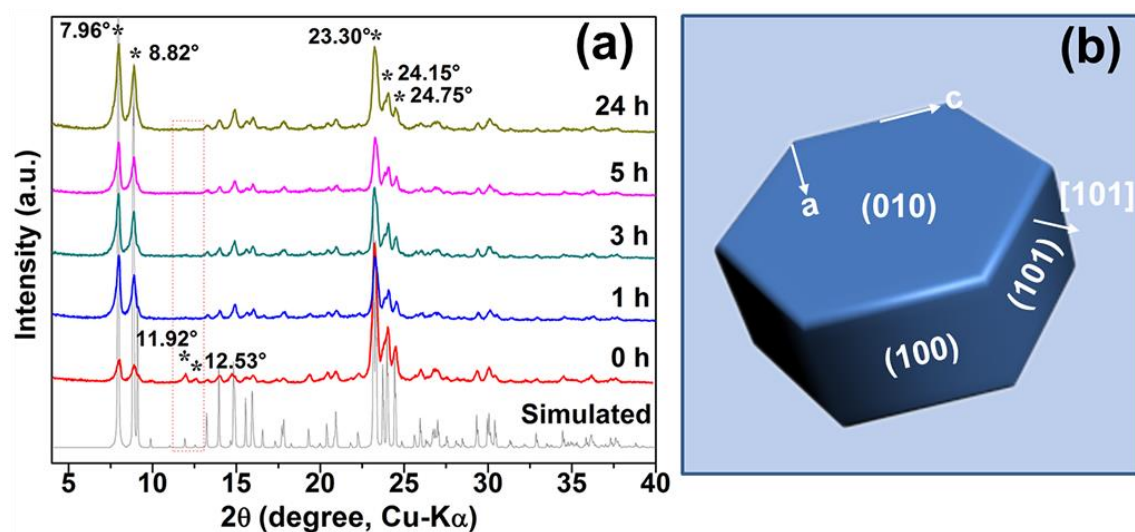


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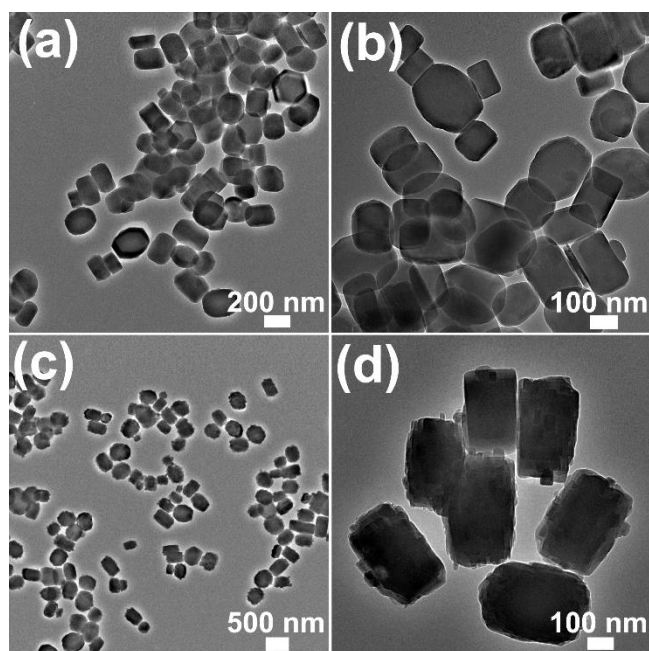


