

## Supporting information

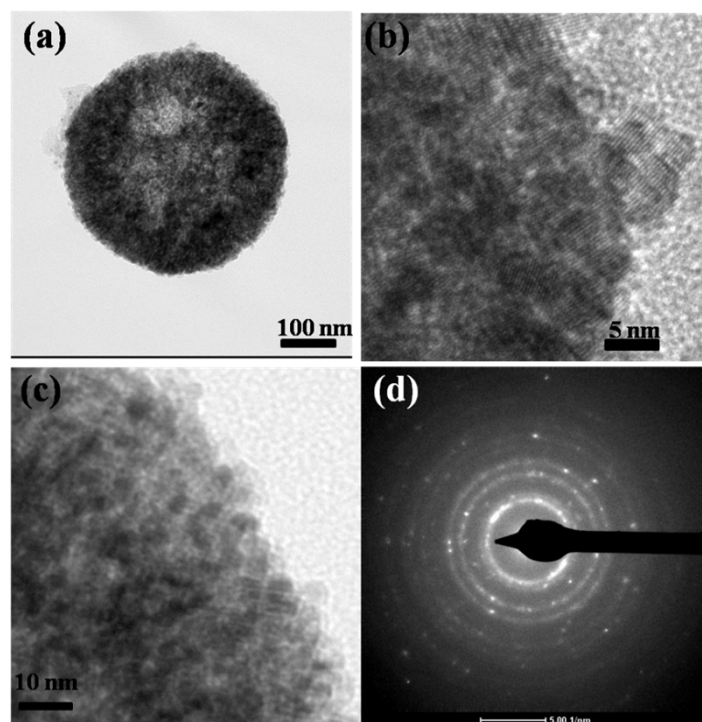
### **Hierarchical structure based on gold nanoparticles embedded into hollow ceria sphere and mesoporous silica layer with high catalytic activity and stability**

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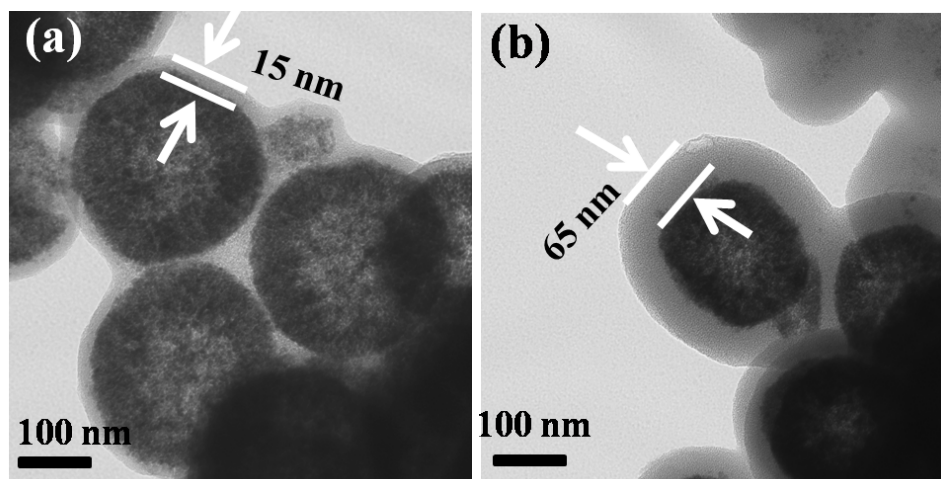
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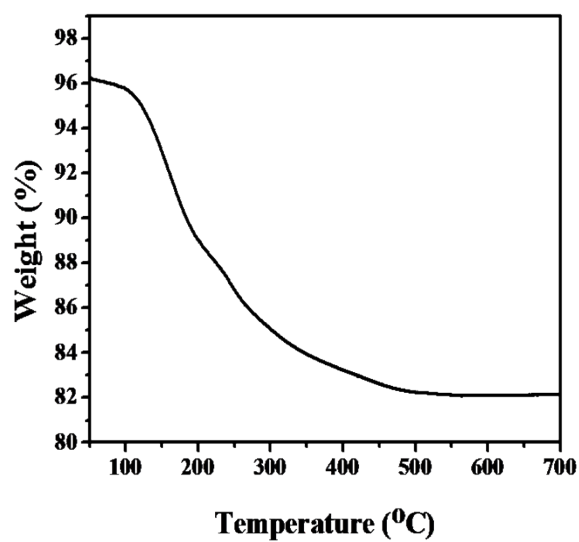
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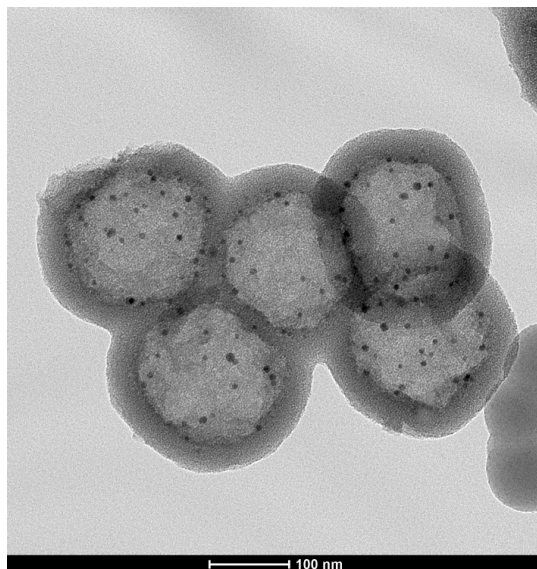
**Fig. S1** (a) and (b) TEM images of porous CeO<sub>2</sub> hollow nanospheres with different magnifications, (c) TEM images of CeO<sub>2</sub>/Au.(d) EDS of CeO<sub>2</sub>/Au.



