

## Supporting information

### Self-assembly of hollow spherical nanocatalysts with encapsulated Pt NPs and the effect of Ce-dipping on catalytic activity

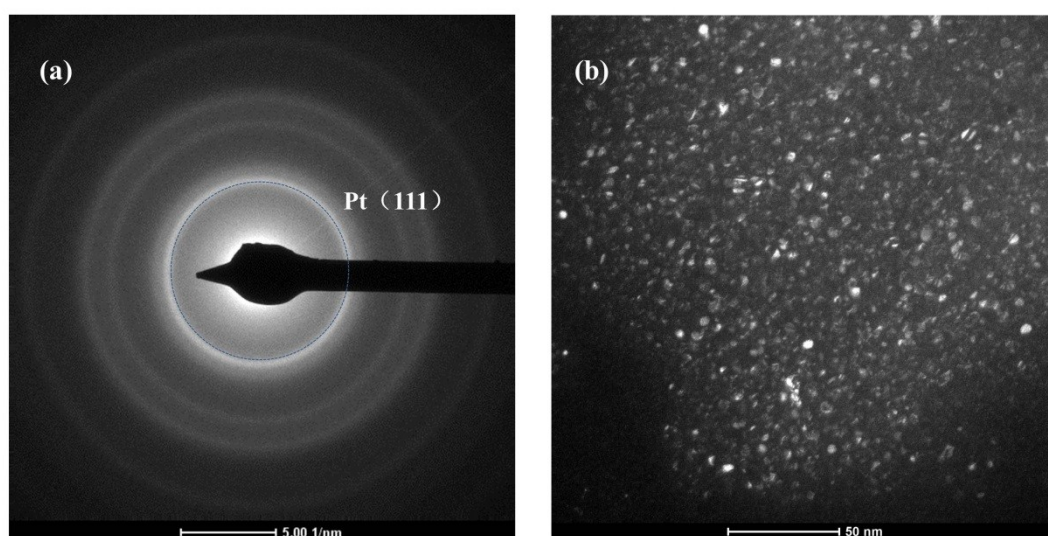


Fig. S1 (a) the SAED pattern obtained from Pt-PVP NPs. (b) a HAADF-STEM image of the obtained Pt-PVP NPs.

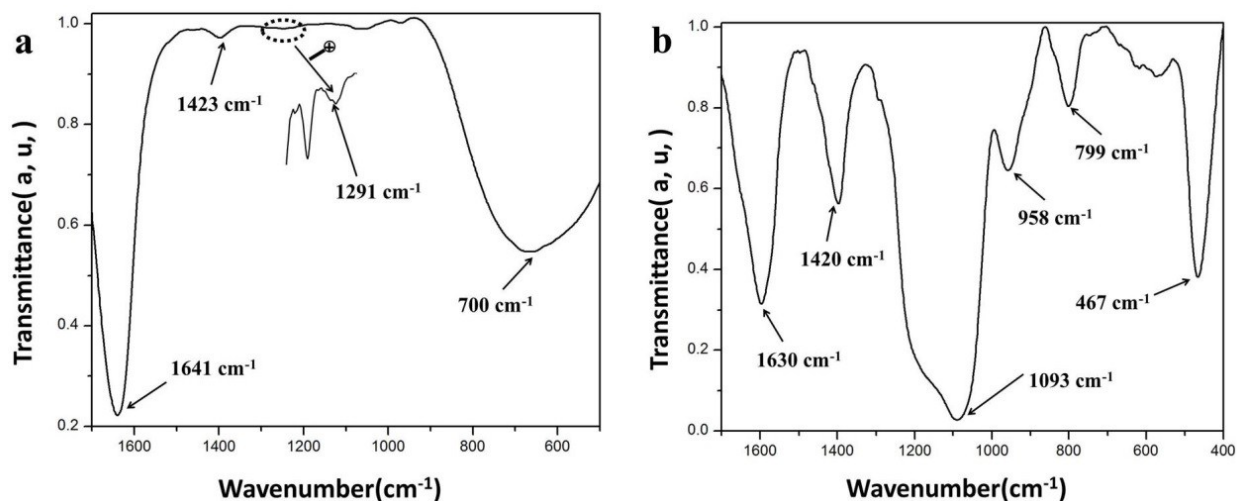


Fig. S2 FT-IR spectrum of the as-synthesized (a) Pt-PVP NPs and (b) Pt@HMSiO<sub>2</sub> NPs.

