Supporting Information

Hierarchical Zeolitic Murray Material with Mass Transfer Advantage Promotes Catalytic Efficiency Improvement

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Figures and Calculations

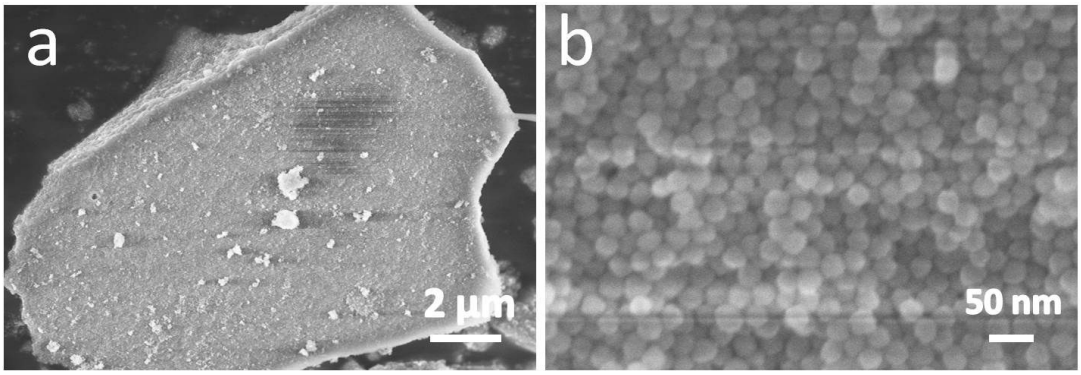

Fig.S1 SEM images of amorphous silica with a monodisperse spherical shape. The particle size distribution of silica sphere is among 25-30nm.

