Electronic Supplementary Information

Precise control of the sizes of zeolite B-ZSM-5 based on seed surface crystallization

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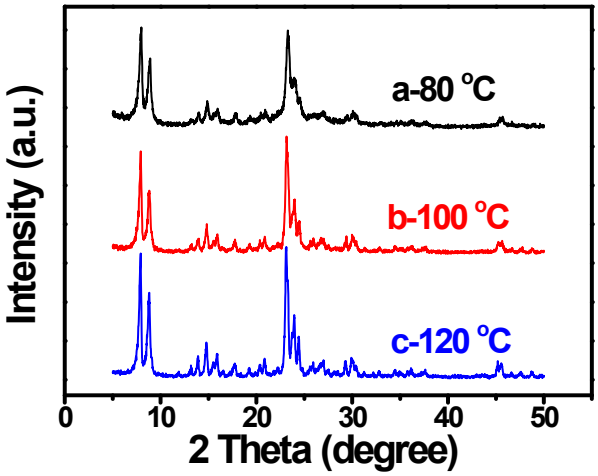

Fig. S1 XRD patterns of the silicalite-1 nanoparticle synthesized with different temperatures, a-80 °C-74nm, b-100 °C -111nm, c-120 °C -141nm.

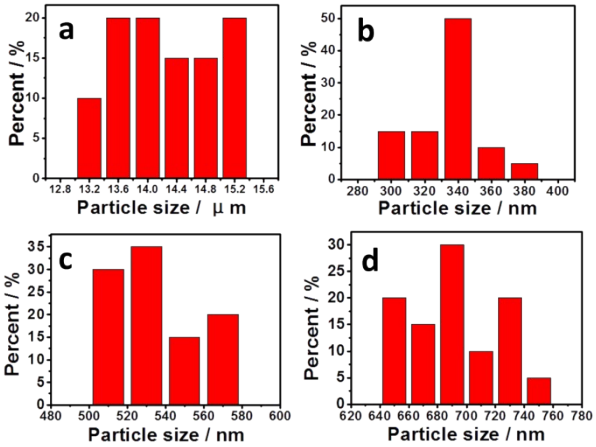

Fig. S2 Particle size distributions of B-ZSM-5 based on measurements of 100 particles by SEM. (a) B-ZSM-5 zeolite synthesized in the absence of seed, (b-d) the amount of seed addition was 1 % and the seed size was 74, 111 and 141 nm, respectively.

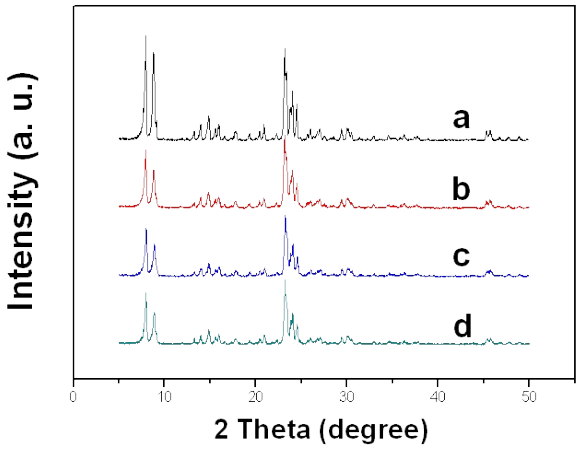

Fig. S3 XRD patterns of the B-ZSM-5 nanoparticle synthesized with different seed sizes. (a) 14.2 μm，(b) 336 nm, (c) 536 nm, (d) 691 nm.

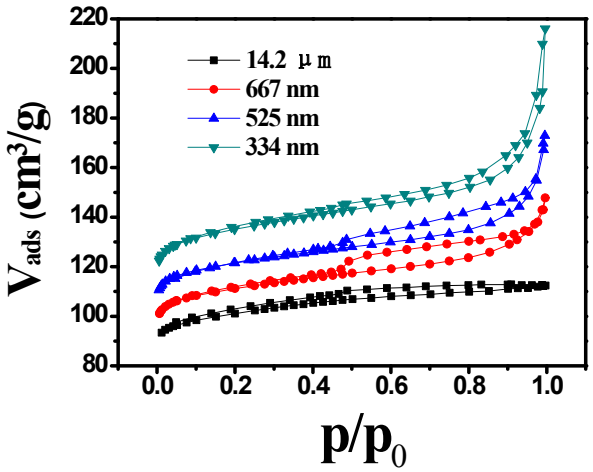

Fig. S4 N_2 adsorption/desorption isotherms at 77 K of B-ZSM-5 samples with different sizes. The isotherms of each sample in one diagram are offset vertically by 10 cm^3/g.

