Controllable synthesis of CeO$_2$ nanospheres with different hollowness and size induced by copper doping

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Fig. S1 The TEM images of the Cu$^{2+}$ doped CeO$_2$ (a-c): P$_2$, P$_3$ and P$_6$.

Fig. S2 EDS spectrum of the Cu$^{2+}$ doped ceria sample.
Fig. S3 The HRTEM images about lattice fringes of the Cu$^{2+}$ doped CeO$_2$: (a, b) P$_3$; (c, d) P$_4$.

Fig. S4 (a) The corresponding XPS survey spectrum of nanospheres: P$_1$ and P$_4$; (b) Ce 3d; (c) O 1s, and (d) Cu 2p. (a), (b) and (c) are P$_1$ and P$_4$ curves, respectively.
Fig. S5 XRD pattern of P$_3$ obtained at different solvothermal time illustrated as (a) 1 h, (b) 2 h, (c) 4 h, (d) 8 h.

Fig.S6 The TEM images of (a) the P$_1$ sample at 36 h and (b) the P$_4$ sample at 2h.
**Fig. S7** $\text{N}_2$ adsorption - desorption isotherms of the pure and Cu$^{2+}$ doped CeO$_2$: (a) $P_1$, (b) $P_2$, (c) $P_3$, (d) $P_4$, (e) $P_5$ and (f) $P_6$. Insets are the corresponding BJH pore size distribution curves.