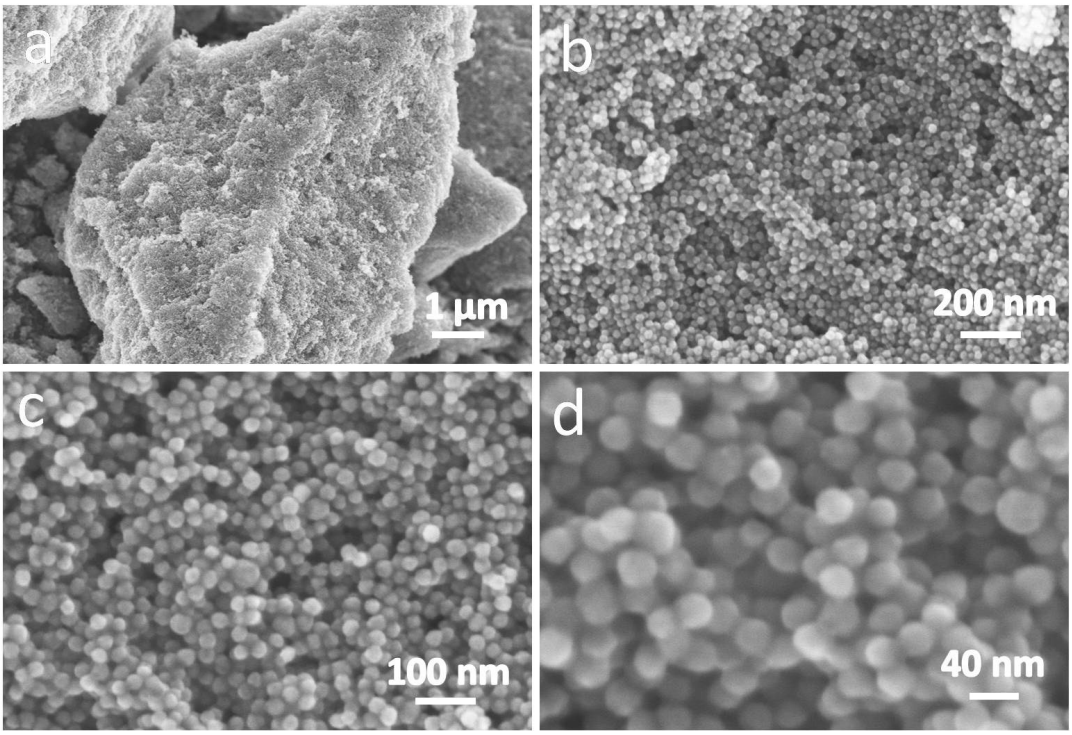

Fig.S2 SEM images of SiO_2 NPs@porous carbon composites over different magnifications. In our synthetic strategy, the appropriate amount of carbon source is extremely important, which could ensure that silicon oxide ball is well coated. As-prepared SiO_2 NPs@C still kept spherical shape with good dispersion. The spherical dimension of each monomer is approximately 35-40 nm.

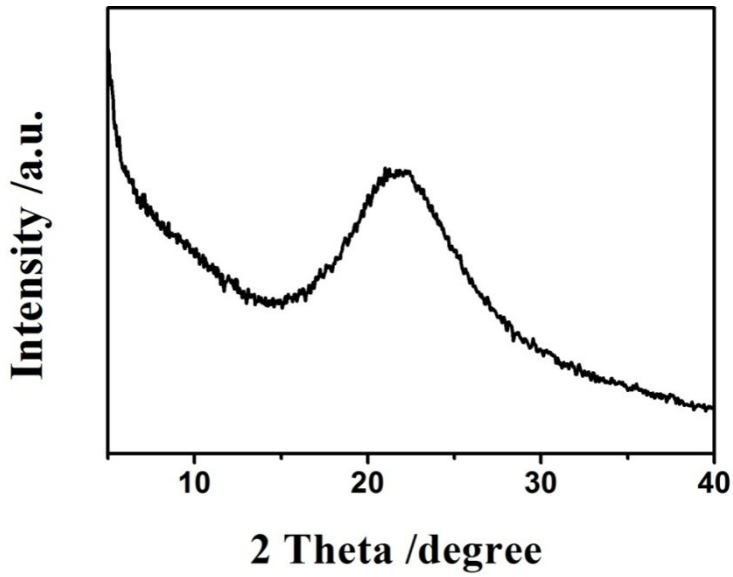

Fig.S3 XRD patterns of SiO_2 NPs@C composites. The sample is completely amorphous.

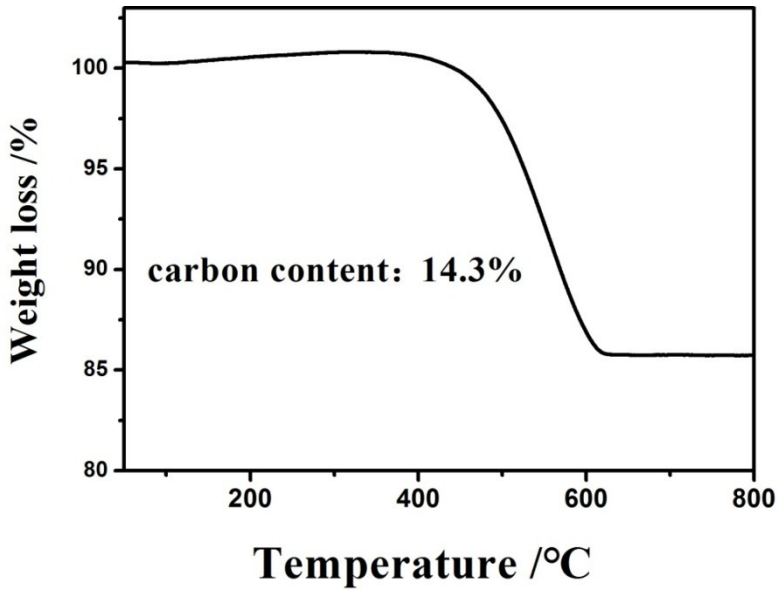

Fig.S4TGA curves of SiO_2 NPs@C composites. The carbon content of the composites is 14.3%.

