Electronic Supplementary Information

Experimental section

Materials: Solid spheres, hollow core−shell spheres, hollow spheres and fragments were obtained in the solvothermal alcoholysis of tin protochloride dihydrate ($SnCl_2 \cdot 2H_2O$, 0.54g), ammonium molybdate ($(NH_4)_6Mo_7O_{24} \cdot 4H_2O$, 2.76 g) and sucrose (1.0 g) in mixtures of ethanol (35 ml) and glycerol (15 ml) reacted from 6 h to 48 h at 180℃, respectively. The obtained precipitate was separated by centrifuge and rinsed several times using distilled water and ethanol. And then the product was dried under vacuum at 60 ℃ overnight. Finally, brown products heated in a furnace at 400 ℃ for 2 h in air to remove water and some impure substances, and the dark green powders of MoO_3-SnO_2/C were obtained.

Characterization: X-ray diffraction (XRD) was carried out to identity the phase composition of synthesized samples over the 2θ range from 20° to 90° using a Rigaku D/max-A diffractometer with Co Kα radiation. A Fourier transform infrared spectroscope (FTIR, Themo Nicolet 670FT-IR) was used for recording the FTIR spectra of the sample ranging from 400 to 4000 cm^{-1}. Morphologies of the synthesized samples were observed with a AMRAY 1000B scanning electron microscope (SEM), and the microstructural characteristics of samples were observed by high-resolution transmission electron microscope (HR-TEM, JEOL JEM-2010) working at 200 kV accelerating voltage and the lattice structure was identified by selected area electron diffraction (SAED) technique. Nitrogen adsorption-desorption measurements were conducted at 77 K on a Micromeritics Tristar apparatus. Specific surface areas were determined following the Brunauer-Emmet-Teller analysis.

Electrochemical Measurements: For electrochemical performance evaluation, half-cell studies were performed. In the experimental electrode, acetylene black powder and polyvinylidene fluoride (PVDF) were used as conductive additive and binder. The synthesized active materials were mixed with acetylene black and PVDF dissolved in N-methyl-pyrrolidinone in the weight ratio of 80:10:10 to form slurry, which was painted on a copper foil used as current collector. After solvent evaporation, the electrode was pressed and dried at 120℃ under vacuum for 48 h. The cells were assembled in argon filled glove-box. Metallic lithium foil was used as counter electrode. The electrolyte was 1M $LiPF_6$ in a mixture of ethylene carbonate (EC) and dimethyl carbonate (DMC) (1:1 in vol. ratio). Cycling tests were carried out at the charge and discharge current density of 100 mAg^{-1}, in the voltage range of 0.01-3.0 V versus Li/Li^+ by Land 2100A tester. Cyclic voltammetry was performed between 0.01 and 3.0 V with scan rate of 0.05 mVs^{-1}.

