Supporting information

Seed-induced and additive-free synthesis of oriented nanorod-assembled meso/macroporous zeolites: toward efficient and cost-effective catalysts for the MTA reaction

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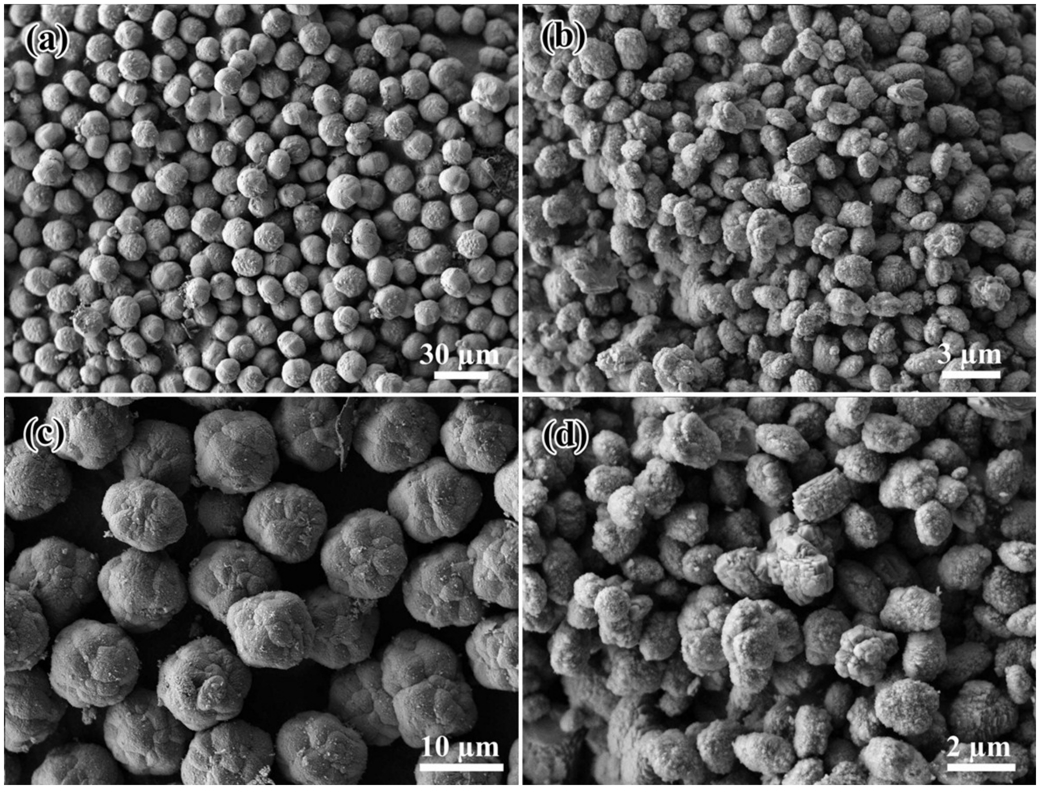

Figure S1. SEM images of (a, c) C-ZSM-5 and (b, d) C-ZSM-11 under different magnification. For comparisons, conventional ZSM-5 and ZSM-11 (denoted as C-ZSM-5 and C-ZSM-11, respectively) were also synthesized by using TPABr or TBABr as the templates under seed-free crystallization conditions. The molar composition of the synthesis mixture for C-ZSM-5 and C-ZSM-11 were 3.5 NaOH : 60 SiO_2 : 4 $NaAlO_2$: 2500 H_2O : 8 TPABr and 3.5 NaOH : 60 SiO_2 : 4 $NaAlO_2$: 2500 H_2O : 8 TBABr, respectively.