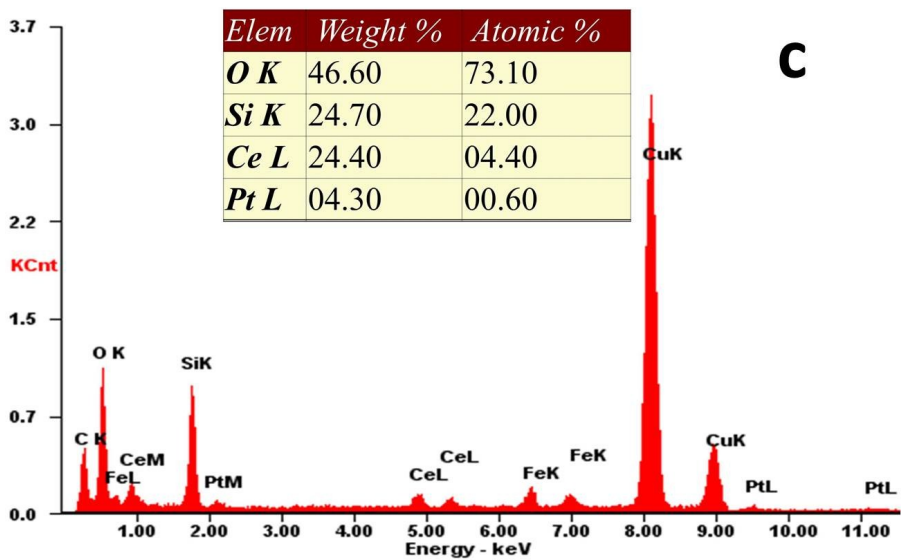
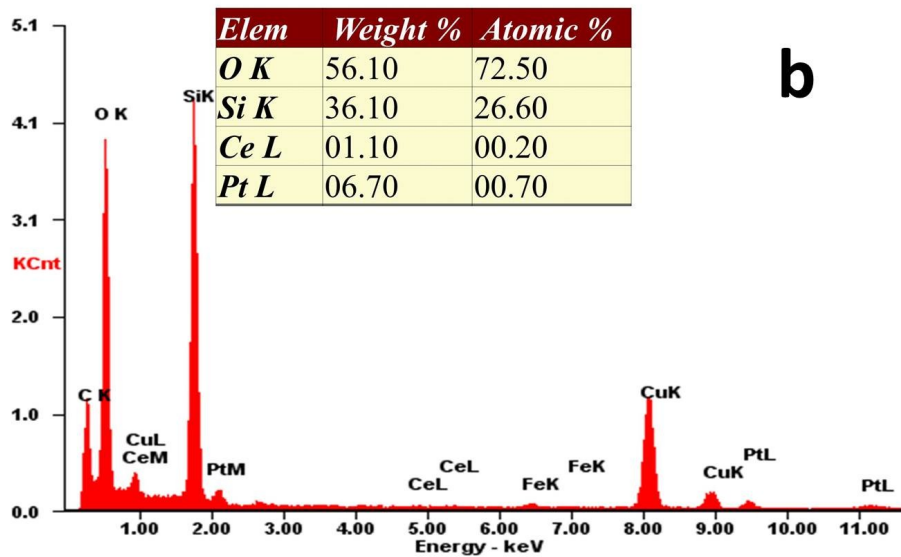
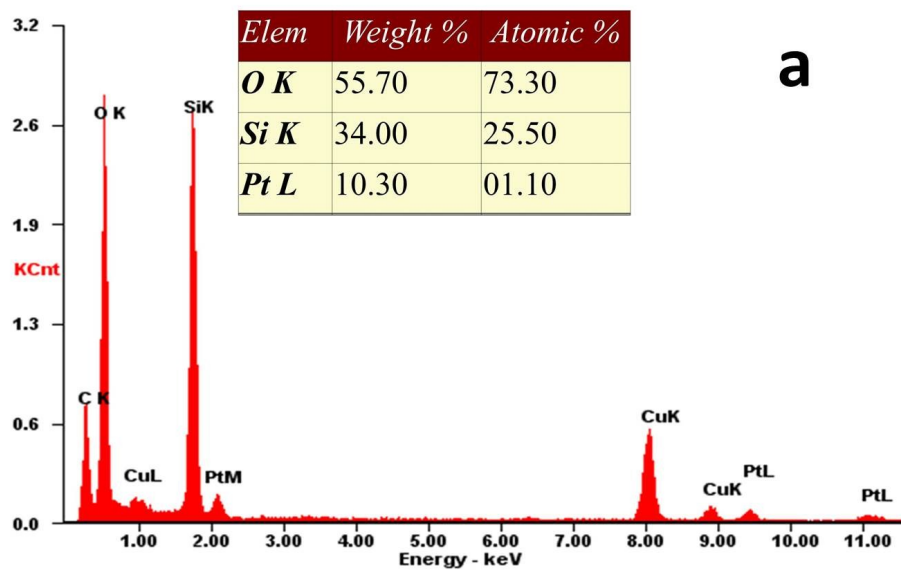


