Electronic Supplementary Information (ESI)

An Efficient, Rapid, and Non-Centrifuged Synthesis of Nanosized Zeolites by Accelerating Nucleation Rate

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Supporting Figures

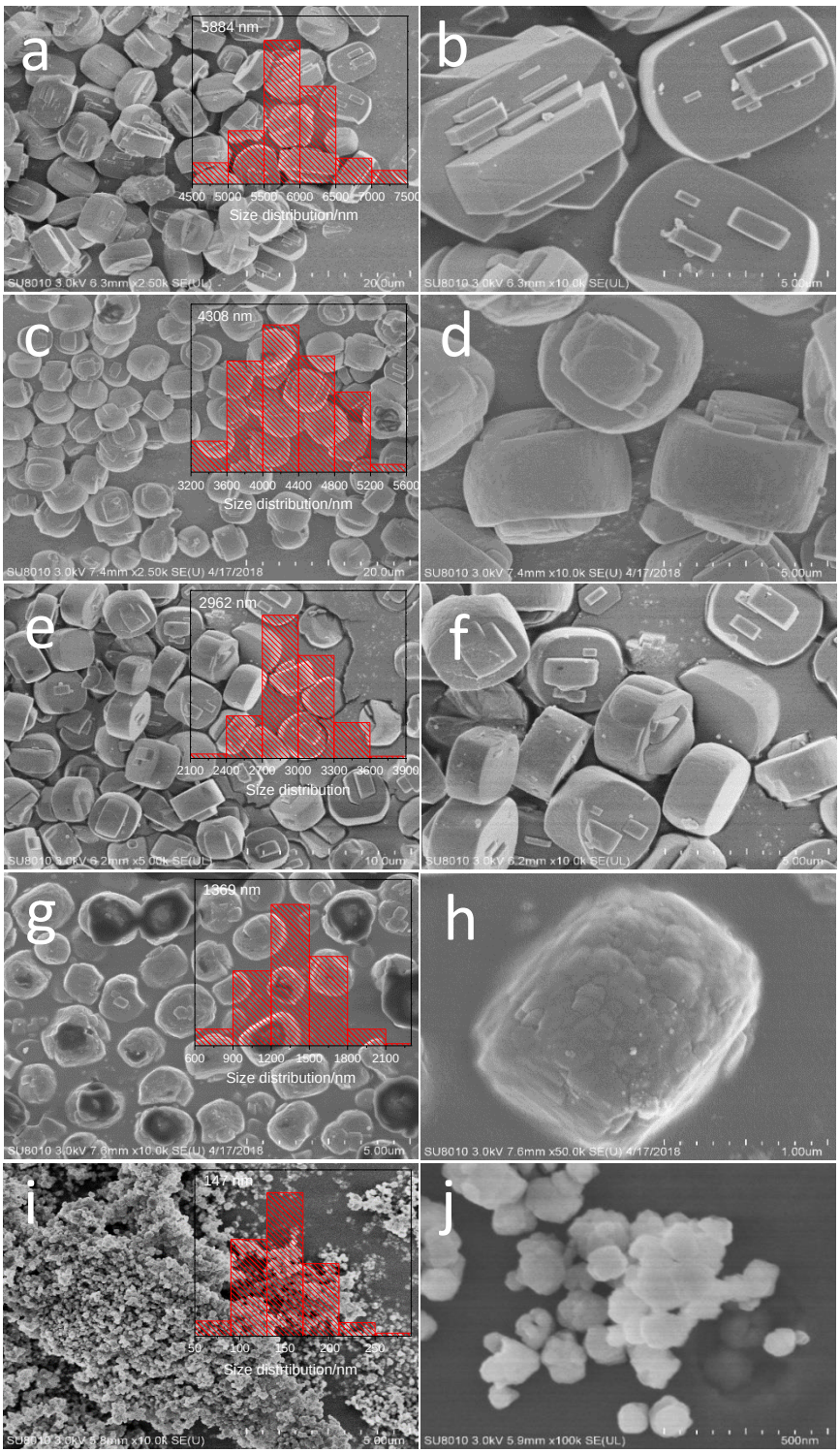


Fig. S1 SEM images of the ZSM-5 synthesized with H_2O/SiO_2 ratio at (a,b) 18, (c,d) 12, (e,f) 10, (g,h) 6, (I,j) 2 crystallized at 180 °C (Size distribution of ZSM-5 zeolite obtained by counting number of more than 200 zeolite particles in the SEM images).

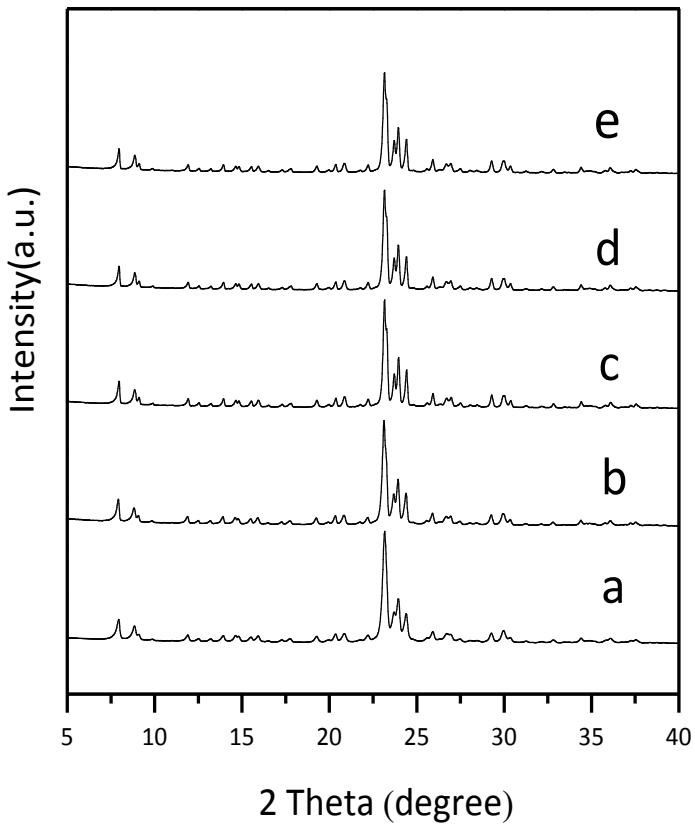


Fig. S2 XRD patterns of the ZSM-5 synthesized with H_2O/SiO_2 ratio at (a) 2, (b) 6, (c) 10, (d) 12 and (e) 18 crystallized at 180 °C.

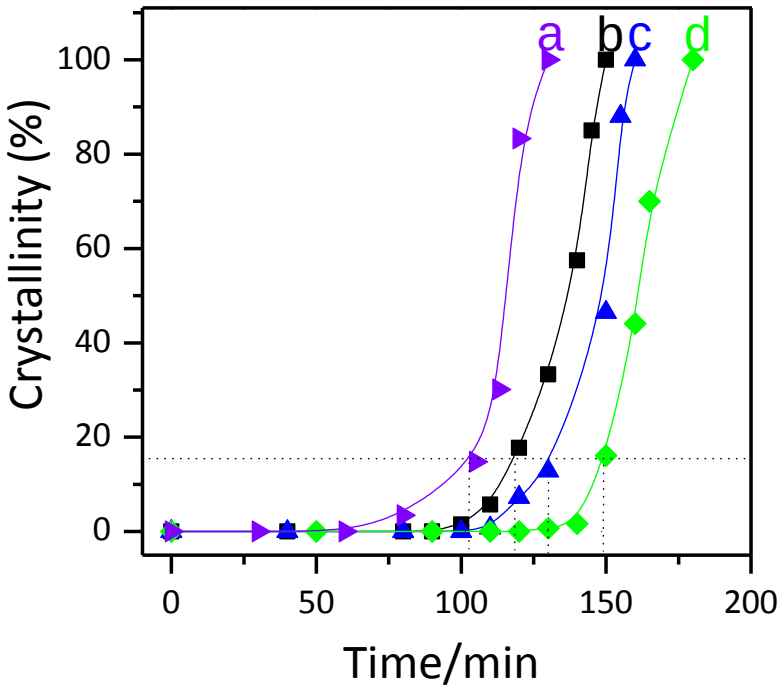


Fig. S3 Dependences of the ZSM-5 crystallinity on the crystallization time synthesized with H_2O/SiO_2 ratio at (a) 2, (b) 6, (c) 10, and (d) 18 crystallized at 180 °C.