Table S1 Specific surface area and porosity characteristics of the samples with different sizes.

Particle size	S_{micro}[a] [m^2g^{-1}]	S_{ext}[a] [m^2g^{-1}]	S_{BET}[b] [m^2g^{-1}]	V_{micro}[a] [cm^3g^{-1}]	V_{pore}[c] [cm^3g^{-1}]
14.2 μm	378	24	402	0.15	0.17
691 nm	369	33	402	0.15	0.21
536 nm	367	36	403	0.14	0.24
336 nm	369	44	413	0.15	0.29

[a] t-plot method [b] BET method [c] p/p_0=0.99

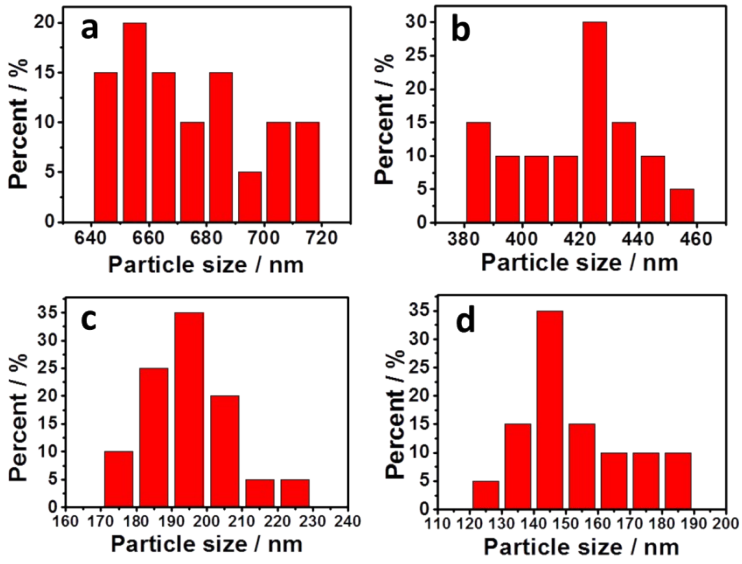

Fig. S5 Particle size distributions of B-ZSM-5 based on measurements of 100 particles by SEM. The amount of seed addition was 0.1, 0.5, 5 and 10 %, respectively.

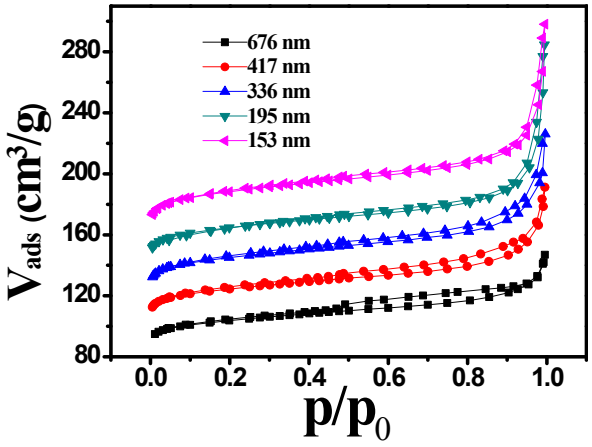

Fig. S6 N_2 adsorption/desorption isotherms at 77 K of B-ZSM-5 samples with different sizes. The isotherms of each sample in one diagram are offset vertically by 20 cm^3/g.

Table S2 Specific surface areas and porosity characteristics of the samples with different particle sizes.

Particle size [nm]	S_{micro}[a] [m^2g^{-1}]	S_{ext}[a] [m^2g^{-1}]	S_{BET}[b] [m^2g^{-1}]	V_{micro}[a] [cm^3g^{-1}]	V_{pore}[c] [cm^3g^{-1}]
676	378	34	412	0.15	0.23
417	375	38	413	0.15	0.27
336	369	44	413	0.15	0.29
195	370	41	411	0.15	0.35
153	375	47	422	0.15	0.34

