Supporting Information

Space-Confined Synthesis of Ultra-Small SnO_2 Nanodots within Ordered Mesoporous Carbon CMK-3 for High-Performance Lithium Ion Batteries

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Experimental Section.

Materials characterization. The crystal structures of products were tested by using X-ray diffractometer (XRD, Bruker D2 PHASER, Cu Kα radiation, λ=1.5418Å) operating at 30 kV and 10 mA. Scanning electron microscopy (SEM) images were obtained on a FEI Quanta 250 SEM, while transmission electron microscopy (TEM) images as well as the high-angle annular dark field (HAADF) scanning TEM (STEM) images were taken on a JEOL F200 equipped with energy dispersive spectrometer (EDS) at an operating voltage of 200 kV. Raman spectroscopy was performed on a Renishaw Raman RE01 spectrometer equipped with 514 nm Ar laser. X-ray photoelectron spectroscopy (XPS) was performed on a Thermo Fisher XPS instrument (ESCALAB Xi+). Thermogravimetric analysis (TGA) was conducted in air on a Mattler thermal analysis TGA/DSC system.

Electrochemical measurements. The electrochemical properties of the targeting materials were measured by using standard CR2025 type coin cells, which were assembled in Ar-filled glovebox where both H_2O and O_2 content were less than 0.1 ppm. For the fabrication of the working electrodes, a slurry was prepared by mixing the active material, acetylene carbon black, poly (vinyl difluoride) (PVDF) binder in a weight ratio of 7: 2: 1 with N-methyl-2-pyrrolidone (NMP) as solvent, and the slurry was uniformly coated on Cu foil and then dried in a vacuum oven at 120 ℃ overnight. Lithium foil and a Celgard 2400 microporous membrane were used as the counter electrode and the separator, respectively. The electrolyte consisting of 1.0M LiPF6 in ethylene carbon/dimethyl carbonate (1/1 in volume) was adopted. Galvanostatic discharge-charge measurement was performed on NEWARE battery test system (Neware Technology Co., Ltd., China) in 0.01-3.0 V (vs. Li/Li+) at room temperature. Cyclic voltammetry (CV) and the electrochemical impedance spectroscopy (EIS) was conducted on Autolab PGSTAT 302 N electrochemical station. The specific capacities were based on the weight of the active materials.

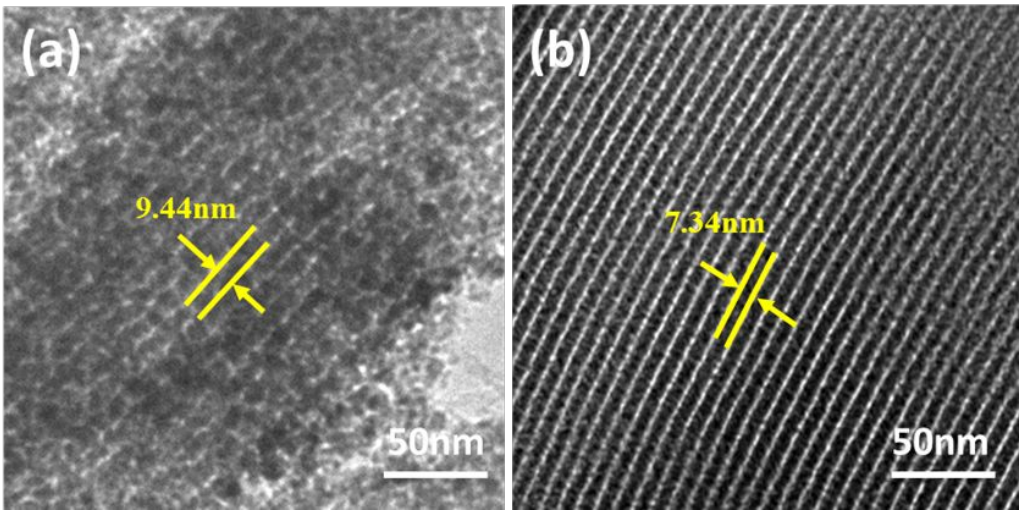

Figure S1. TEM images of the channels spacings of (a) SnO_2/CMK-3 and (b) CMK-3.