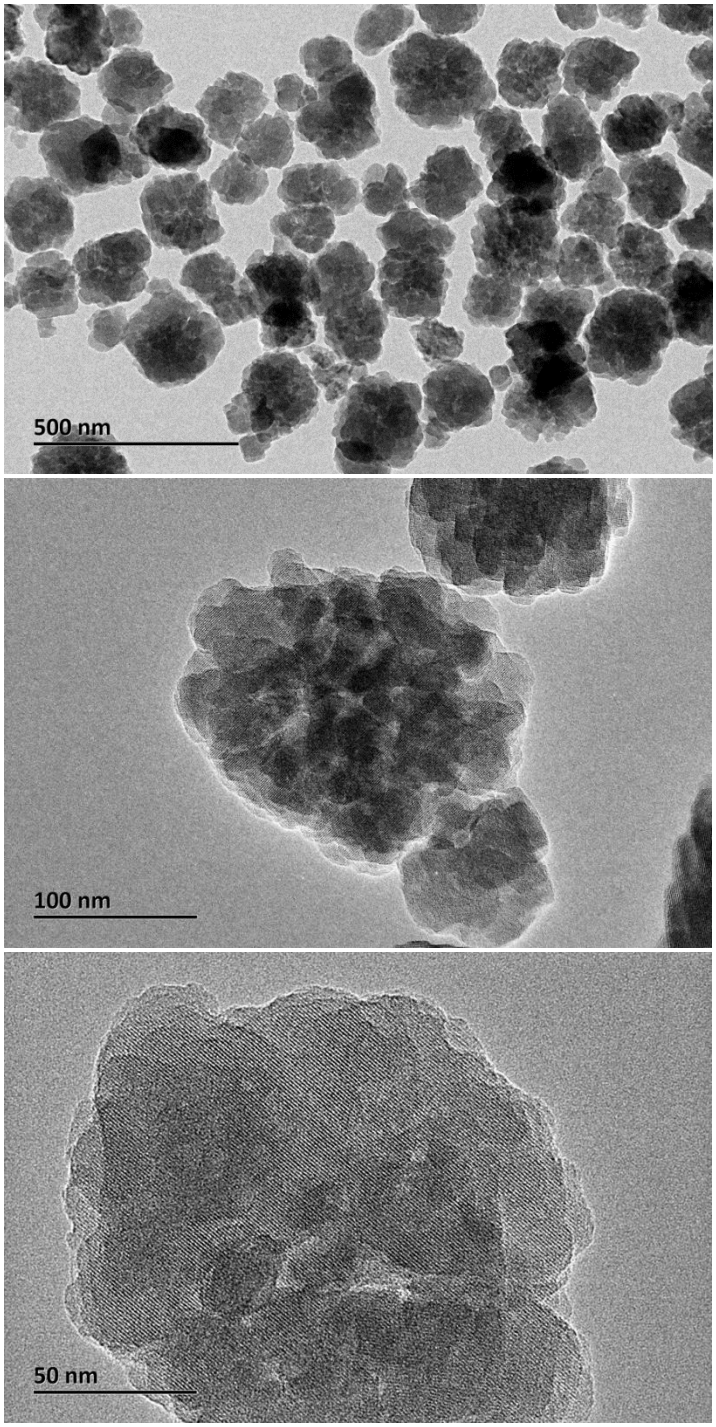


Fig. S4 TEM images of the ZSM-5-*2* crystallized at 180 °C for 3 h.

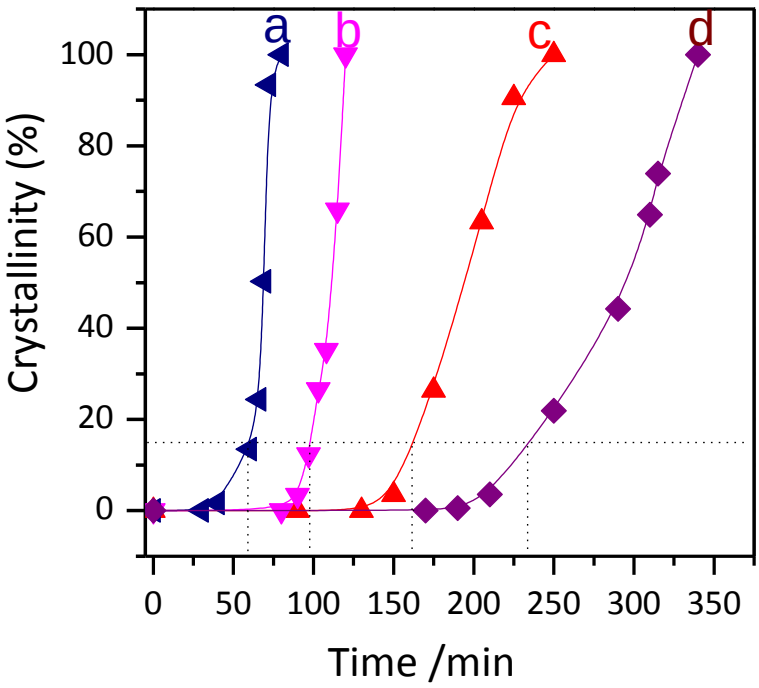


Fig. S5 Dependences of the ZSM-5-*2* crystallinity on the crystallization time synthesized at (a) 200 °C, (b) 180 °C, (c) 140 °C, and (d) 120 °C.

