

## Electronic Supplementary Information

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### **Self-sacrifice template formation of ultrathin single-crystalline ZnMn<sub>2</sub>O<sub>4</sub> nanoplates with enhanced Li-storage behaviors for Li-ion batteries**

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#### **Experimental Section**

*Materials Synthesis.* All the chemicals were of analytical grade, and used directly without further purification. Graphene oxide (GO) was synthesized from natural graphite by a modified Hummers method as described by us before.<sup>1,2</sup> 30 mL of aqueous GO solution (0.1 mg mL<sup>-1</sup>) was mixed with 0.0826 g of KMn<sub>2</sub>O<sub>4</sub> under ultrasonication. The mixture was transferred to a Teflon-lined autoclave and hydrothermally treated at 160 °C just for 10 min. The as-obtained product (denoted as MnO<sub>2</sub>) after filtering and washing for several times was directly dispersed into 20 mL of de-ionized (DI) water with 0.0594 g of Zn(NO<sub>3</sub>)<sub>2</sub>. Under vigorous stirring, 10 mL of freshly-prepared NaBH<sub>4</sub> solution (NaBH<sub>4</sub> dissolved in NaOH solution, pH = 12) was added dropwise to the above mixture, and then stirred for 6 h. The resulting precipitate was filtered, washed repeatedly with DI water to

remove residual ions, and further vacuum-dried. Finally, the ZnMn<sub>2</sub>O<sub>4</sub> product was fabricated.

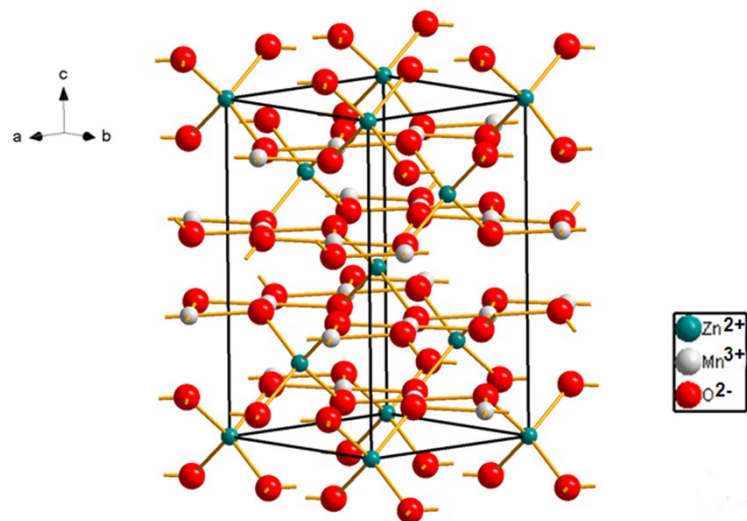
*Materials Characterization.* The samples were examined by powder X-ray diffraction (XRD) (Max 18 XCE, Japan) using a Cu K $\alpha$  source ( $\lambda = 0.154056$  nm) at a scanning speed of 3° min<sup>-1</sup> over a  $2\theta$  range of 10 – 70 °. The morphologies and structures were observed with transmission electron microscope (TEM), and high-resolution TEM (HRTEM) (JEOL JEM 2100 system operating at 200 kV) with energy dispersive X-ray spectrometer (EDS) elemental mapping analysis. Fourier transform infrared (FT-IR) spectrum was measured on a Shimadzu FT-IR-8400S spectrometer.

*Electrochemical Measurements.* The working electrode consisted of the ZnMn<sub>2</sub>O<sub>4</sub> NPs, conductive material (acetylene black, Super-P-Li), and sodium carboxymethyl cellulose (CMC, average  $M_w$ : ~250 000) at a weight ratio of 70 : 20 : 10 with water as a solvent upon the copper foil substrate. The resultant slurry was uniformly spread onto pure Cu foil using a doctor blade, and dried in a vacuum oven overnight at 100 °C overnight. CR2032-type coin cells were fabricated by sandwiching a porous Cellgard 2400 separator between the working electrode and Li metal foil (Cyprus Foote Mineral, 99.98%, USA) in a high-purity Ar-filled glove box with both the moisture and the oxygen content below 0.5 ppm. The typical loading of electrode materials per electrode is ~1.1 mg. The electrolyte used here was 1 M LiPF<sub>6</sub> in a mixed solvent of ethylene carbonate (EC), dimethylcarbonate (DMC) and diethyl carbonate (DEC) (1 : 1 : 1, V/V/V) as the electrolyte. Galvanostatic discharge and charge cycling of the cells were conducted by using a CT2001A tester (Wuhan, China) at several different rates as indicated between cut-off potentials of 0.01 and 3.00 V (vs. Li/Li<sup>+</sup>). Cyclic voltammogram (CV) was performed by an IVIUM electrochemical workstation (the Netherlands).