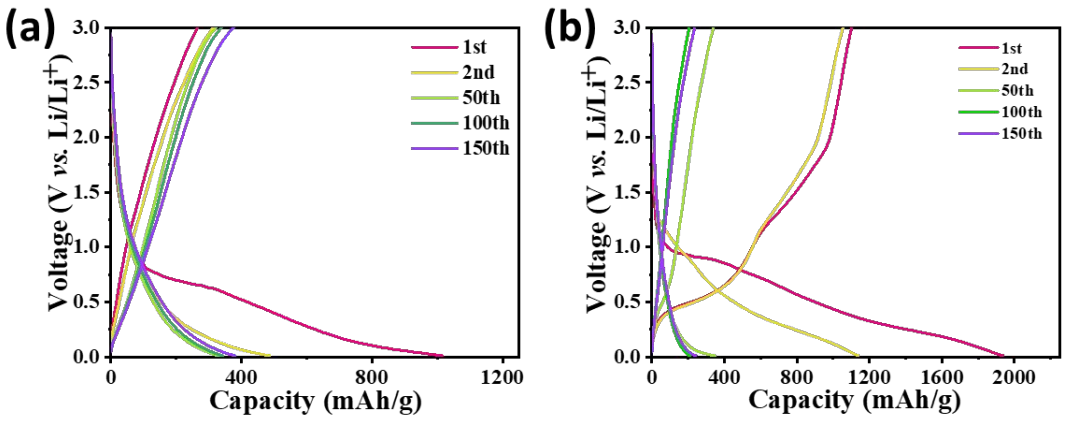

Figure S2. Galvanostatic discharge/charge profiles of (a) CMK-3 and (b) SnO_2 at the current densities of 500 mA/g in 0.01-3.0 V (corresponding in Figure 5b), respectively.

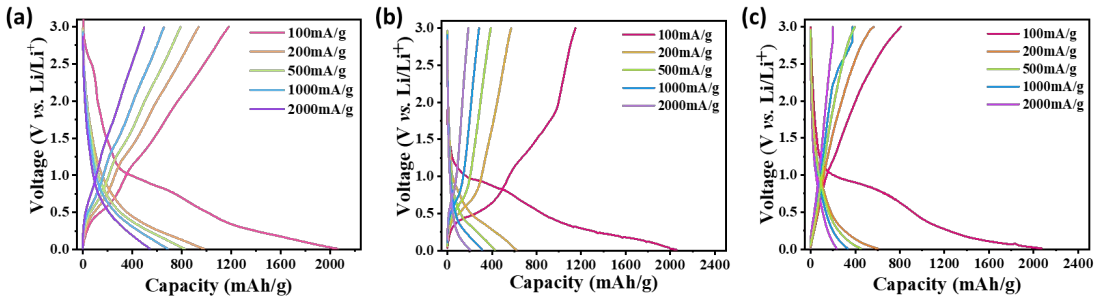

Figure S3. Galvanostatic discharge/charge profiles of (a) SnO_2/CMK-3, (b) SnO_2, (c) CMK-3 at the current densities of 100, 200, 500, 1000, 2000 mA/g in 0.01-3.0 V (corresponding in Figure 5c), respectively.

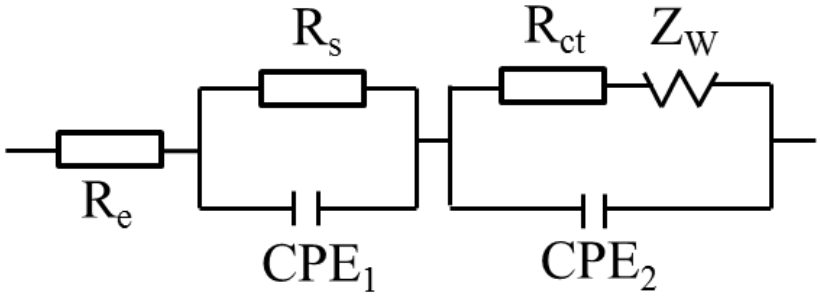

Figure S4. The equivalent circuits model.

In the equivalent circuit model, Re corresponds to electrolyte resistance, Rs and CPE_1 represent surface resistance and capacitance, respectively, Rct and CPE_2 are related to charge transfer resistance and double layer capacitance, respectively, and Zw is attached to the Warburg component. The depressed semicircle is associated with the combination of surface resistance (Rs) and charge transfer resistance (Rct), while the linear part is related to the Warburg component (Zw) that describes the lithium-ion diffusion in the product.