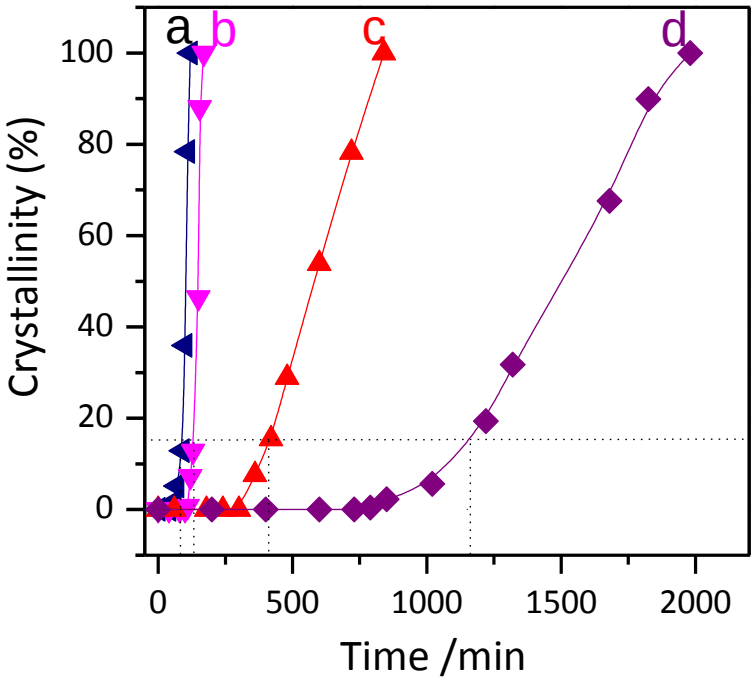
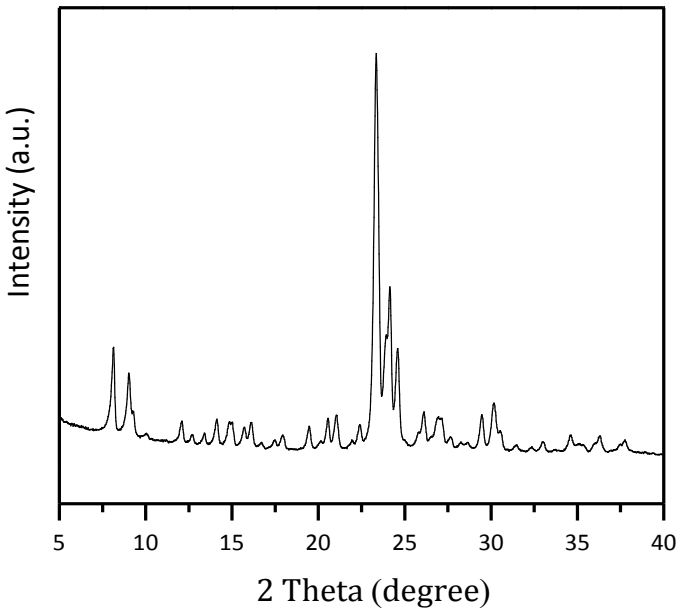
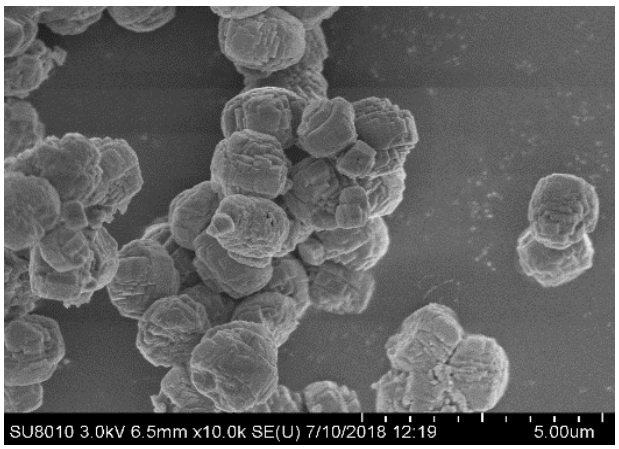


Fig. S6 Dependences of the ZSM-5-*10* crystallinity on the crystallization time synthesized at (a) 200 °C, (b) 180 °C, (c) 140 °C, and (d) 120 °C.





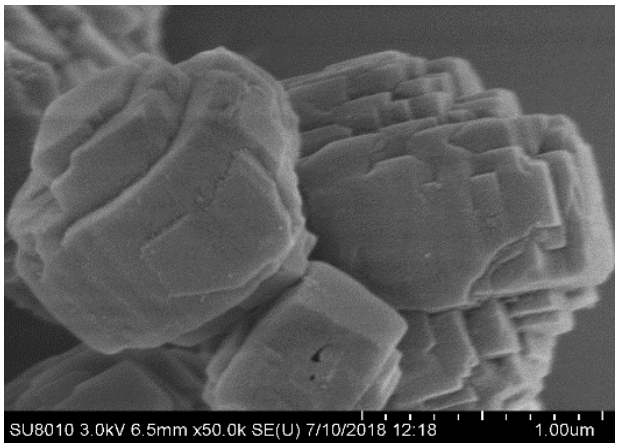


Fig. S7 XRD pattern and SEM images of the ZSM-5-*6* synthesized with additional NaOH (NaOH/SiO_2 at 0.15).

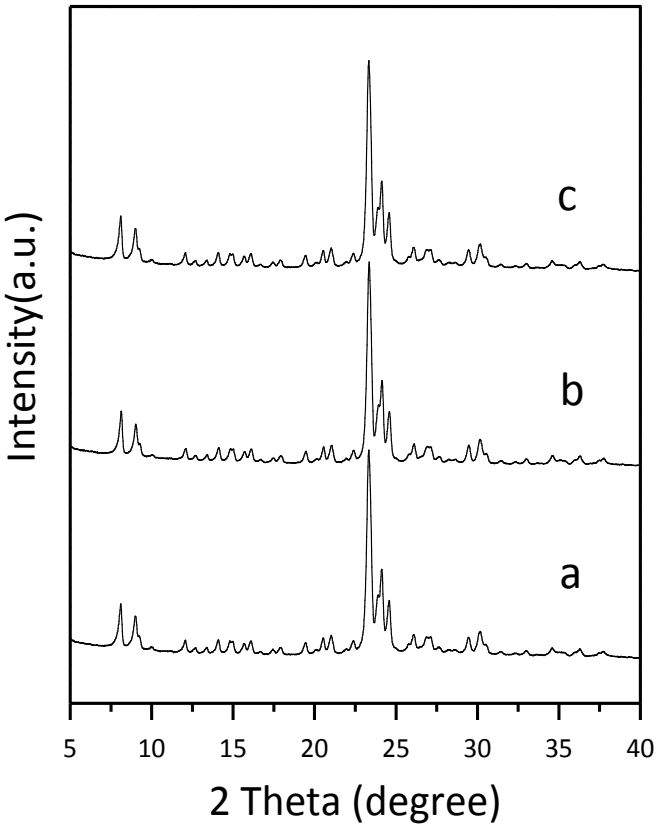


Fig. S8 XRD patterns of the ZSM-5-*2* zeolites synthesized in starting aluminosilicate gels with Si/Al ratio at (a) 100, (b) 200, and (c) ∞.

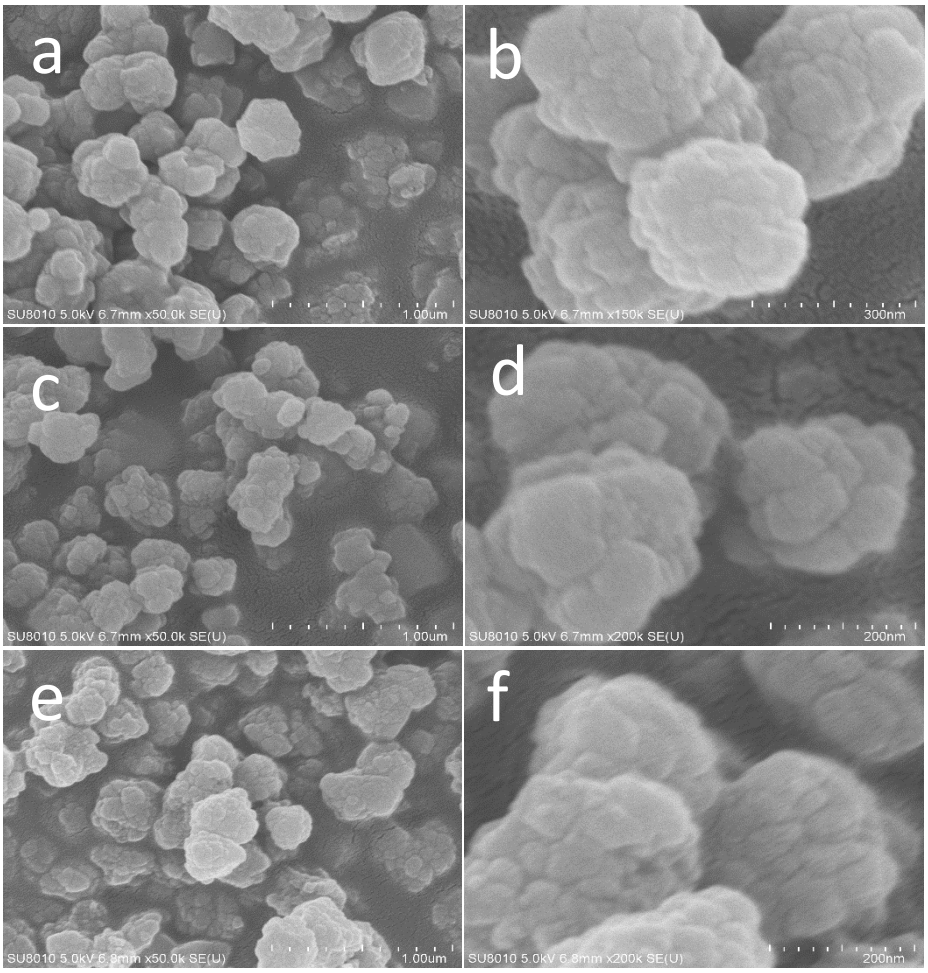


Fig. S9 SEM images of the ZSM-5-*2* zeolites synthesized in starting aluminosilicate gels with Si/Al ratio at (a) 100, (b) 200, and (c) ∞.

