Electronic Supplementary Information (ESI)

One-pot synthesis of mesoporous interconnected carbon-encapsulated Fe_3O_4 nanospheres as superior anodes for Li-ion batteries

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Experimental section

Preparation of mesoporous interconnected Fe_3O_4@C nanospheres

In a typical synthesis process of mesoporous interconnected Fe_3O_4@C nanospheres, ferrocene (0.3 g) and hydrogen peroxide (0.5 mL) were dissolved in 20–40 mL acetone, and stirred for about 1 h. After a clear transparent solution was formed, the mixture was then transferred into a 30–50 mL Teflon-lined stainless steel autoclave, which was sealed and maintained at 210 ºC for 24 h. The as-synthesized sample was further annealed at 450 ºC in a N_2 flow to obtain the final product of Fe_3O_4/C nanospheres.

Preparation of hierarchical bare Fe_3O_4 nanospheres

In a typical synthesis of hierarchical bare Fe_3O_4 nanospheres, 4 mmol $FeCl_3 \cdot 6H_2O$, 8 mmol sodium citrate and 12 mmol urea were dissoloved in distilled water. Then 0.3 g polyacrylamide was added under continuous stirring until it was dissolved totally. The solution was transferred to a 50 mL Teflon-lined autoclave. The autoclave was then sealed and maintained at 190 ºC for 12 h.

Characterization

The collected products were characterized by an X-ray diffractometry (XRD) on a Rigaku-DMax 2400 diffractometer equipped with the graphite monochromatized Cu Kα radiation flux at a scanning rate of 0.02°s–1. The structure of these mesoporous

interconnected Fe_3O_4@C nanospheres was investigated by means of Scanning electron microscopy (SEM, JSM-6700F) and transmission electron microscopy (TEM, Philips, TecnaiG2 20). The N_2 adsorption/desorption isotherm was obtained at 77 K using Beishide Instrument-ST, 3H-2000PS2. The BET surface area was estimated using adsorption data in a relative pressure ranging from 0.05 to 0.3. The thermogravimetric analysis (TGA) was performed from room temperature to 800 °C at a ramp rate of 20 °C/min with an air flow rate of 20 mL/min using Q50 TGA. The electron conductivity was measured by Keithley 4200 Semiconductor Characterization System.

Electrochemical measurements

The electrochemical performances of the as-prepared products were measured by using CR2025 coin cells at 0.01–3.00V with NEWARE-BTS-5V20mA battery test system. For the preparation of the working electrode, a mixture of mesoporous interconnected Fe_3O_4@C active material, carbon black, and polyvinylidene fluoride (PVDF) in the weight ratio of 80:15:5 was ground in a mortar with *N*-methy1-2-pyrrolidone (NMP) as solvent to make slurry. A Li foil was used as the counter electrode and a solution of 1M $LiPF_6$ in ethylene carbonate (EC)/diethyl carbonate (DEC) (1:1 in volume) was used as electrolyte.

Table R1

Electrical conductivities of prepared samples

Sample	Fe_3O_4	Fe_3O_4@C
σ (S/cm)	1.15×10^{-2}	2.5

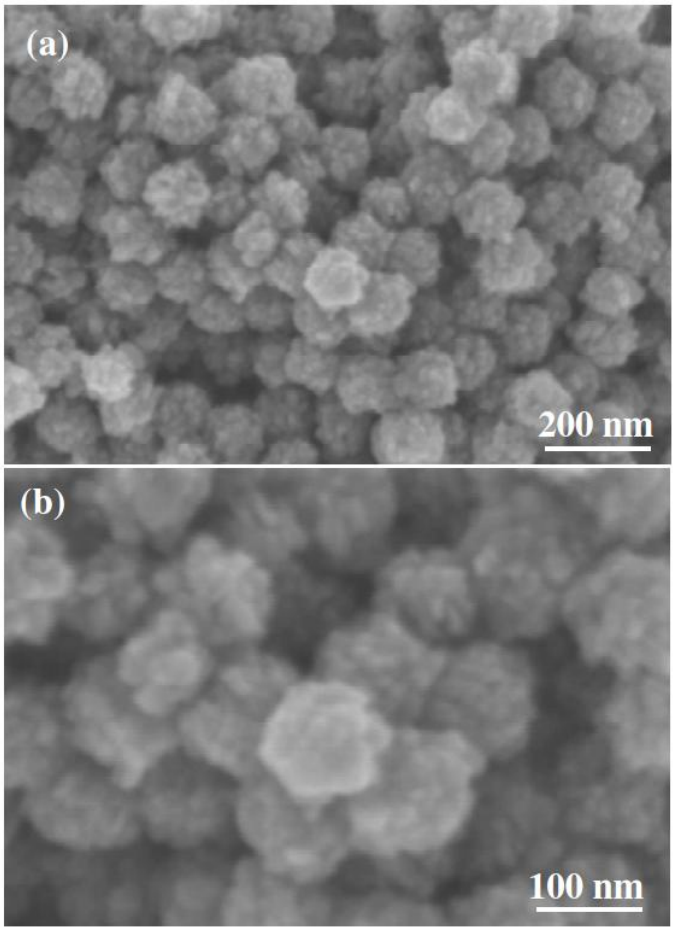

Fig. S1 SEM images of hierarchical bare Fe_3O_4 nanospheres.