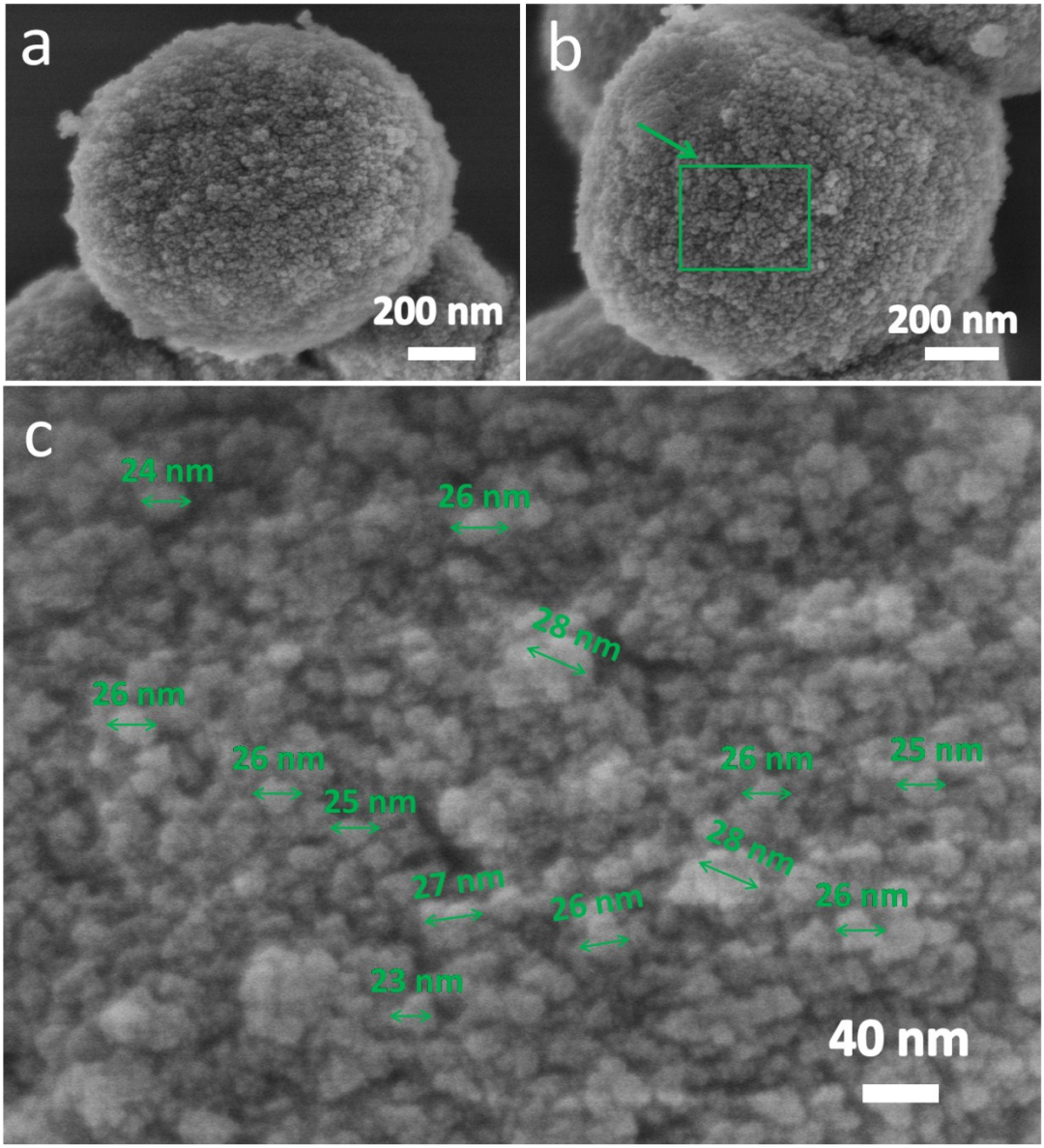

Fig.S5 SEM images of Hier-ZSM-5 under different magnifications.