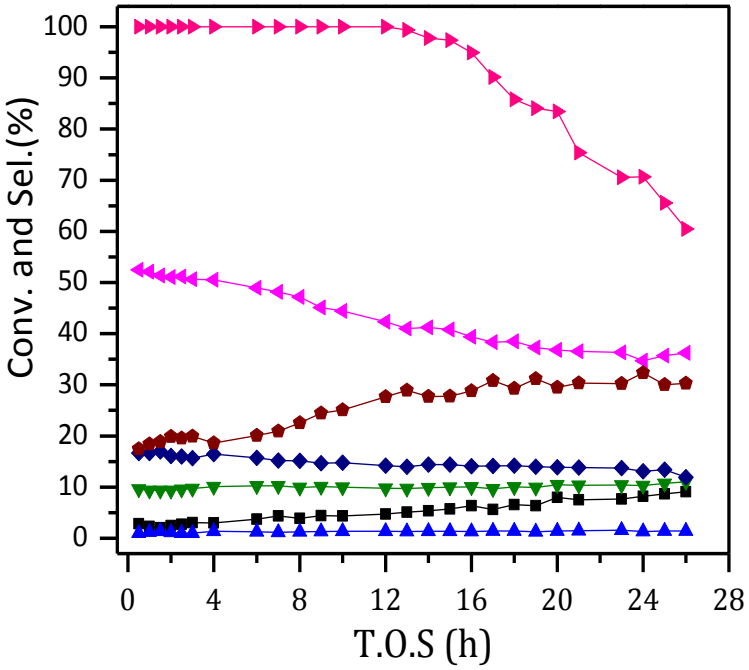


Fig. S10 Dependences of catalytic conversion and product selectivity on reaction time in MTO over the conventional bulky ZSM-5 catalyst (C-ZSM-5, ▶Conv, ▼$C_2^=$, ◀$C_3^=$, ◆$C_4^=$, ■C_1, ▲$C_{2\text{-}4}$, ⬟≥C_5).

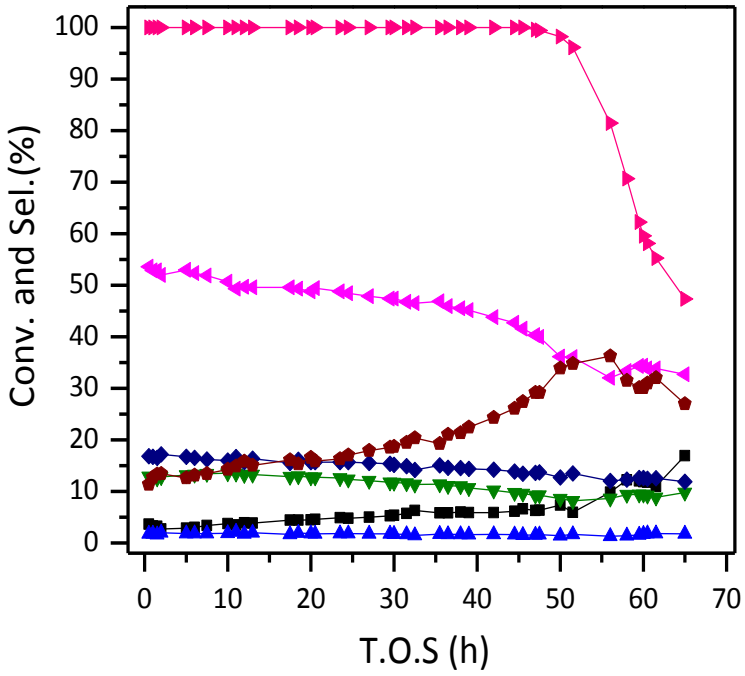


Fig. S11 Dependences of catalytic conversion and product selectivity on reaction time in MTO over the CN-ZSM-5 catalyst (▶Conv, ▼$C_2^=$, ◀$C_3^=$, ◆$C_4^=$, ■C_1, ▲C_{2-4}, ⬟≥C_5).

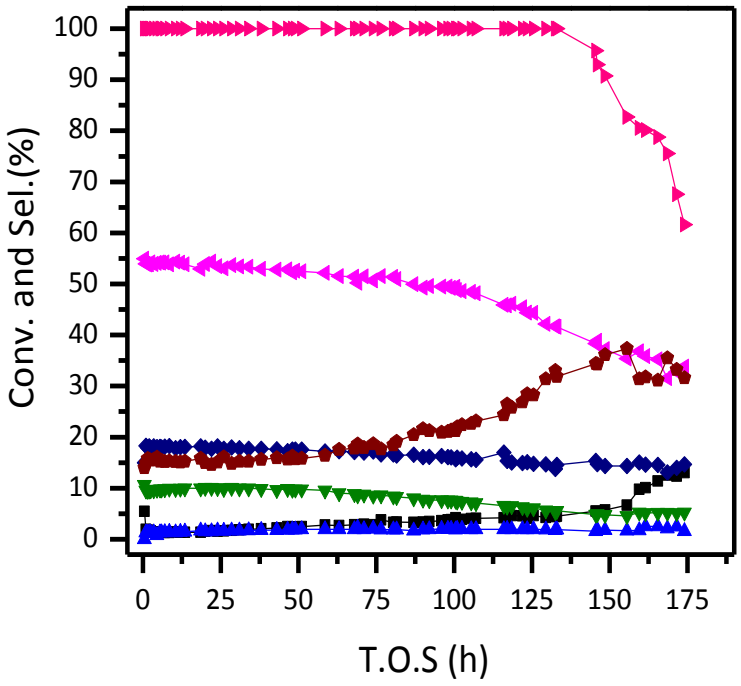


Fig. S12 Dependences of catalytic conversion and product selectivity on reaction time in MTO over the ZSM-5-*2* catalyst. (▶Conv, ▼$C_2^=$, ◀$C_3^=$, ◆$C_4^=$, ■C_1, ▲C_{2-4}, ⬟≥C_5)

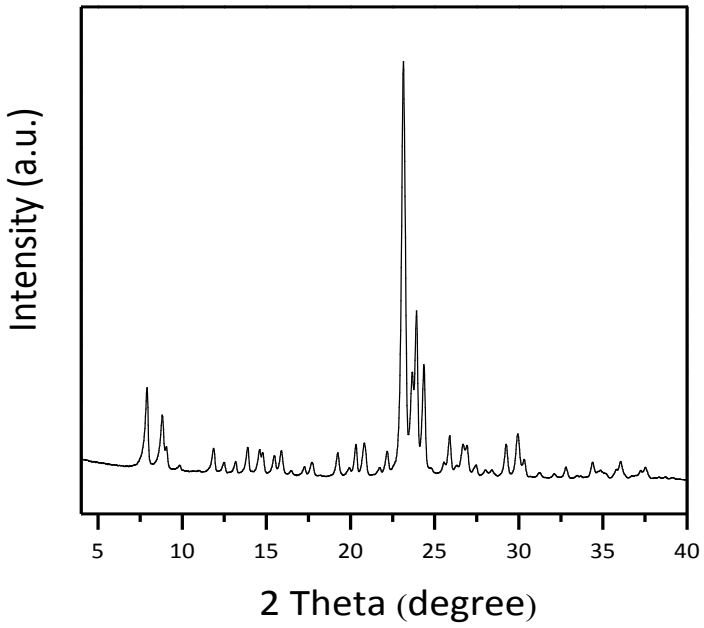


Fig. S13 XRD pattern of CN-ZSM-5 zeolite from conventional hydrothermal route.

