Supporting Information for

Mesoporous Carbon Coated Molybdenum Oxide Nanobelts for Improved Lithium Ion Storage

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Experimental Section

Materials and synthesis

In a typical synthesis, 2.47 g of $(NH_4)_6Mo_7O_{24}\cdot 4H_2O$ and 1.0 g of the amphiphilic triblock copolymer (Pluronic F127) were mixed in a 40 ml of HNO₃ solution (10 mL HNO₃ and 30 mL H₂O), followed by incubation in an autoclave. The autoclave was placed at 180 °C for 24 h. Then the MoO₃ powder products in the solution were collected by centrifugation. A water-soluble phenolic resol with a molecular weight of ~ 500 was prepared by polymerizing phenol and formaldehyde using a base catalyst. For the synthesis of the MoO_x@meso-C nanocomposites, 0.3 g of MoO₃ and 0.1 g of Pluronic F127 were mixed with 2.0 g of phenolic resol (~ 5 % in ethanol), and stirred for 2 h. Then the mixture was poured in a glass culture dish. For comparison, a certain amount of homogeneous solution containing 1.0 g of resol (20% in ethonal), 0.2 g of Pluronic F127 was poured in another dish for producing mesoporous carbon. After drying, the samples were scraped and annealed at 500 °C for 2 h in N₂ gas, and then were ready for the structural characterization, battery assembly and electrochemical tests.

Structural characterization

Scanning electron microscopy images were carried out on a FE-SEM S-4800 scanning electron microscope (Hitachi, Japan). Transmission electron microscopy images were conducted on a JEM-2100F field-emission TEM with an acceleration voltage of 200 kV (Jeol, Japan). X-ray

diffraction patterns were scanned by an X-ray single crystal diffractometer (Bruker SMART APEX (II)-CCD, Germany, D8). Nitrogen sorption isotherms were measured using a Micromeritics Tristar 3000 analyzer at -196 °C. The Brunauer-Emmett-Teller (BET) method was utilized to calculate the specific surface area (S_{BET}) using the absorption data. X-ray photoelectron spectroscopy was recorded on a Perkin-Elmer PHI 5000C ESCA system. The cyclic voltammetry plot and electrochemical impedance spectroscopy (EIS) were measured by the CHI660D potentiostat.

Battery fabrication and measurements

The batteries were assembled in a glove box equipped with Ar gas. The contents of moisture and oxygen were less than 1 ppm. For each sample, 80 mg of the powder was mixed with 10 mg of acetylene black and 10 mg of poly-(vinylidene fluoride) (PVDF), and dispersed in a 0.4 ml of N-methylpyrrolidone (NMP) solvent to form a homogeneous slurry, which was uniformly coated on a Cu foil and dried at 80 °C in a vacuum oven for over 12 h before use. The electrolyte used for battery assembly was 1 M LiPF₆ dissolved in an ethylene carbonate (EC)/diethyl carbonate (DEC) with a 1:1 weight ratio. Li foils were chosen as the cathode materials. All cells were tested using a battery tester (Neware Co., China) between 3.0 - 0.01 V (vs Li⁺/Li) in the galvanostatic charge-discharge mode.

Supporting Figures



Figure S1. EDX spectrum of the MoO₃ nanobelt samples.



Figure S2. High-resolution SEM image of $MoO_x@meso-C$ nanocomposite after the carbon coating. The scale bar is 500 nm.



Figure S3. High resolution TEM image of mesoporous carbon layer. The white arrows indicate a repeating unit of pores in the mesoporous carbon of the whole composite. The scale bar is 10 nm.



Figure S4. Mo 3*d* spectra (red line) of MoO₃ nanobelts. The decomposed lines (dashed line in green) show the Mo $3d_{3/2}$ and $3d_{5/2}$.



Figure S5. Voltage profiles for selected galvanostatic cycles of the MoO₃ nanobelt samples.