

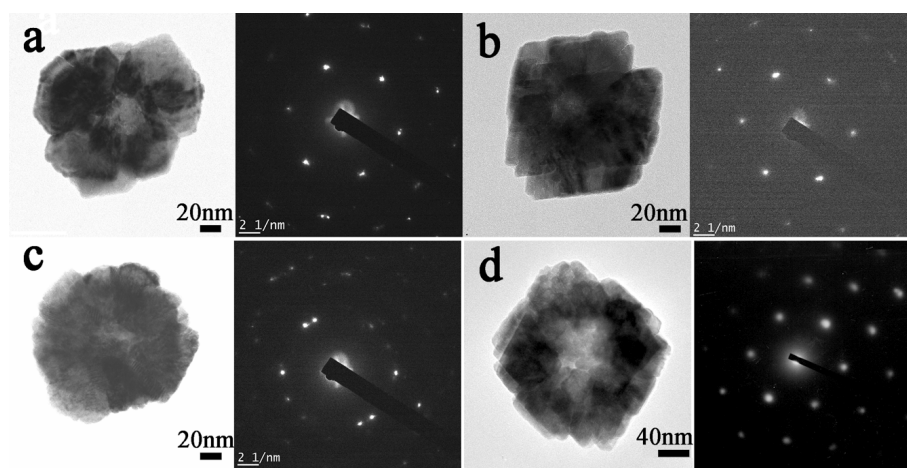
**Electronic supplementary information for**

**Benign Synthesis of Ceria Hollow Nanocrystals through  
Template-free Method**

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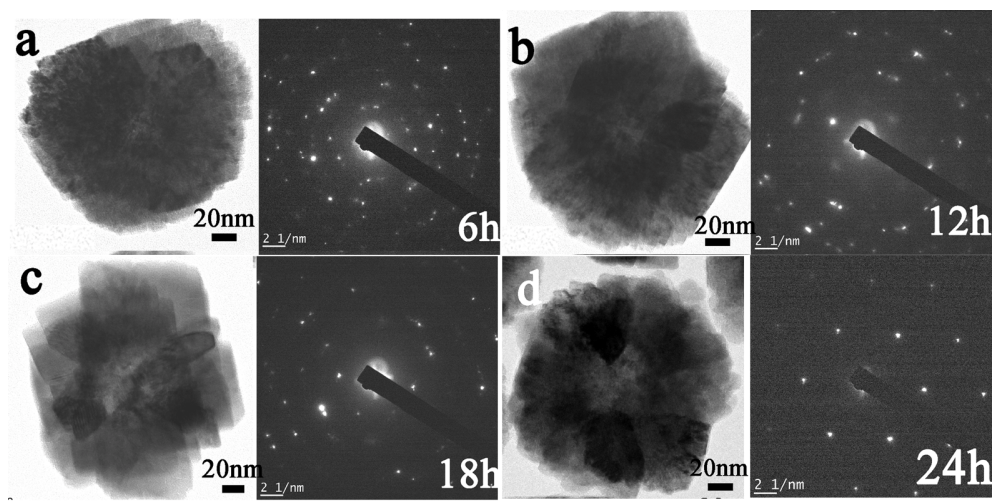
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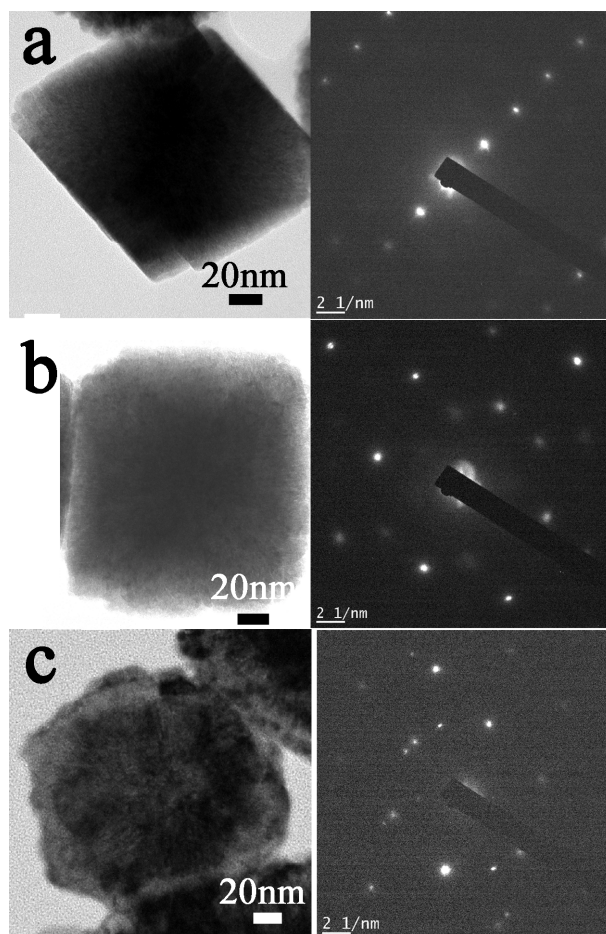