Fig. S3 The EDX spectrum datum for the obtained (a) Pt@HMSiO<sub>2</sub> NPs, (b) (c) the Pt-CeO<sub>2</sub>@HMSiO<sub>2</sub> NPs of different Ce content.

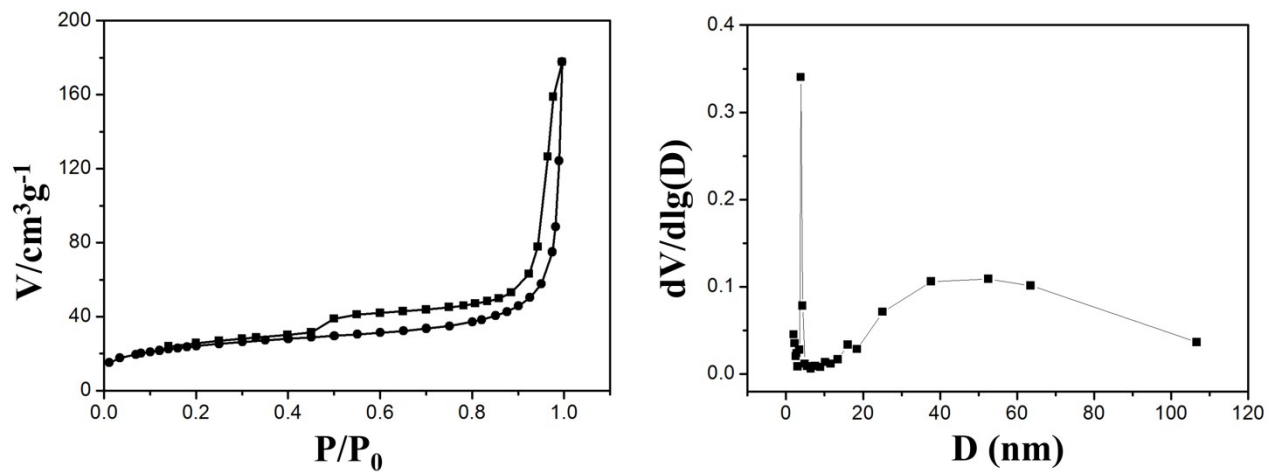


Fig. S4  $\text{N}_2$  adsorption/desorption isotherms and pore size distribution of the  $\text{Pt-CeO}_2@\text{HMSiO}_2$  samples.