[a] t-plot method [b] BET method [c] p/p_0=0.99

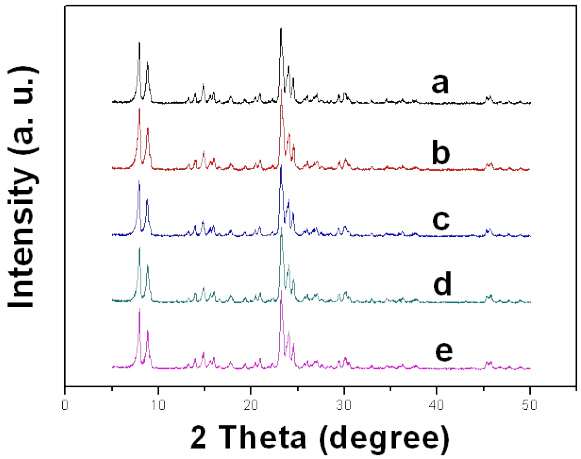

Fig. S7 XRD patterns of the B-Al-ZSM-5 samples synthesized with different particle sizes. (a) 676 nm, (b) 417 nm, (c) 336 nm, (d) 195 nm, (e) 153 nm. The seed size was 74 nm and the amount of seed addition was 0.1, 0.5, 1, 5 and 10 %, respectively.

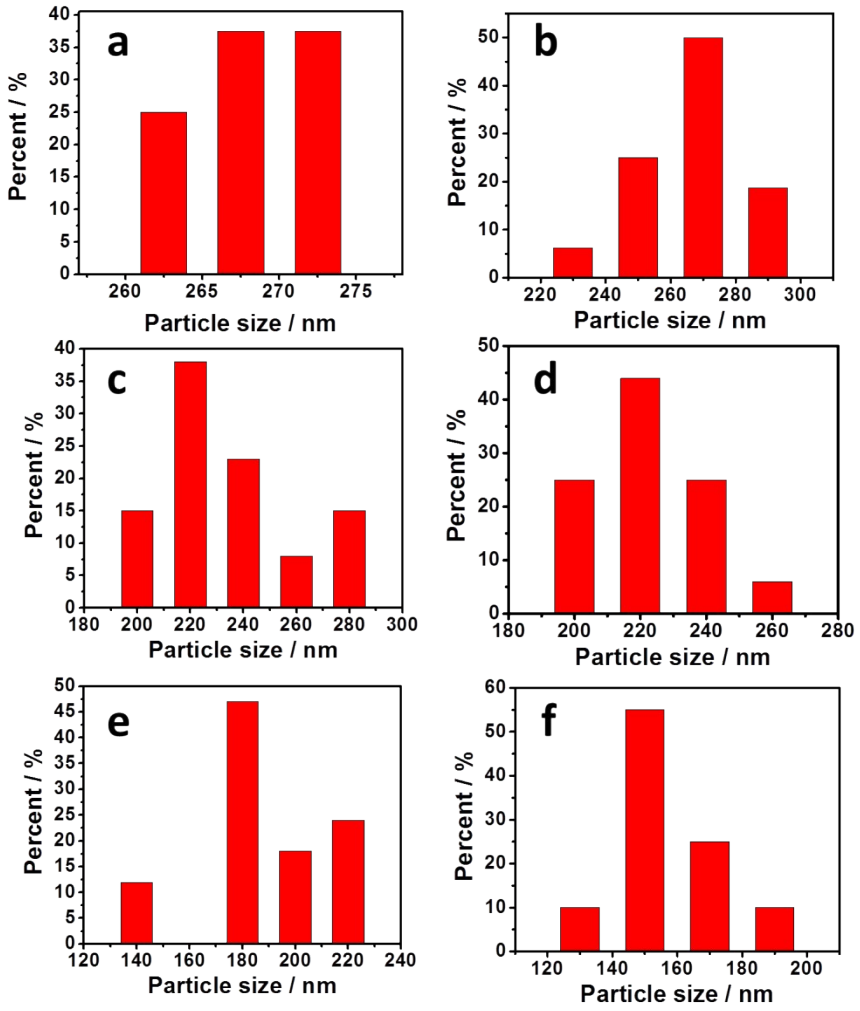

Fig. S8 Particle size distributions of B-ZSM-5 based on measurements of 100 particles by SEM. The seed size was 74 nm and the amount of seed addition was 0, 0.1, 0.5, 1, 5 and 10 %, respectively.

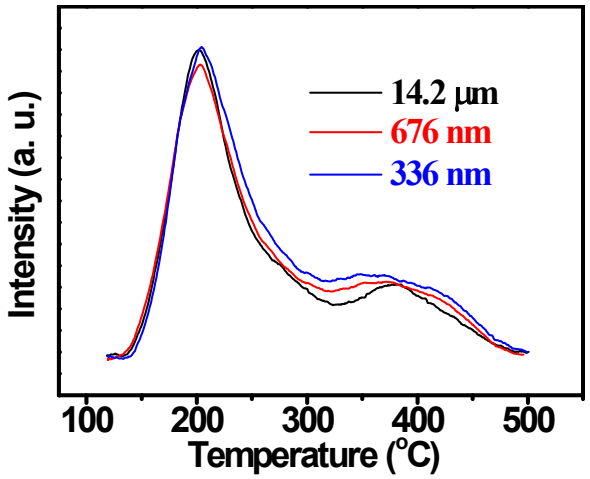

Fig. S9 NH_3-TPD profiles of the B-ZSM-5 samples with 14.2 μm, 676 nm and 336 nm. The seed size was 74 nm and the amount of seed addition was 0, 0.1 and 1 %, respectively.