**Fig. S1** TEM images and corresponding SAED patterns of different individual hollow nanocrystals prepared from the conditions: the  $\text{CeCl}_3$  was the cerium precursor and the volume ratio between water and ethanol was 3:1 in the mixed

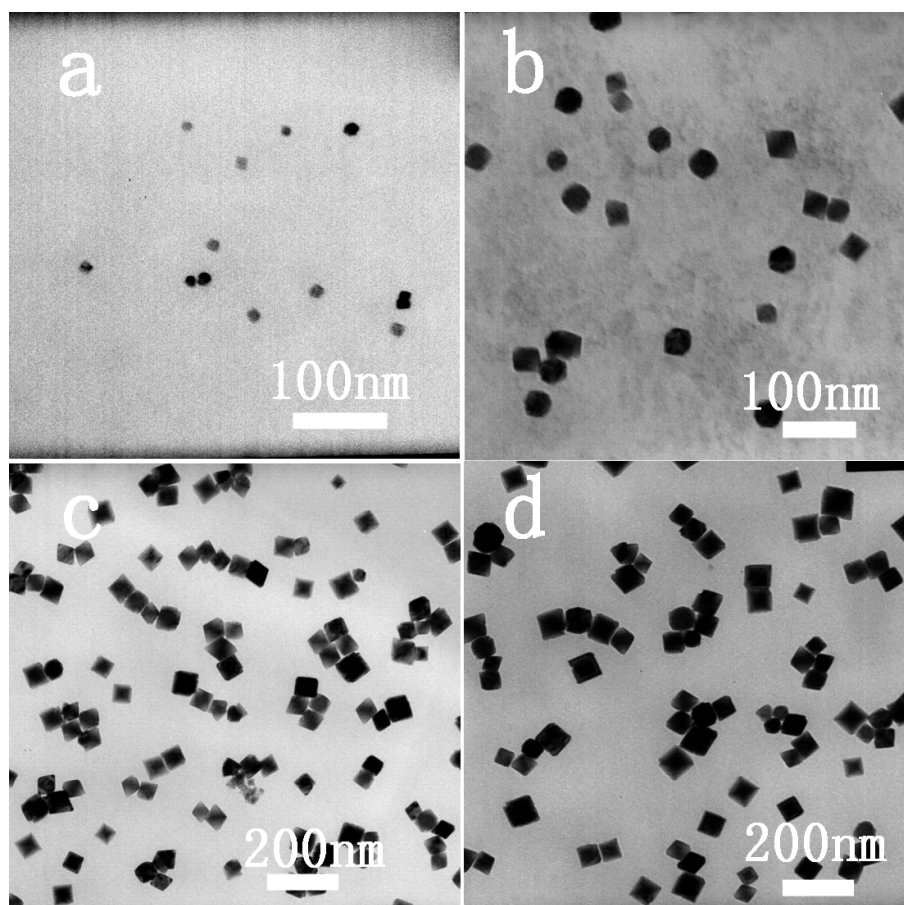
solvent at 160 °C for 24h.