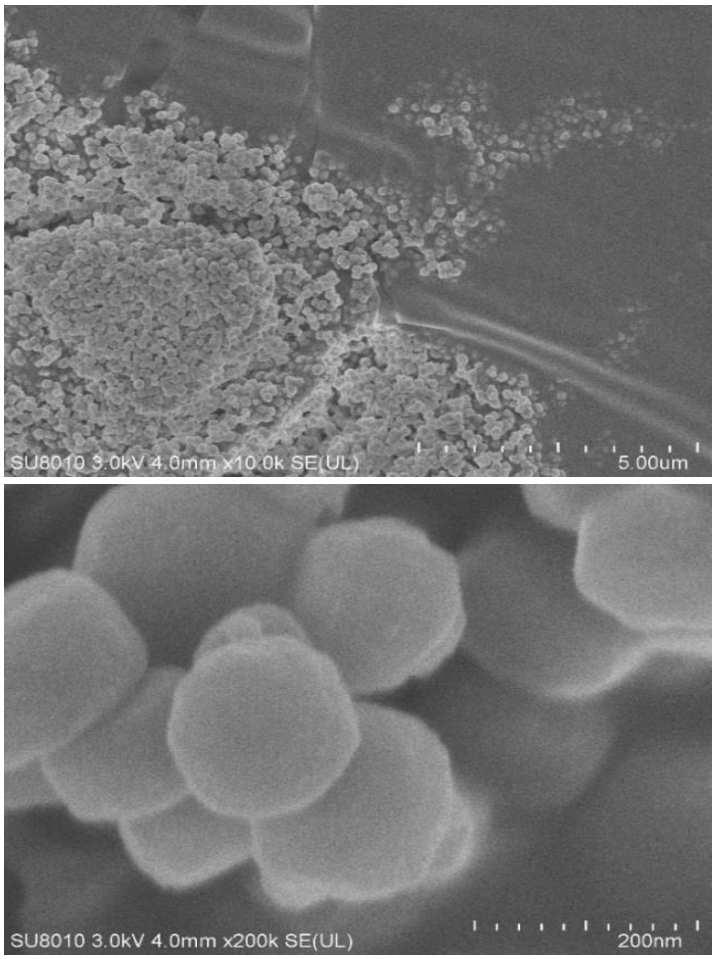


Fig. S14 SEM images of CN-ZSM-5 zeolite from conventional hydrothermal route.

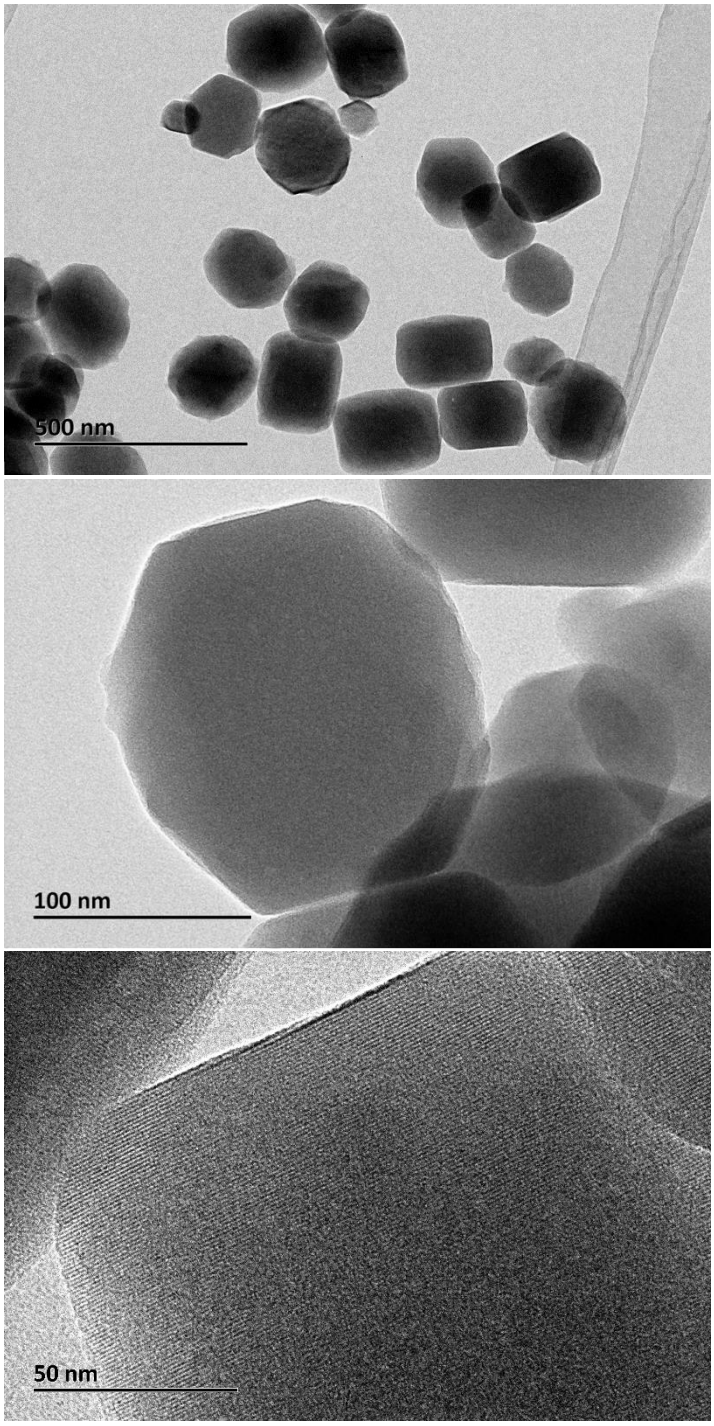


Fig. S15 TEM images of CN-ZSM-5 zeolite from conventional hydrothermal route.

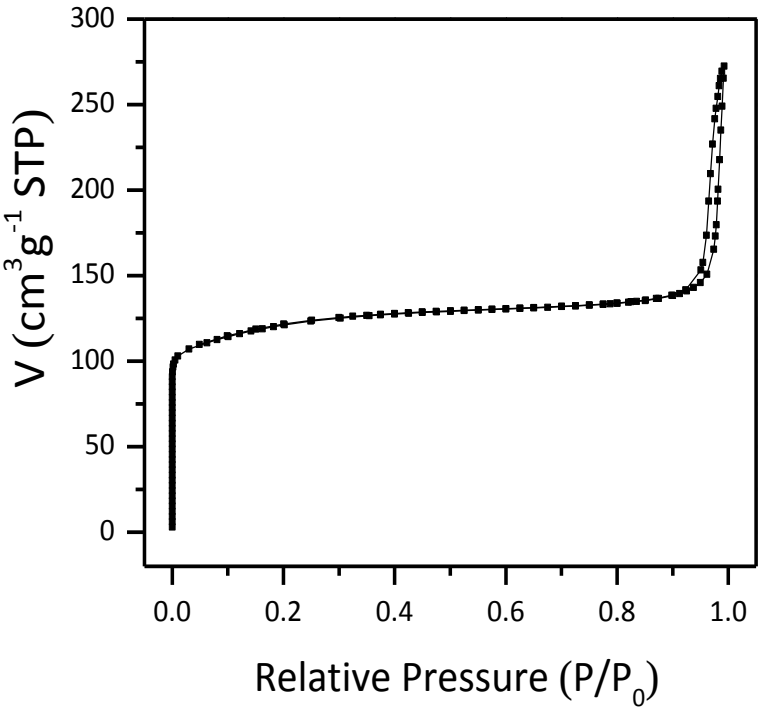


Fig. S16 N_2 sorption isotherms of CN-ZSM-5 zeolite from conventional hydrothermal route.