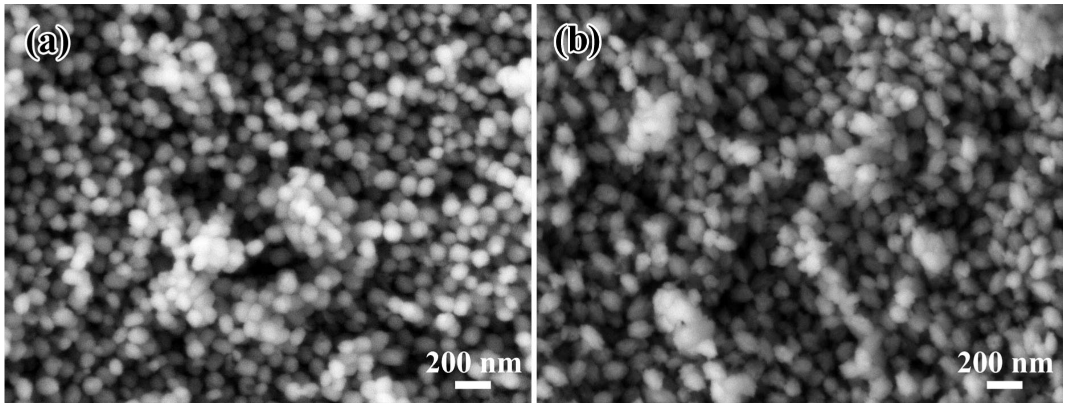

Figure S2. SEM images of silicalite-1 (a) and silicalite-2 seeds (b). It was obvious that the as-prepared silicalite-1 and silicalite-2 seeds had similar particle size of about 150 nm but with slightly different crystal morphologies of near-sphere shape and olive shape, respectively.

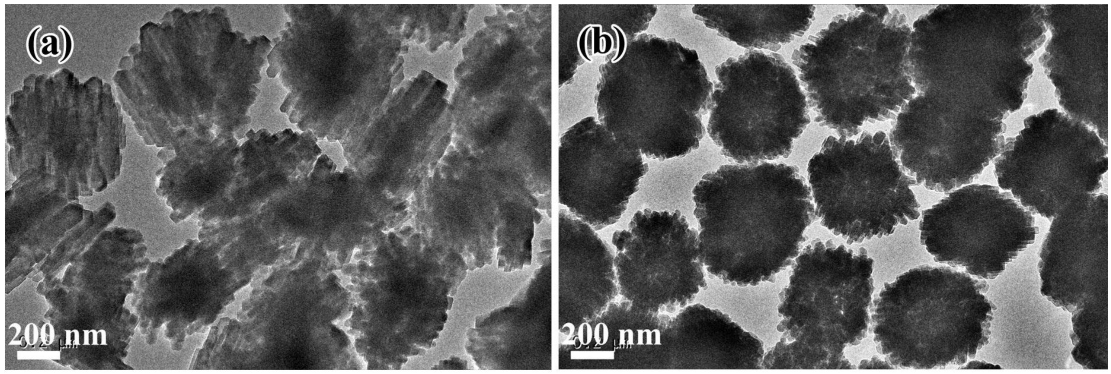

Figure S3. Low-resolution TEM images of (a) N-ZSM-5 and (b) N-ZSM-11, which showed the existence of zeolite nanorods that assembled into hedgehog-shaped sub-micron particles, in which substantial mesopores were formed due to the stacking of these nanorods, resulting in quite different structure properties from C-ZSM-5 and C-ZSM-11.