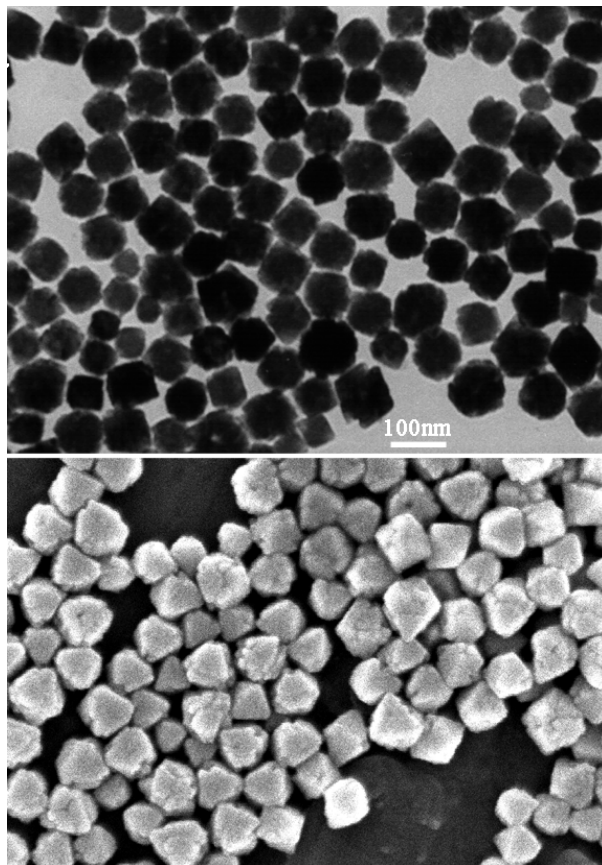
**Fig. S2** TEM images and corresponding SAED patterns of individual nanocrystal obtained at 160°C at different reaction times: (a) 6h; (b) 12 h; (c) 18 h; (d) 24h when the CeCl<sub>3</sub> was the cerium precursor and the volume ratio between water and ethanol was 3:1 in the mixed solvent.



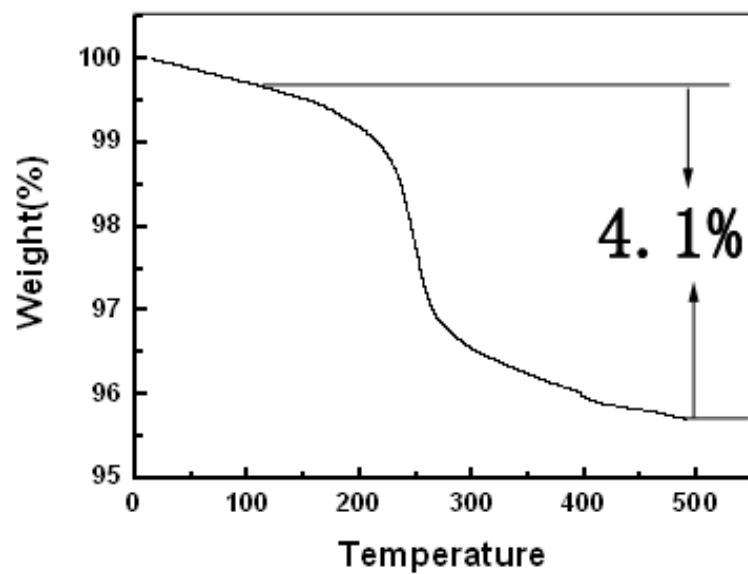
**Fig. S3** TEM images and corresponding SAED patterns of individual CeO<sub>2</sub> nanocrystal with the electron beams parallel to <110>, <100>, and <111>, respectively.