Table S3 Chemical compositions of the B-ZSM-5 samples with 14.2 μm, 676 nm and 336 nm. The seed size was 74 nm and the amount of seed addition was 0, 0.1 and 1 %, respectively.

Particle size	Si/B	Si/Al
14.2 μm	29	375
676 nm	24	402
336 nm	23	397

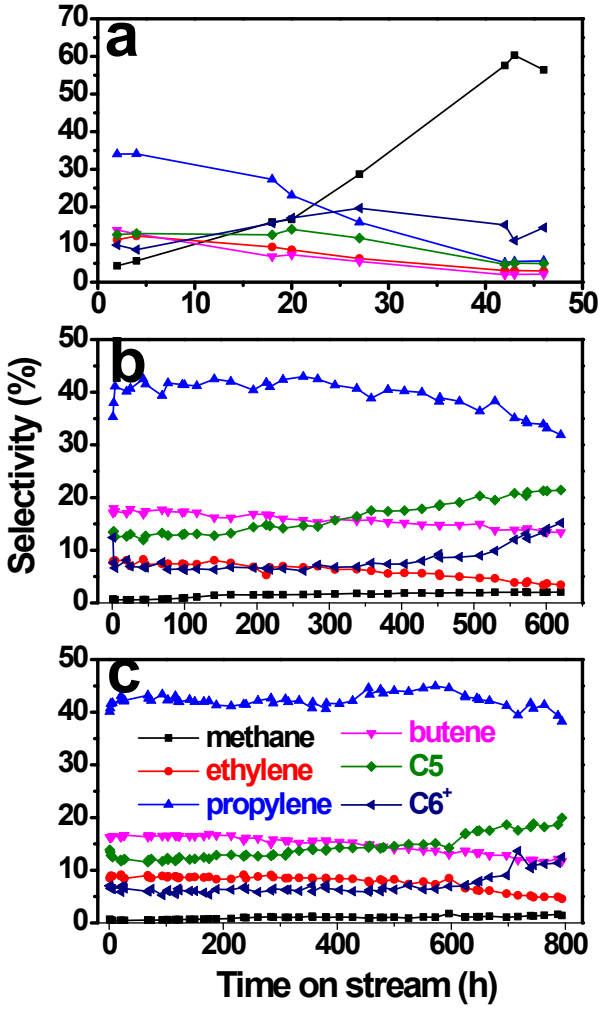

Fig. S10 Variations of product selectivity over 14.2 μm (a), 676 nm (b) and 336 nm (c) B-ZSM-5 as a function of the time on stream. Reaction conditions: WHSV = 1 h^{-1}, T=500 °C, n (CH_3OH): n (H_2O) =1: 5, P_{total}=1 atm.

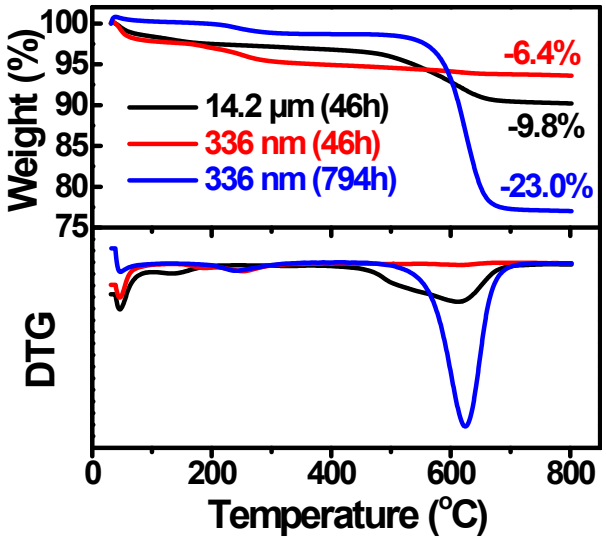

Fig. S11 TG and DTG curves of the coked catalysts with 14.2 μm and 336 nm after 46 and 794 h reaction.