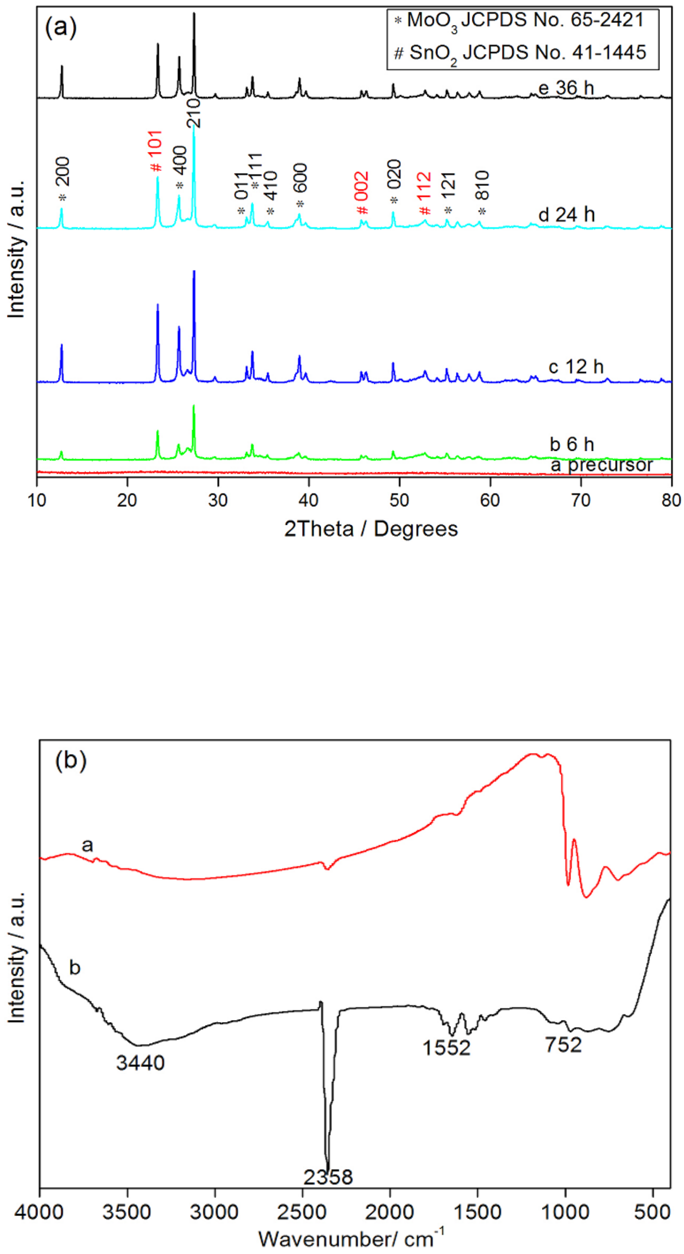

Fig. S1 (a) XRD pattern of hollow core-shell MoO_3-SnO_2 samples prepared by alcoholysis synthesis process and subsequent calcinations at 400 ℃. (b) FTIR spectra of the prepared MoO_3-SnO_2 hollow core-shell sample of 24 h corresponding to curve a and its precursor corresponding to curve b.

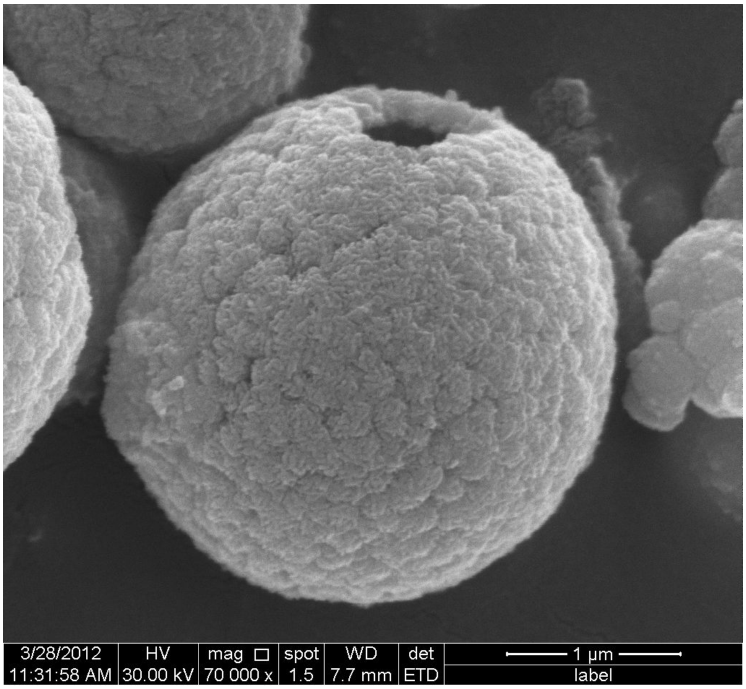

Fig. S2 SEM image of the obtained hollow TiO_2 microsphere.