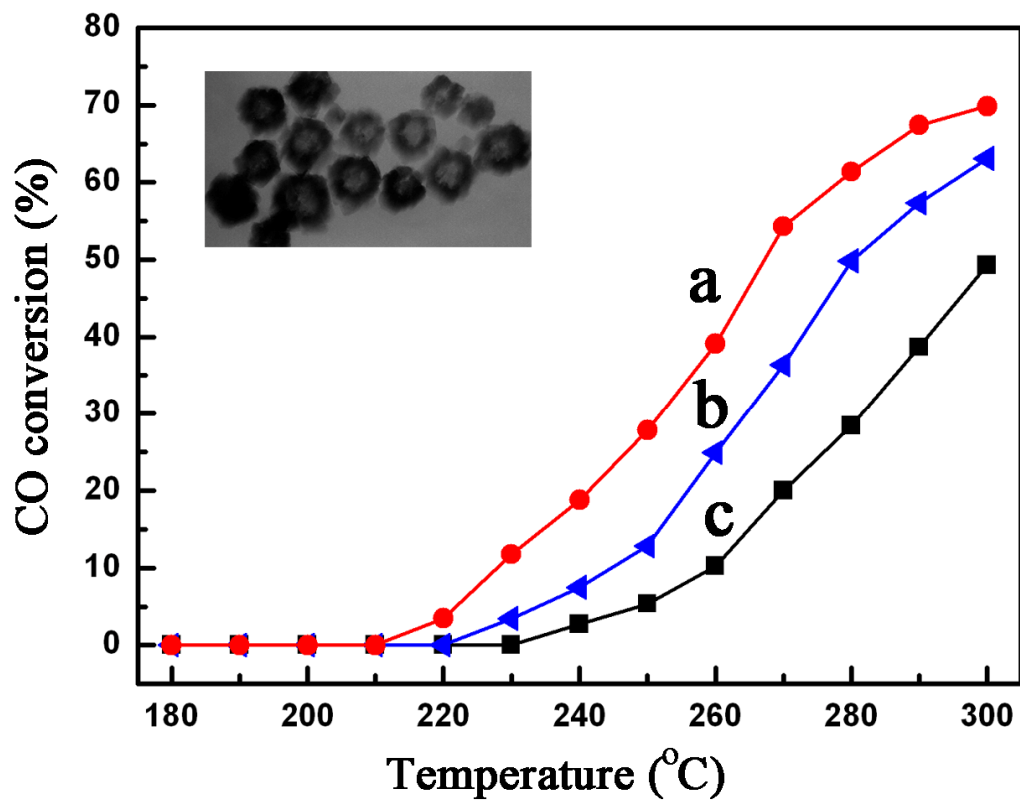
**Fig. S4** TEM images of particles obtained at 160° C at different reaction times: (a) 6h; (b) 12 h; (c) 18 h; (d) 24h with the  $\text{Ce}(\text{NO}_3)_3$  as the cerium precursor and the volume ratio between water and ethanol was 3:1 in the mixed solvent.



**Fig. S5** TEM/SEM images of the nanoparticles synthesized from  $(\text{NH}_4)_2\text{Ce}(\text{NO}_3)_6$  while keeping other experimental parameters constant.



**Fig. S6** TG curve of as-obtained CeO<sub>2</sub> hollow nanocrystals.



**Fig. 7** CO conversion profiles in the presence of CeO<sub>2</sub>: (a) the freshly prepared CeO<sub>2</sub> hollow nanocrystals; (b) the CeO<sub>2</sub> hollow nanocrystals after the first run catalysis evaluation; (c) the commercial CeO<sub>2</sub> powder. Inset is the TEM image of CeO<sub>2</sub> hollow nanocrystals after the first run catalysis evaluation.