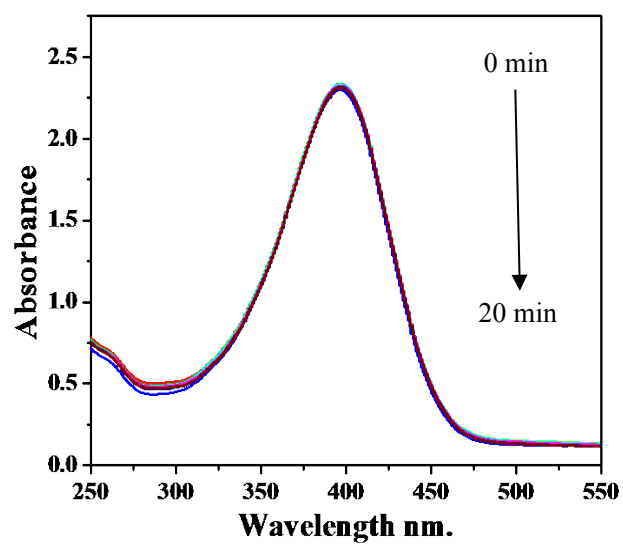
**Fig. S2** The TEM images of  $\text{CeO}_2/\text{Au}@\text{SiO}_2$  with different amount of TEOS:  
 (a)  $\text{CeO}_2/\text{Au}@\text{SiO}_2$ -15, (b)  $\text{CeO}_2/\text{Au}@\text{SiO}_2$ -65



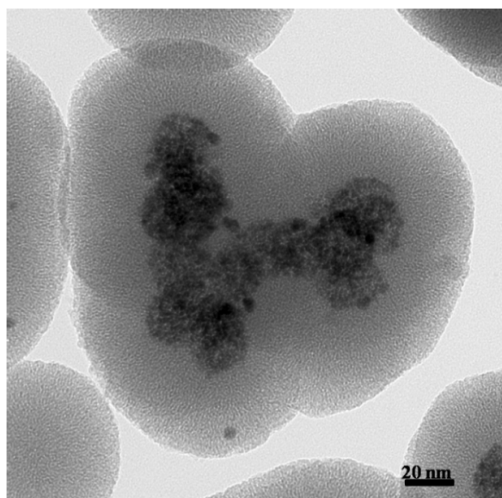
**Fig. S3** TGA curves of hollow  $\text{CeO}_2/\text{Au}@\text{SiO}_2$  nanospheres under air atmosphere.



**Fig. S4** The TEM of the sample after removal of the  $\text{CeO}_2$ .



**Fig. S5** The solution without catalyst for two days.



**Fig. S6** The TEM of solid  $\text{CeO}_2/\text{Au}@\text{SiO}_2$ .