Metal-organic nanofibers as anodes for lithium-ion batteries

Chongchong Zhao, *a,b* Cai Shen**a*, and Weiqiang Han**a*

Synthesis of Suc-Cu MOFs and Fum-Cu MOFs

Metal organic frameworks of Suc-Cu and Fum-Cu were prepared by the following steps: Firstly, an aqueous solution of $Cu(NO_3)_2 \cdot 6H_2O$ (4.5 mmol, 6ml) was added to a 30 ml aqueous solution containing a mixture of NaOH (6 mmol) and succinic acid (or fumaric acid) (3 mmol) at room temperature. The solution immediately turned into a deep blue colour and the growth of blue flocculent was observed. The solution was then washed six times with distilled water and ethanol solution (1:1), followed by centrifugation. The product was dried in a vacuum oven at 80°C for 10 h.

Electrochemical measurements

Electrochemical measurements were carried out using a 2032-type coin cell system. All the composite anode electrodes were prepared by mixing 70wt% active materials, 20wt% conductive carbon black (super P), and 10wt% polyvinylidenefluoride (PVDF). N-methyl-2-pyrrolidone (NMP) was used as solvent to form a slurry onto Cu current collectors. Metallic lithium was used as counter electrode, and Celgard 2400 polypropylene was used as separator. 1M Lithium Hexafluorophosphate (LiPF₆) in a mixture of fluoroethylene carbonate / ethyl methyl carbonate/ dimethyl carbonate (FEC/EMC/DMC, 1:1:1 in volume ratio) were used as electrolytes. Charge/discharge measurements were carried out galvanostatically at various current densities over a voltage range of 0.01–3.0 V (vs. Li/Li⁺) using a commercial battery test system (LAND model, CT2001A) at 30°C.



Figure S1. Cycling performance and coulombic efficiency of aspartic acid at current densities of 50 mA/g.



Figure S2. SEM image (a) and XRD pattern (b) of Suc-Cu nanofibers.



Figure S3. SEM image (a) and XRD pattern (b) of Fum-Cu MOFs.



Figure S4. Cycling performance and coulombic efficiency of Asp-Cu, Suc-Cu, and Fum-Cu MOFs at current densities of 100 mA/g.



Figure S5. Thermogravimetric curve of the Asp-Cu nanofibers in air atmosphere with a heating rate of 10 °C/min from 30 °C to 300 °C (insert: nitrogen atmosphere).



Figure S6. Nitrogen adsorption-desorption isotherms (a) and the corresponding pore size distribution (b) of Asp-Cu nanofibers.