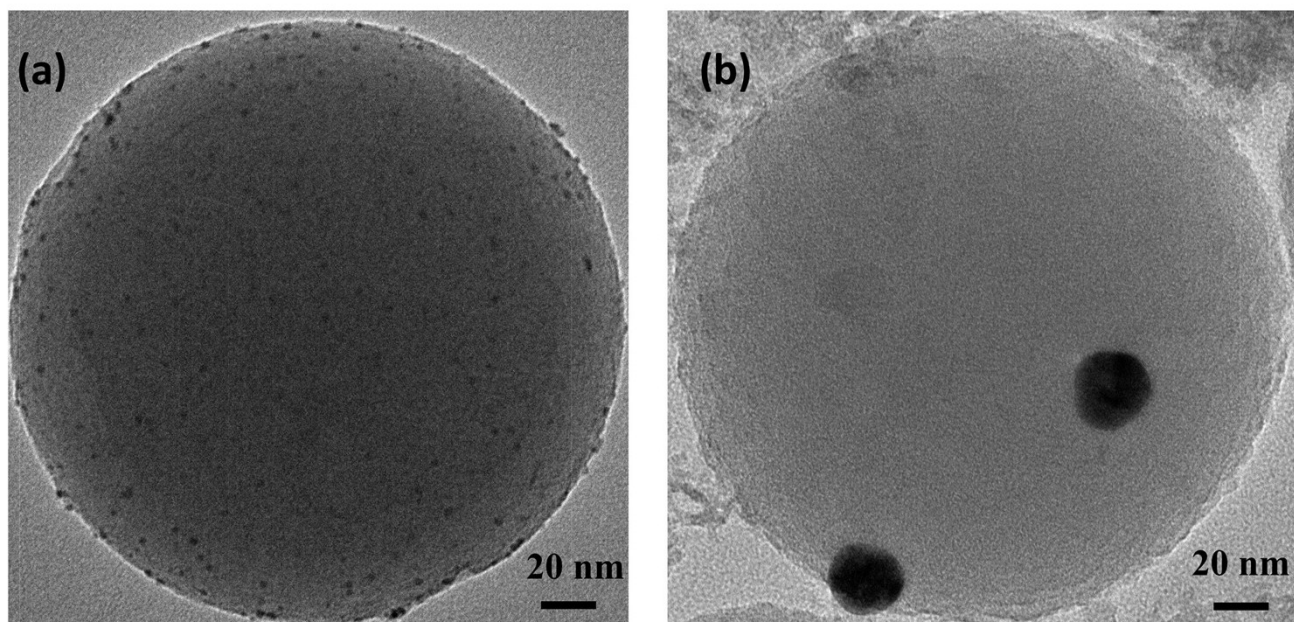


Fig. S5 TEM images of (a)  $\text{Pt/SiO}_2$  NPs, (b)  $\text{Pt/SiO}_2$  NPs calcined at  $550 \text{ }^\circ\text{C}$

