

Porous Mn_2O_3 microsphere as a superior anode material for lithium ion batteries

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Experimental section

2.1. Synthesis of MnCO_3 microspheres

MnCO_3 microspheres were prepared by a low temperature solvothermal method. All of the reactants and solvents were analytical grade and were used without any further purification. In a typical procedure, 15 mmol of $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$ was dissolved into 30 mL of ethylene glycol (EG), adding 1.0 g of PEG-1200 and 0.54 g deionized water. Then 45 mmol of urea was added slowly under continues stirring, and a homogenous suspension was obtained. The reaction mixture was vigorously stirred for 1 h and then transferred into a Teflon-lined stainless-steel autoclave with a capacity of 50 mL for solvothermal treatment at 200 °C for 24 h. After the autoclave had cooled down to room temperature naturally, the product was centrifuged, washed with distilled water and anhydrous ethanol several times, and finally dried under vacuum at 80 °C for 12 h.

2.2. Synthesis of porous Mn_2O_3 microspheres

porous Mn_2O_3 microspheres were prepared by thermal decomposition of MnCO_3 microspheres at 600 °C for 2 h in air.

2.3. Characterization

X-ray diffraction (XRD) patterns of the samples were obtained using a Bruker D8 ADVANCE powder diffractometer using $\text{Cu K}\alpha$ radiation at 40 kV and 40 mA at a step of 0.020. Data were recorded ranging from 10° to 80°. Field emission scanning electron

microscopy (SEM) was performed on a JEOL 6300F scanning electron microscope. The N₂ adsorption/desorption surface area was characterized using a TriStar II 3020 surface area analyzer.

2.4. Electrochemical measurement

The composite electrodes consisted of 70% Mn₂O₃, 20% acetylene black and 10% polyvinylidene fluoride (PVDF) by weight and were prepared by coating the mixture on copper foils. The testing 2025 coin cells use lithium foil as counter electrode, polypropylene micro porous membrane as separator and 1M LiPF₆ dissolved in ethylene carbonate (EC), dimethyl carbonate (DMC) and ethylene methyl carbonate (EMC) (1:1:1, v/v/v) as the electrolyte. The cells were assembled in an argon-filled glove box. The charge–discharge measurements were carried out using a Neware Battery Testing System (CT3008W) at 100 mA g⁻¹ in the range of 3.0–0.01 V vs. Li/Li⁺.

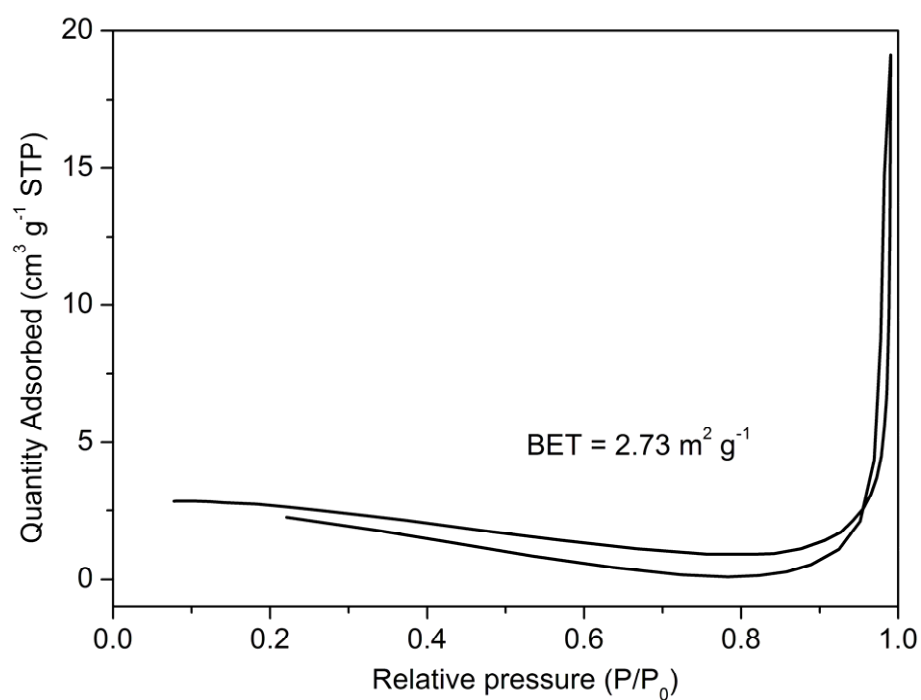


Fig. S1. N₂ adsorption/desorption isotherm of porous Mn₂O₃ microspheres and the corresponding BET.