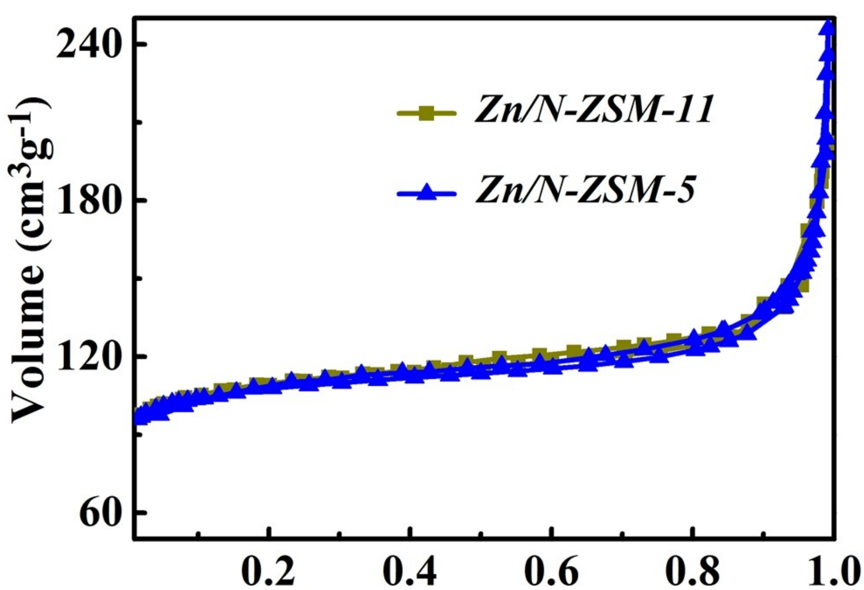

Figure S4. Nitrogen adsorption/desorption isotherms of Zn/N-ZSM-5 and Zn/N-ZSM-11.

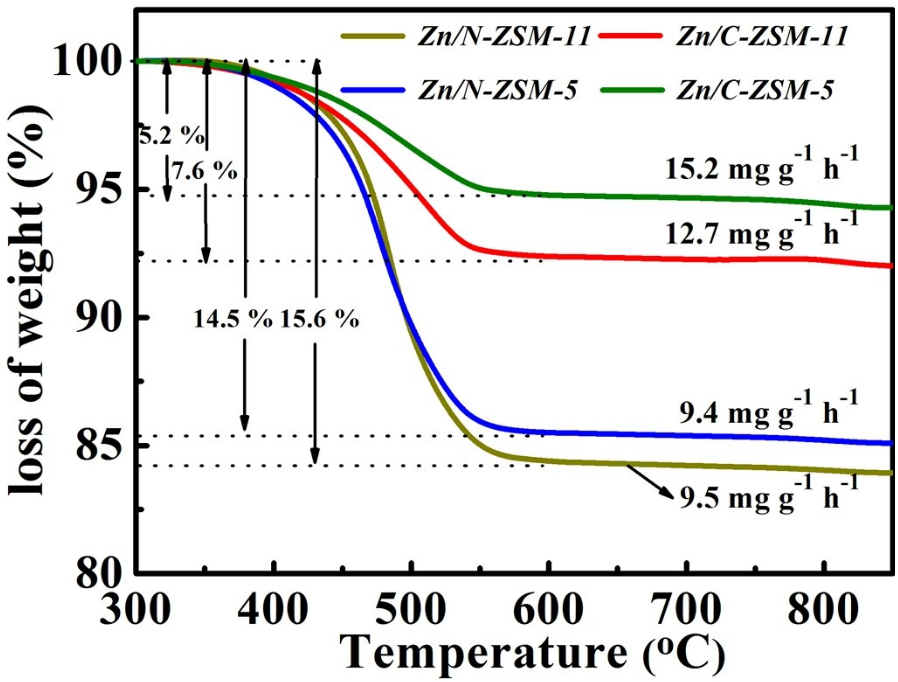

Figure S5. TG curves of Zn/N-ZSM-5, Zn/N-ZSM-11, Zn/C-ZSM-5, and Zn/C-ZSM-11 after MTA reaction tested at 748 K (W_{cat} = 0.7 g; GHSV = 0.75 h^{-1}). Clearly, both of Zn/N-ZSM-5 and Zn/N-ZSM-11 have much slower coke formation rate (about 4.41 mg g_{cat}^{-1} h^{-1}) than Zn/C-ZSM-5 and Zn/C-ZSM-11 (26.33 mg g_{cat}^{-1} h^{-1}).

Table S1. Textural properties and compositions of various samples.

Sample name	S_{BET} ($m^2 g^{-1}$)	$S_{Micro}{}^{a}$ ($m^2 g^{-1}$)	S_{Meso} ($m^2 g^{-1}$)	$V_{Micro}{}^{a}$ ($cm^3 g^{-1}$)	$V_{Meso}{}^{b}$ ($cm^3 g^{-1}$)
Zn/N-ZSM-5	415	371	44	0.15	0.23
Zn/N-ZSM-11	417	369	48	0.15	0.18

[a] *t-plot method.*

[b] $V_{meso}=V_{tot}-V_{micro.}$