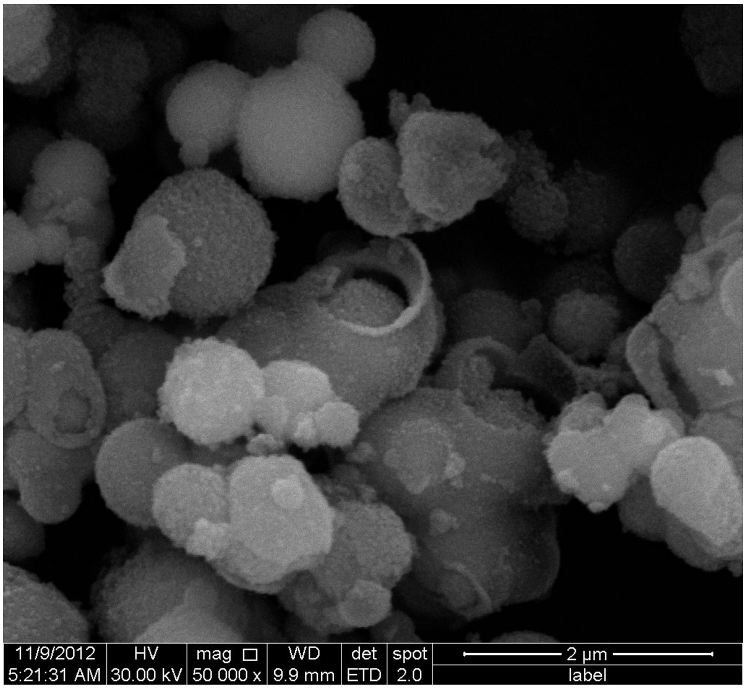

Fig. S3 SEM image of the obtained hollow CeO_2 microsphere.

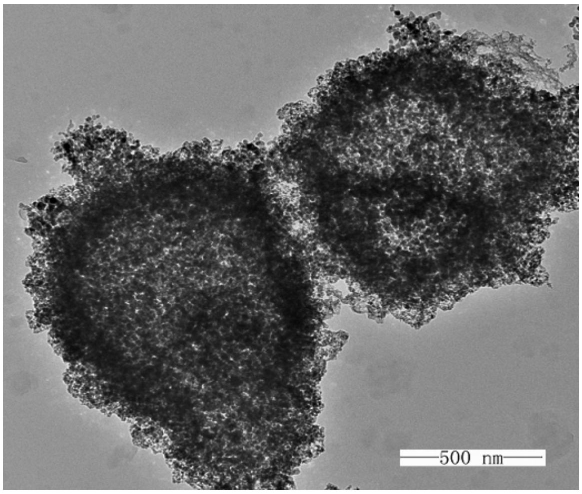

Fig. S4 TEM image of hybrid hollow MoO_3-SnO_2@C hybrid electrodes after 200 cycles at current density of 500 mAg^{-1}.

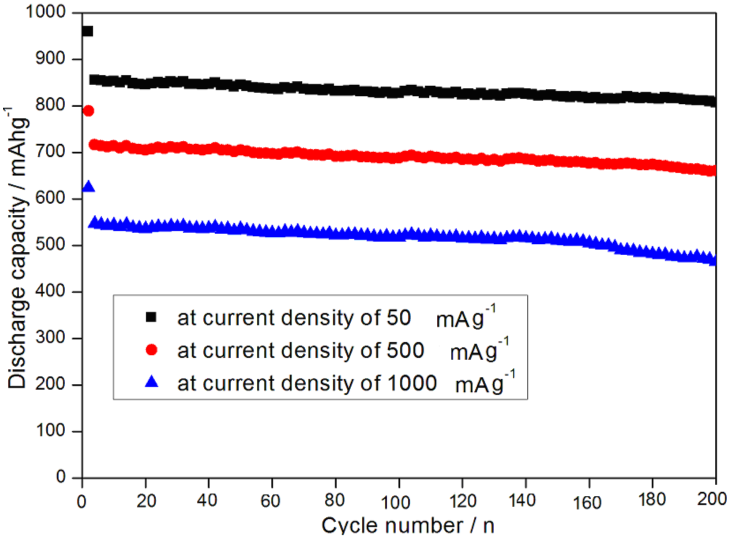

Fig. S5 Cycling performance of MoO_3-SnO_2 (24 h) electrode at 50 mAg^{-1}, 500 mAg^{-1} and 1000 mAg^{-1}, respectively.