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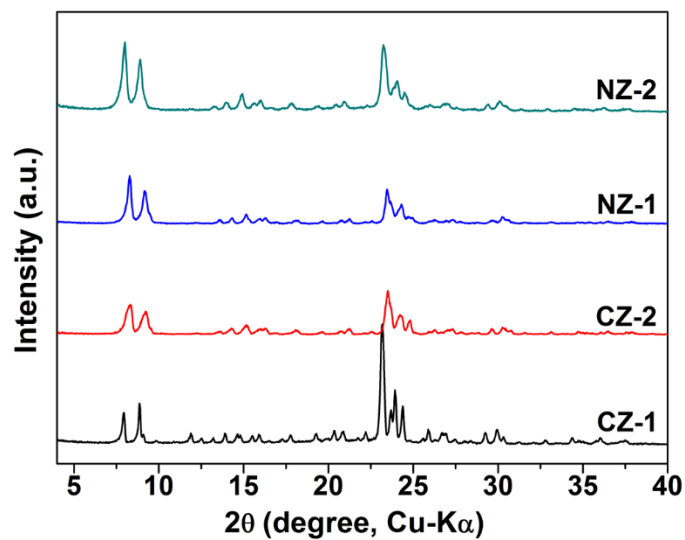


Figure S10. XRD patterns of nanosized ZSM-5 catalysts NZ-1 and NZ-2, and conventional ZSM-5 catalysts CZ-1 and CZ-2.

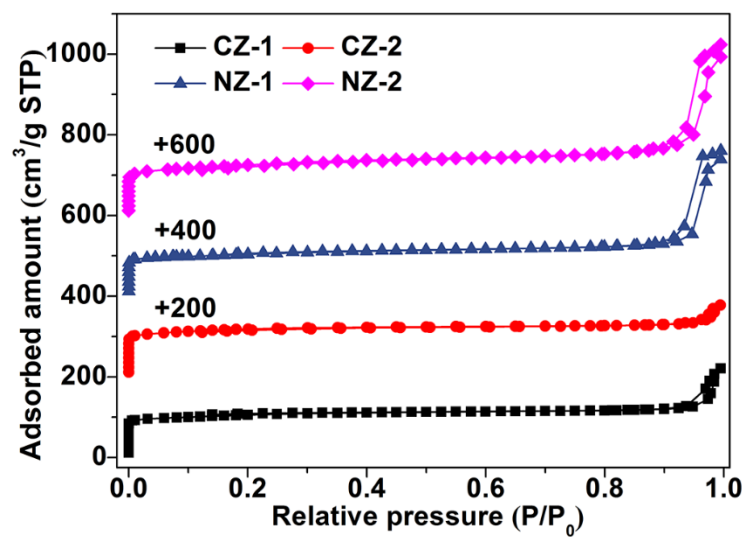


Figure S11. N_2 adsorption/desorption of selected ZSM-5 samples.

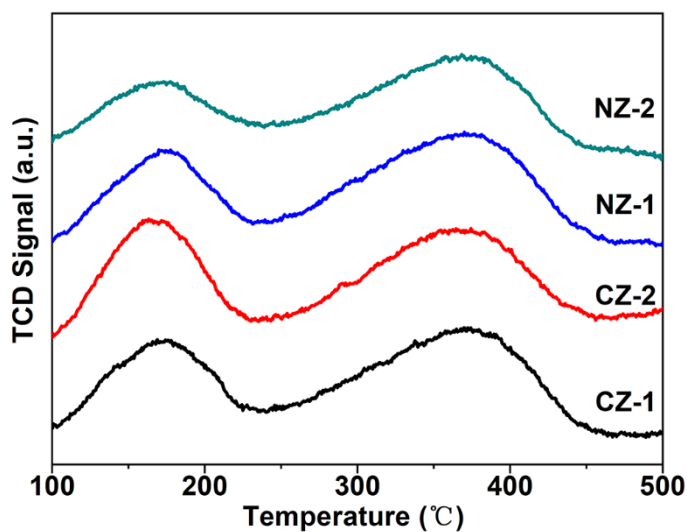


Figure S12. NH_3 -TPD profiles of nanosized ZSM-5 catalysts NZ-1, NZ-2 and conventional ZSM-5 catalysts CZ-1, CZ-2.