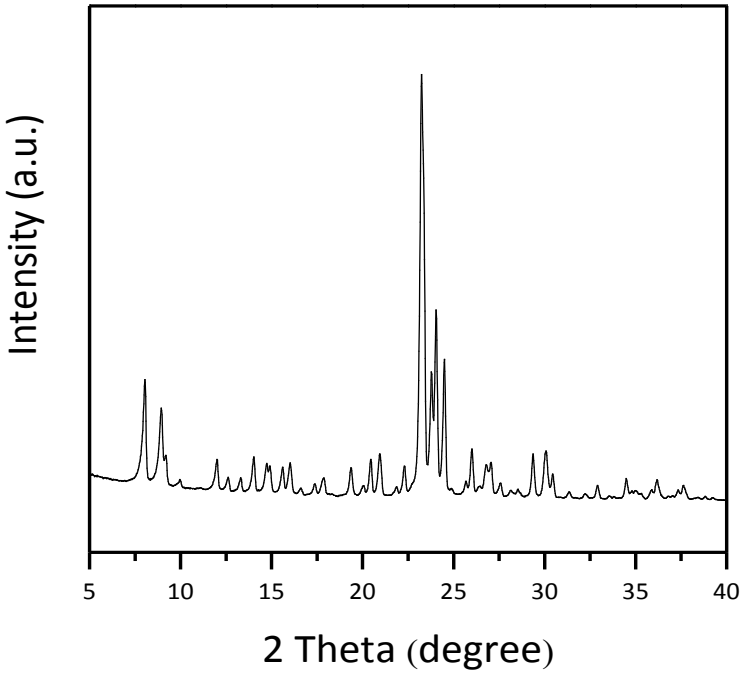


Fig. S17 XRD pattern of the conventional bulky ZSM-5 zeolite.

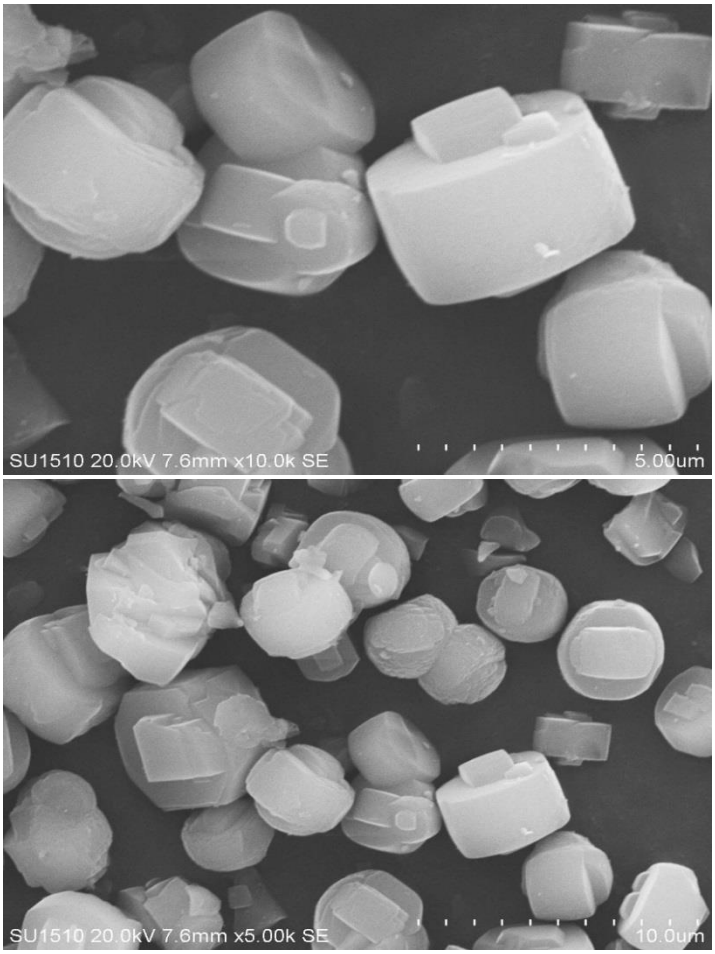


Fig. S18 SEM images of the conventional bulky ZSM-5 zeolite.

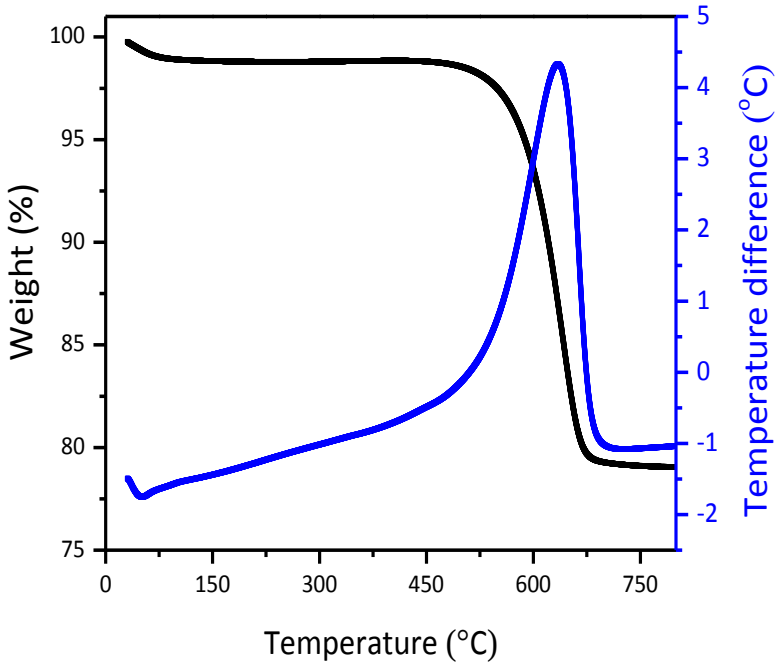


Fig. S19 TG-DTA curves of the deactivated ZSM-5-*2* catalyst.

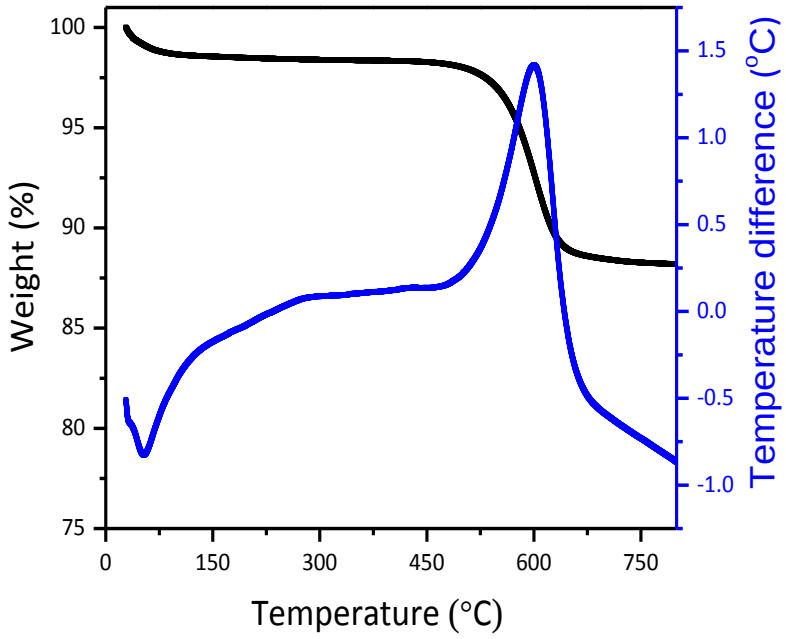


Fig. S20 TG-DTA curves of the deactivated CN-ZSM-5 catalyst.