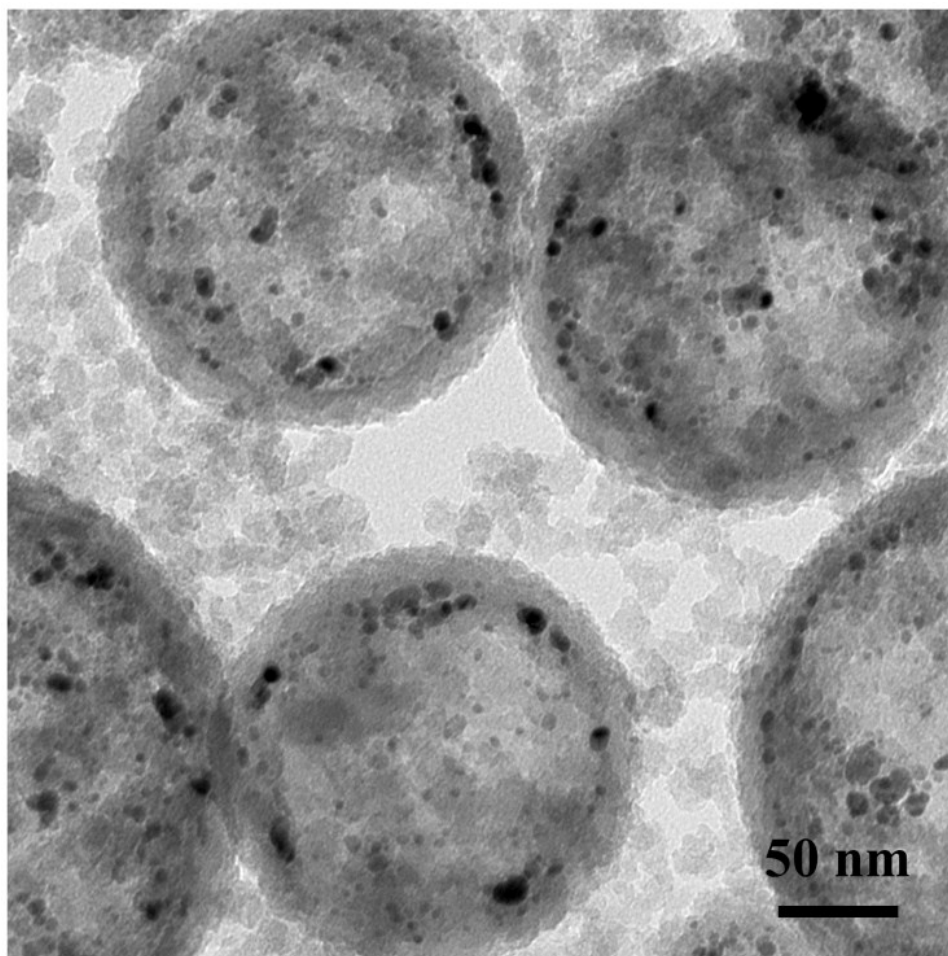


Fig. S6 TEM image of PtCe-0.2 nanocatalyst used seven times

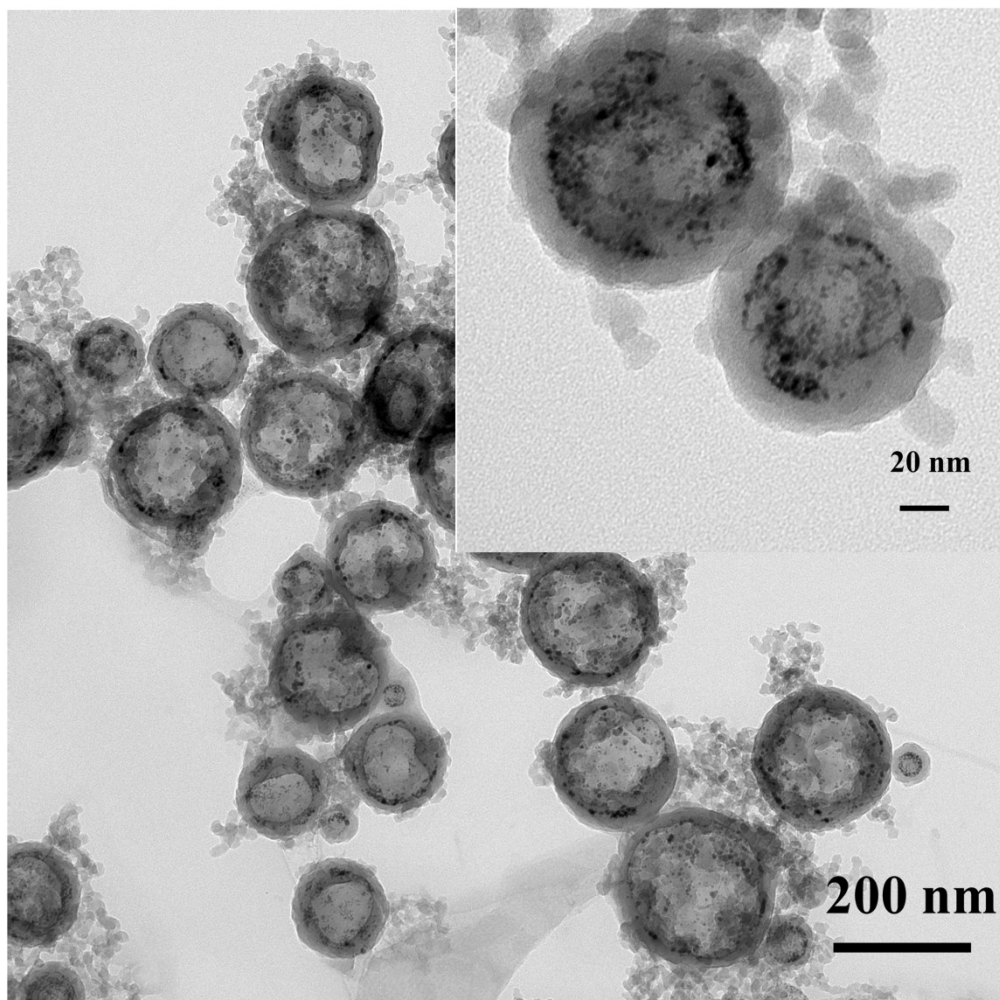


Fig. S7 After reaction for 8 h, TEM image of PtCe-0.2 nanocatalyst.

**The propane conversion ( $X$ ) was calculated by the following formulae:**

$$\text{propane conversion (X\%)} = \frac{[n(\text{C}_3\text{H}_8)_{\text{in}} - n(\text{C}_3\text{H}_8)_{\text{out}}]}{n(\text{C}_3\text{H}_8)_{\text{in}}} \times 100\%.$$

After reaction for 8 h, the propane conversion of PtCe-0.2 nanocatalysts decreases from 21.47% to 19.06%. Possibly, the decreasing of the catalytic activity is due to the coke deposition over the catalyst surface.<sup>62</sup>