[1] C. Z. Yuan, L. H. Zhang, L. R. HOu, G. Pang and W. C. Oh, *RSC Adv.*, **2014**, 4, 14408.

[2] C. Z. Yuan, L. Yang, L. R. Hou, J. Y. Li, Y. X. Sun, X. G. Zhang, L. F. Shen, X. J. Lu, S. L.

Xiong and X. W. Lou, *Adv. Funct. Mater.*, **2012**, 22, 2560.



**Fig. S1** Typical crystallographic structure of the spinel ZnMn<sub>2</sub>O<sub>4</sub>

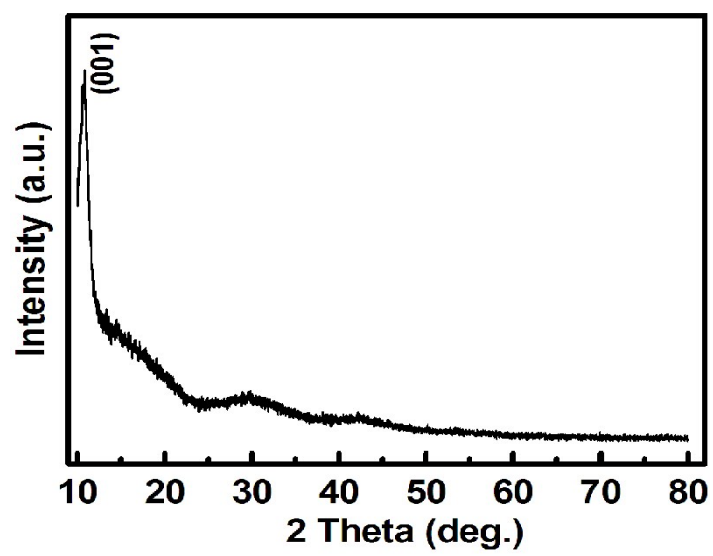
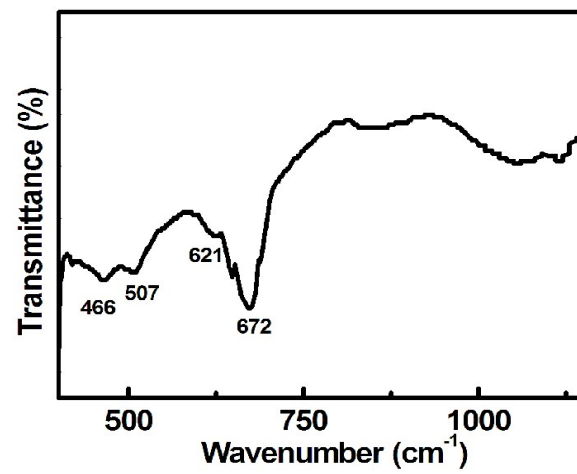
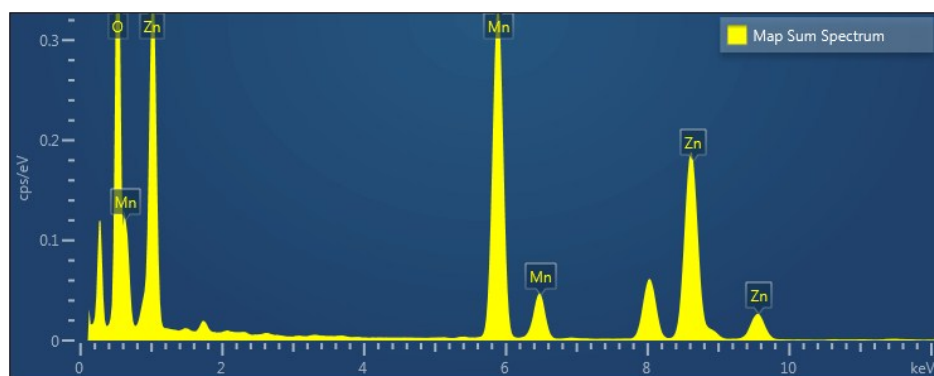


Fig. S2 XRD pattern of the as-obtained GO product



**Fig. S3** FT-IR spectrum data of the resultant ZMO NPs sample



**Fig. S4** EDS data of the resultant ZMO NPs sample