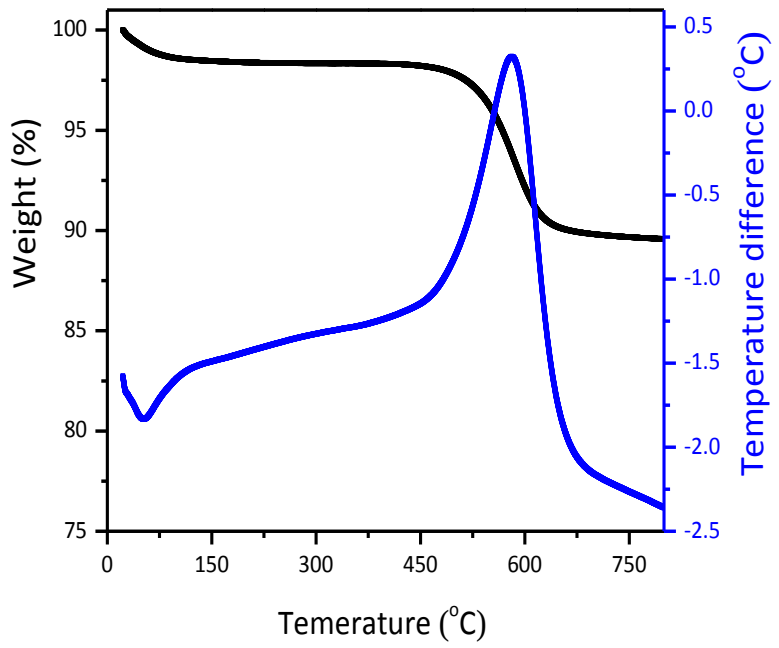


Fig. S21 TG-DTA curves of the deactivated conventional bulky ZSM-5 catalyst.

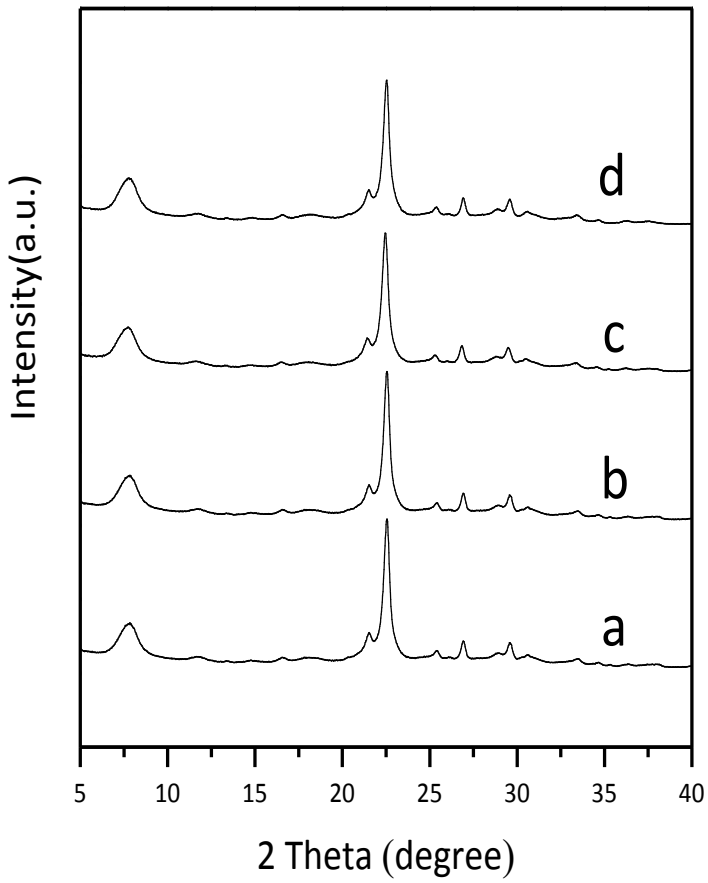


Fig. S22 XRD patterns of the beta synthesized with H_2O/SiO_2 ratio at (a) 2.50, (b) 3.75, (c) 5.00, and (d) 6.25.

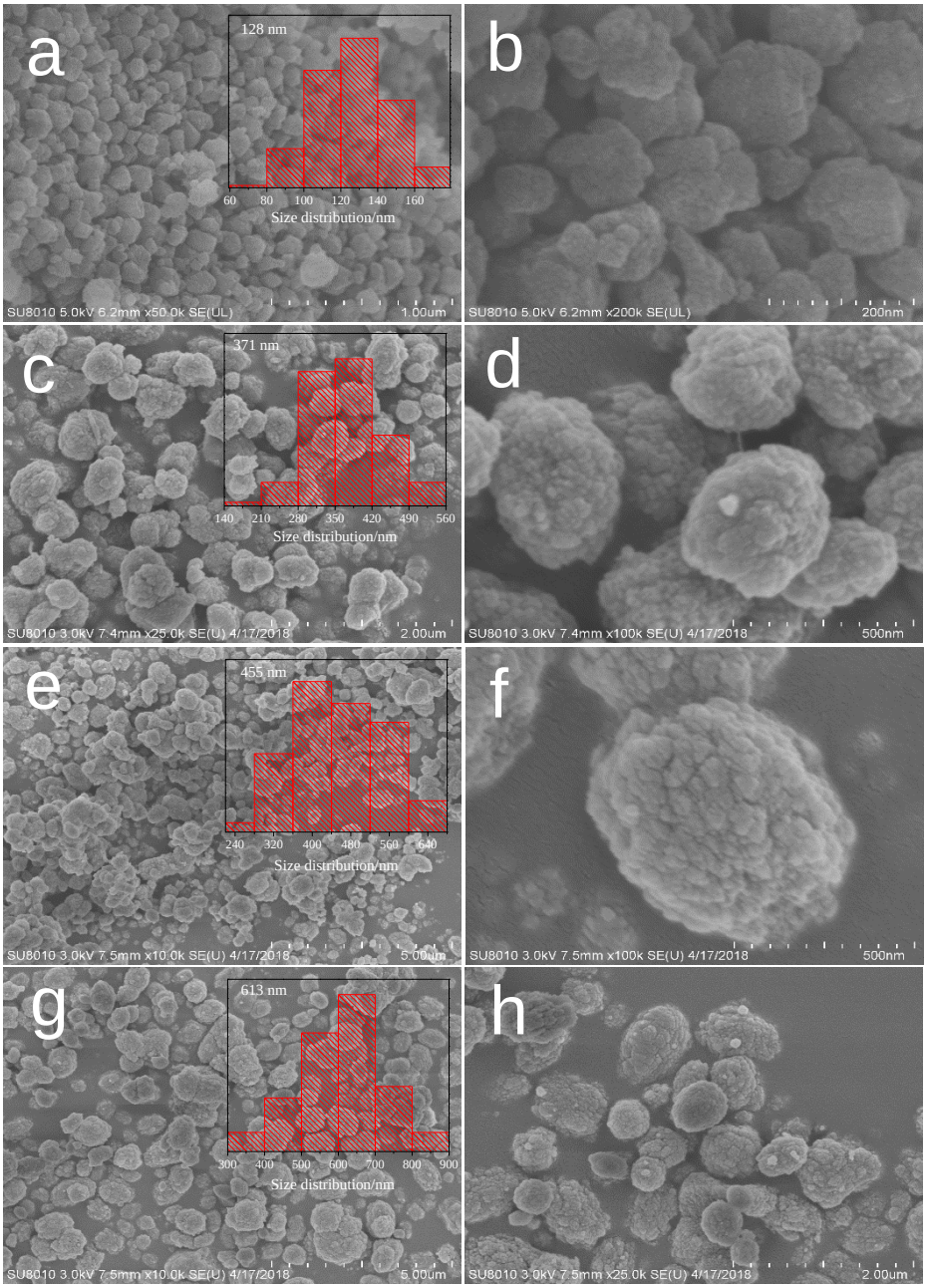


Fig. S23 SEM images of the beta synthesized with H_2O/SiO_2 ratio at (a,b) 2.50, (c,d) 3.75, (e,f) 5.00, (g,h) 6.25 (Size distribution of beta zeolites obtained by counting number of more than 200 zeolite particles in the SEM images).