Fig. S2

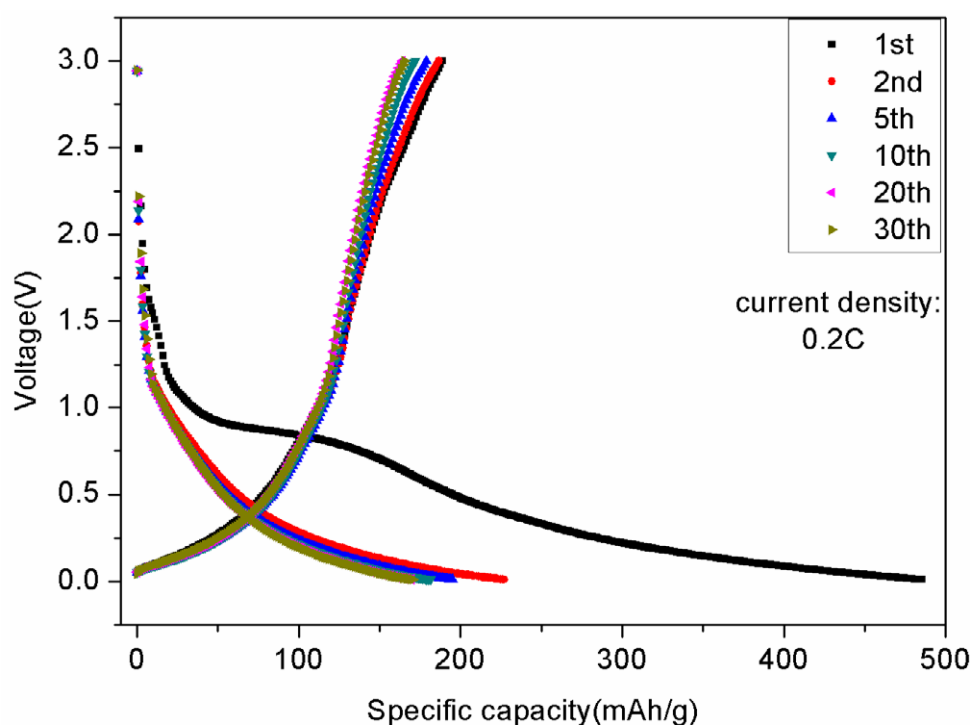


Fig. S2. The discharge and charge curves of the acetylene black/Li cell at a current density of 0.2 C. The cycle numbers are indicated in the graph.

Fig. S3

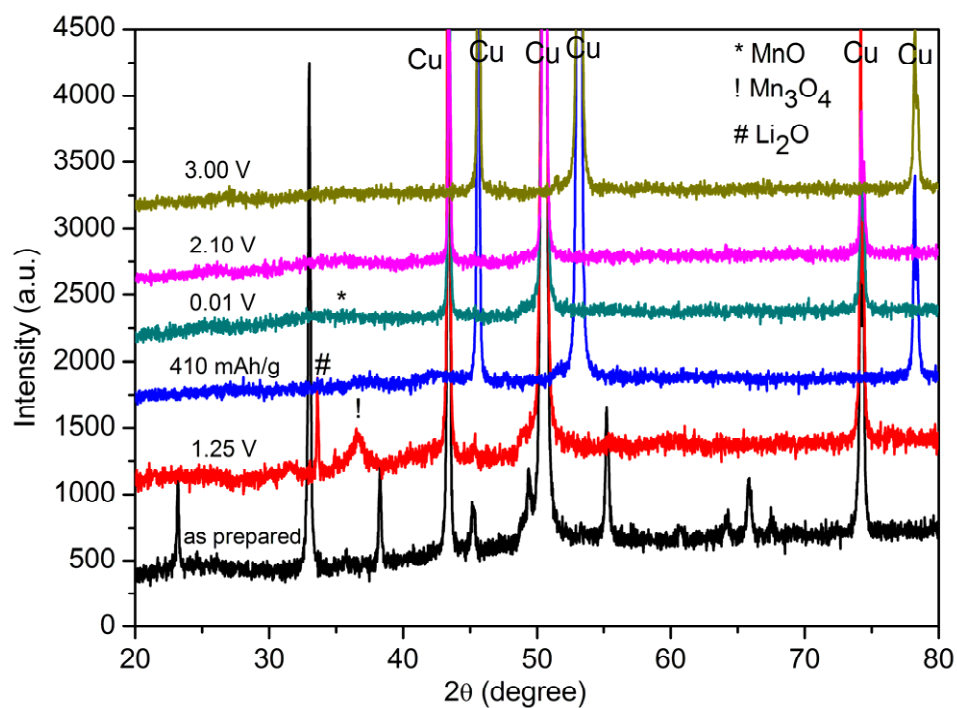


Fig. S3. *Ex situ* XRD patterns of discharged and charged to the selected voltage in the initial cycle.