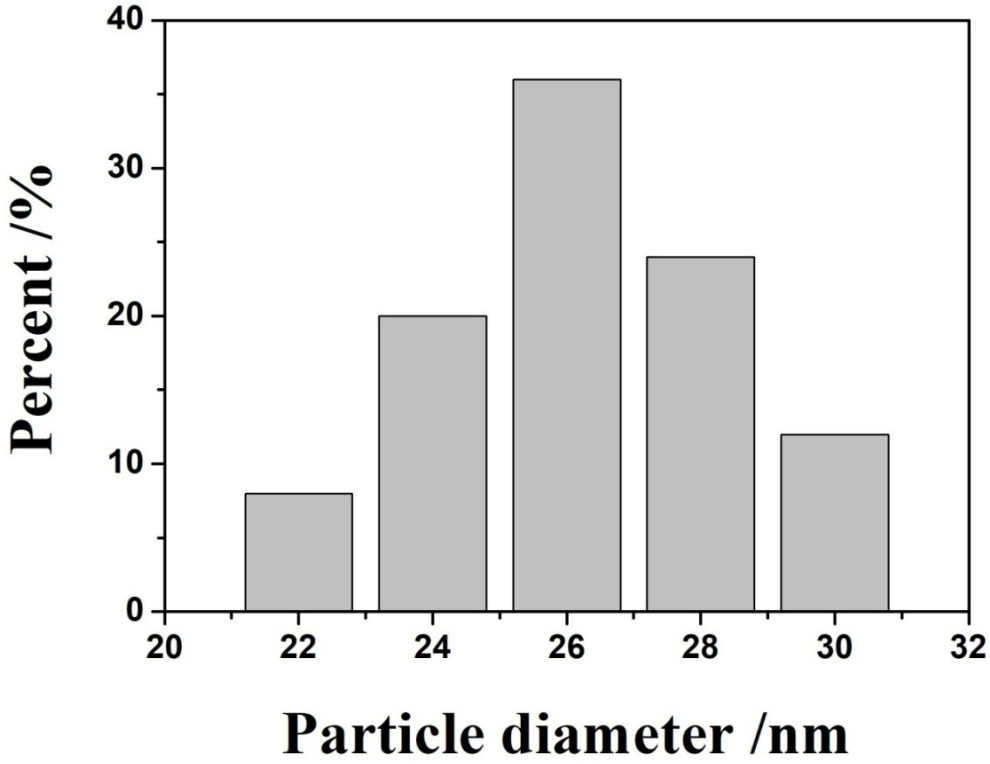

Fig.S6 Particle-size distributions of primary nanocrystalline units in Hier-ZSM-5. Histograms showed the percentage distribution of particle-sizes, and the average size is 26 nm.

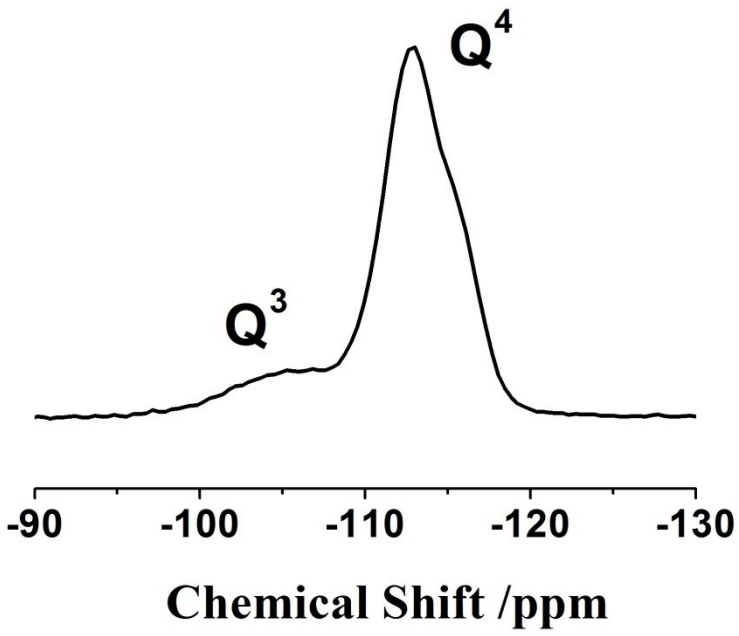

Fig.S7 ^{29}Si MAS NMR spectra of Hier-ZSM-5. Hier-ZSM-5 indicated a high degree of skeleton condensation.