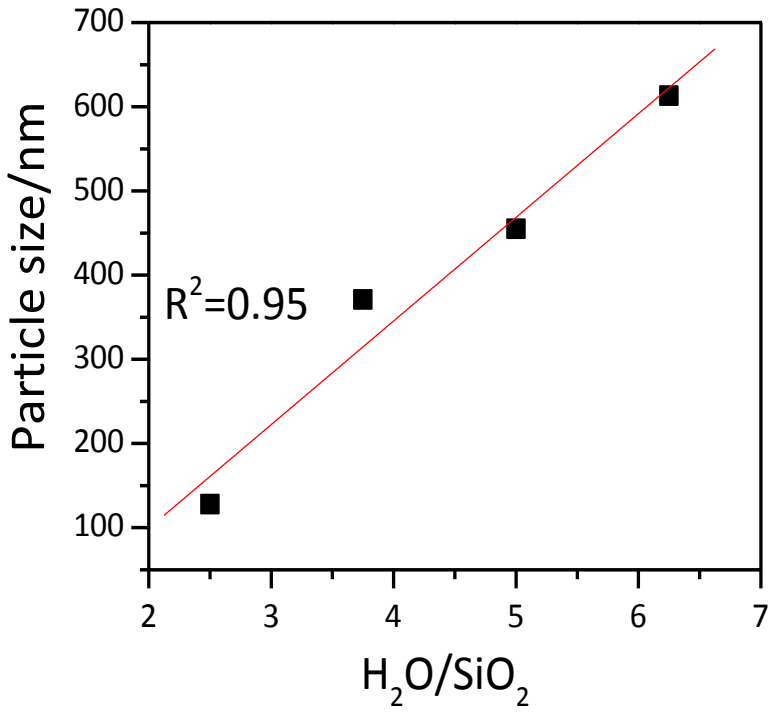


Fig. S24 Dependence of obtained beta particle size on H_2O/SiO_2 ratio.

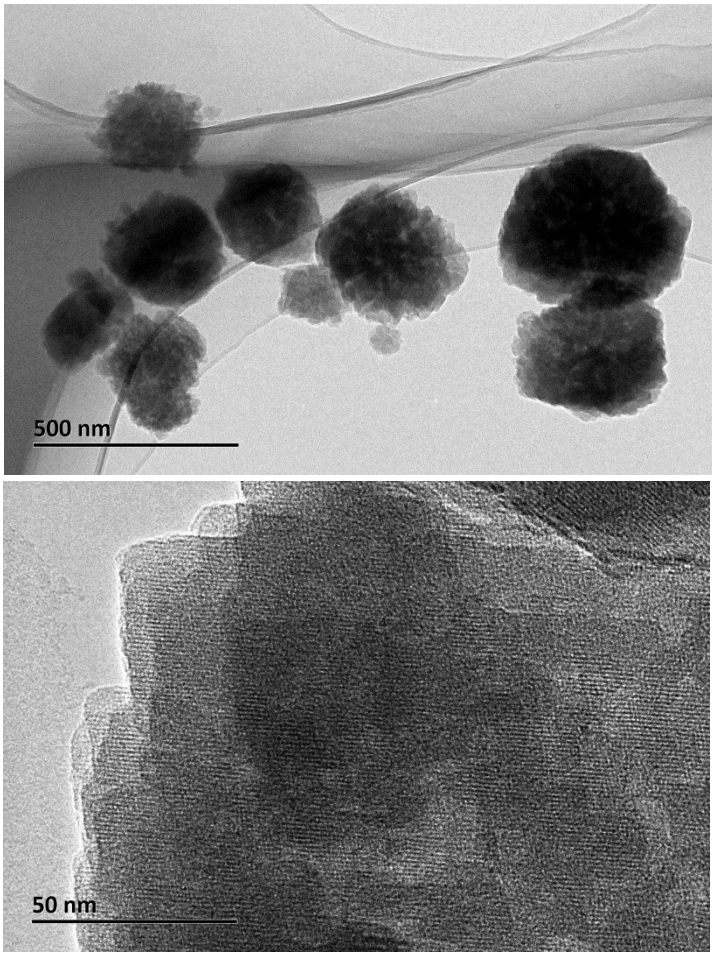


Fig. **S25** TEM images and SEAD pattern of Beta-*2.5* zeolite.

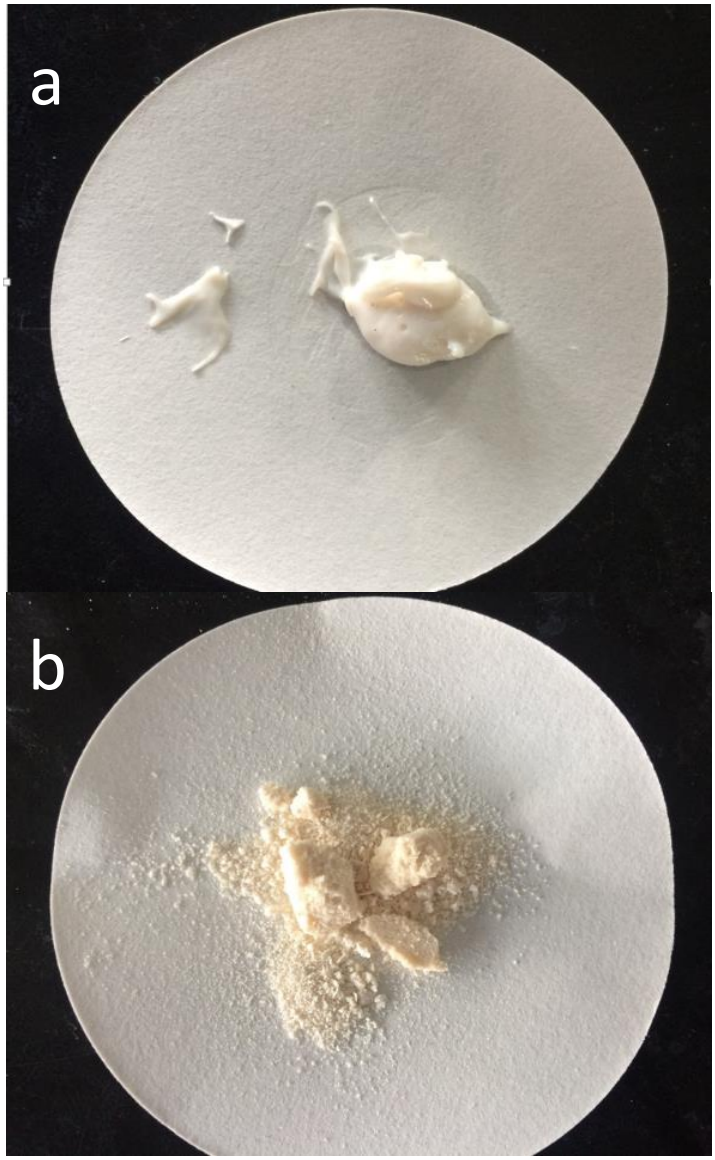


Fig. S26 Photographs of fully crystallized (a) ZSM-5-*2* and (b) Beta-*2.5* zeolites.