Mesoporous CeO$_2$ nanoparticles assembled by hollow nanostructures: formation mechanism and enhanced catalytic property

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**Fig. S1** XRD pattern of the product obtained by the calcination of the cerium formate precursor at 400 °C for 2 h.

**Fig. S2** high-magnification SEM image of the as-prepared CeO$_2$ nanoparticles
Fig. S3 Representative TEM images of CeO$_2$ nanospheres after calcination method via cerium formate precursor: (a) over morphology of the products; (b) TEM image of a single nanosphere.

Fig. S4 N$_2$ adsorption-desorption isotherms of the CeO$_2$ spherical structures after calcination method; inset is the corresponding BJH pore size distribution curve.

Fig. S5 The TEM images of the products of solvothermal reaction: (a) with slow injection of strong ammonia (10M); (b) with PVP instead of OP-10; (c) without OP-10.
Fig. S6 Catalytic performance of the obtained CeO$_2$ in different runs.

Fig. S7 The TEM image of the nano-cone constructed CeO$_2$ nanoparticles after the catalysis.