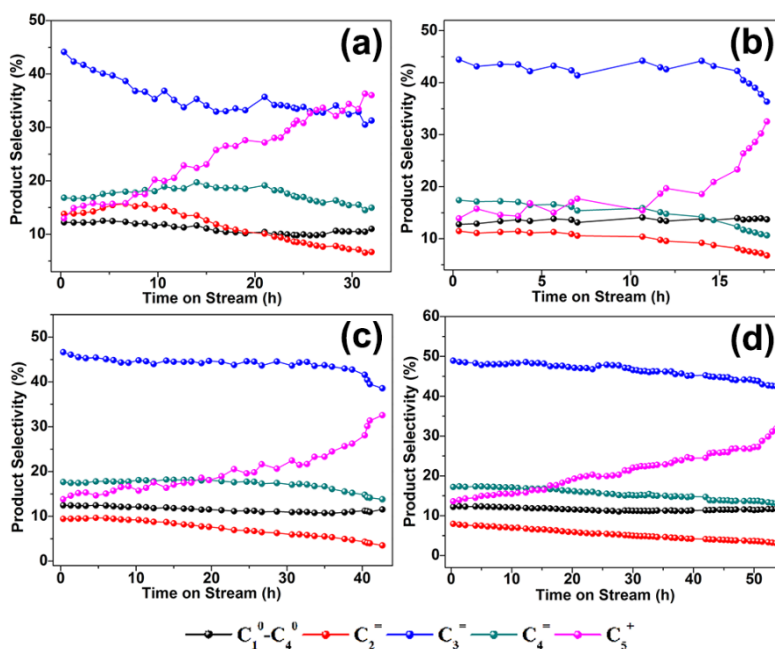


Figure S13. Product selectivity of methanol as a function of time on stream over (a) CZ-1, (b) CZ-2, (c) NZ-1, and (d) NZ-2. Reaction conditions: $T = 470^\circ\text{C}$, $P_{\text{total}} = 1 \text{ atm}$. $\text{WHSV} = 7.2 \text{ h}^{-1}$, catalyst weight = 150 mg.

Table S1. Molar compositions of the initial mixtures, reaction conditions, and particle sizes of nanosized and conventional ZSM-5 catalysts.

Sample	SiO ₂	TPAOH	L-lysine	Al ₂ O ₃	Na ₂ O	H ₂ O/Si	Temperature (time)	Si/Al ^a	Particle size ^b (nm)
NZ-1	1	0.45	0.1	0.003	0.015	9	80(2d)/170(1d)	157	58
NZ-2	1	0.45	0.1	0.0025	0.015	9	80(2d)/170(1d)	193	57
CZ-1	1	0.45	0	0.003	0.015	35	170(4d)	154	238
CZ-2	1	0.45	0	0.003	0.015	100	170(4d)	158	442

^aMeasured by using an Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES).

^bParticle size : estimated based on TEM results by counting more than 100 particles.

Table S2. C, H, N analysis of selected samples.

Sample	C[wt%]	H[wt%]	N[wt%]	C/H(mol/mol)	C/N(mol/mol)
S-LC-80/170	8.20	1.78	0.76	0.38	12.58
S-LoC-170	8.39	1.84	0.78	0.38	12.55
TPAOH	/	/	/	0.41	12.00
L-lysine	/	/	/	0.42	3.00

Table S3. Crystal sizes estimated by Scherrer equation to selected (hkl) planes of S-LC-8o crystallized at 170°C for different time.

Crystallization time (h)	Crystal size from Scherrer equation ^a (nm)	
	(101)	(200)
0	55.8	52.0
1	54.2	52.0
3	56.8	54.0
5	56.2	54.0
24	56.6	53.4

^aThe Scherrer equation is of the form: $D = K\lambda / (B \cos \theta)$; where D is the crystal sizes to selected (hkl) planes, K is the Scherrer constant, λ is the wavelength of X-rays, B is the full width at half maximum of the peak, θ is the diffraction angle.