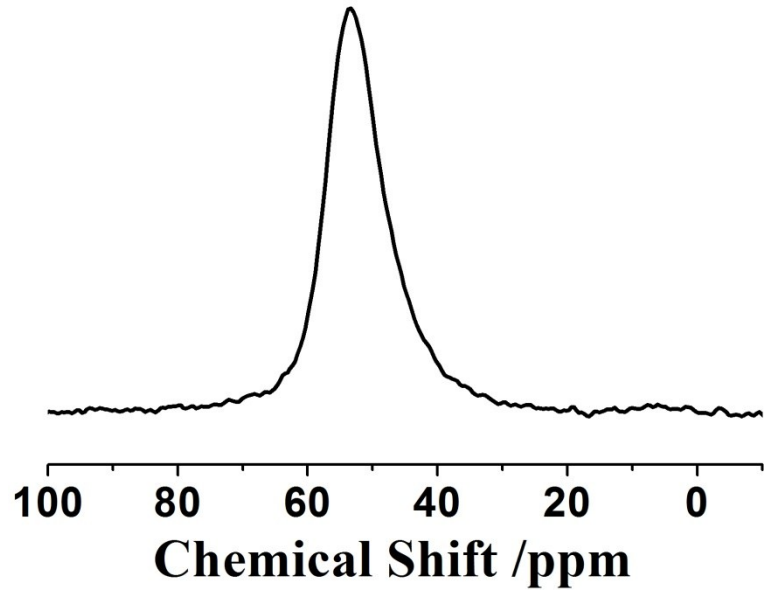

Fig.S8^{27}Al MAS NMR spectra of Hier-ZSM-5. The aluminum atom was almost completely introduced into a zeolitic skeleton.

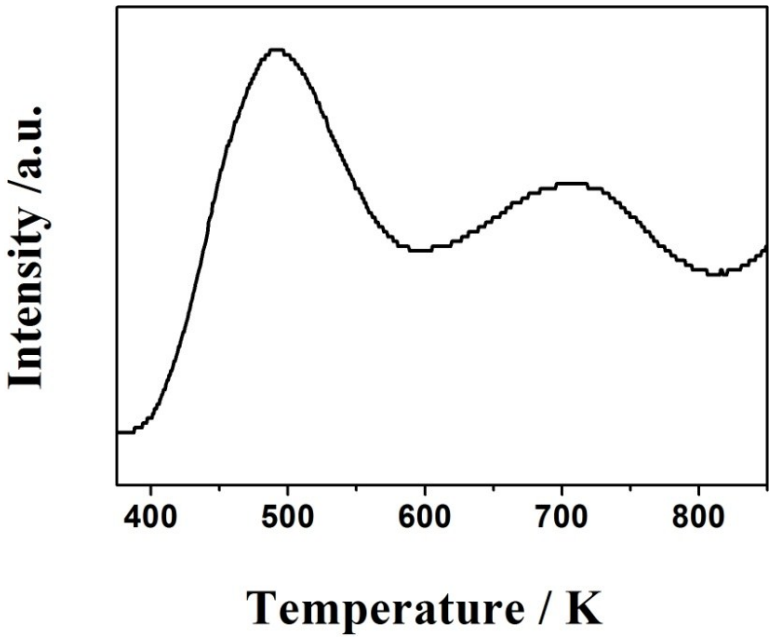

Fig.S9 NH_3-TPD curve of Hier-ZSM-5.

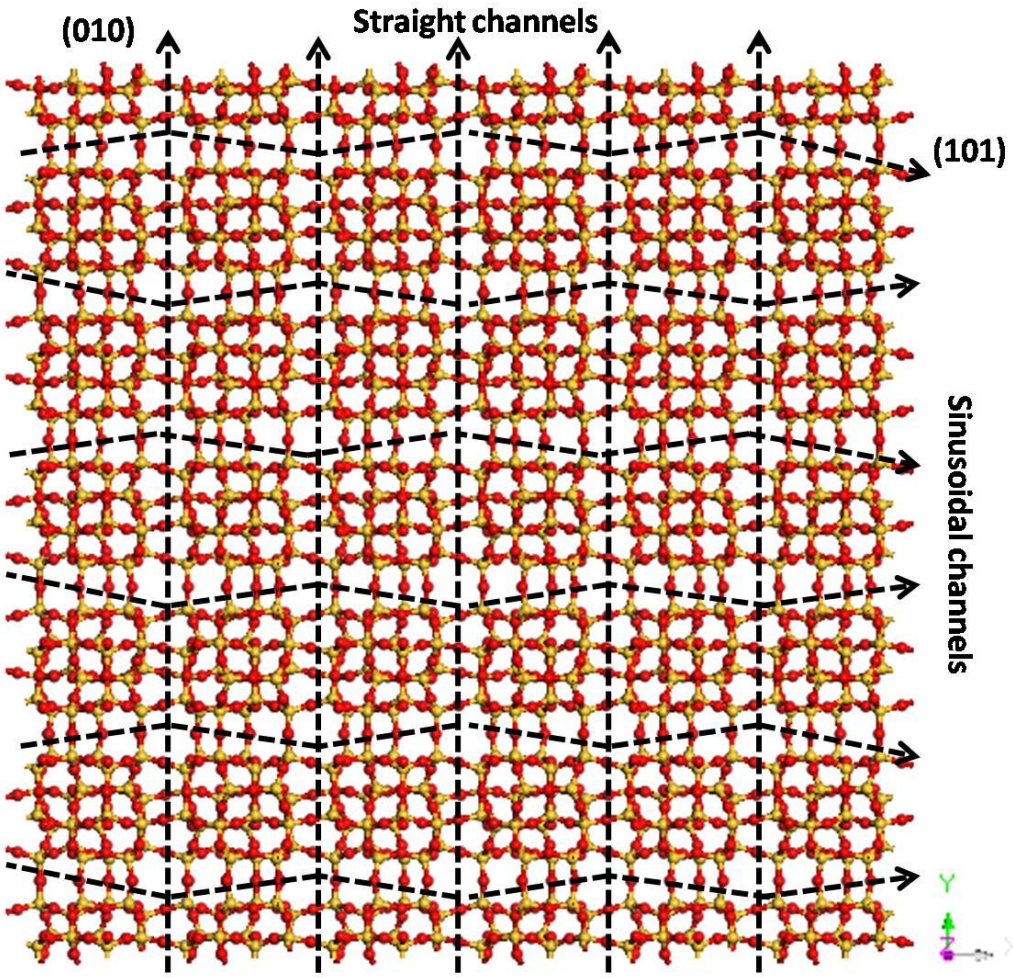

Fig. S10 The basic skeleton diagram of MFI-type zeolite. There are two kinds of channels, straight channels along b (010) axis, and sinusoidal channels along (101) axis. The density distribution for the number of straight channels along b (010) axis was 0.730 per square nanometer. And the density distribution for the number of sinusoidal channels along (101) axis was 0.612 per square nanometer. The micropore channel of MFI-type nanocrystalline with a diameter (i.e. **d**) was calculated as following formula, that is, the value of **n** in generalized Murray's law.

$$n = \frac{\pi d^2}{4}(0.730 + 0.612) \quad (1)$$

For Hier-ZSM-5, while **d** equals 26 nm, **n** gets 712.