**Supporting Information**

# Three-Dimensional Crumpled Reduced Graphene Oxide/$MoS_2$ Nanoflowers: A Stable Anode for Lithium-Ion Batteries

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EXPERIMENTAL SECTION

All the reagents used in the experiment are analytical grade without further purification. Commercial carbon fiber cloths were cleaned in 0.1 M HCl solution, deionized water and ethanol with ultrasonic treatment for 30 minutes, respectively.

**Preparation of MS and MS-CG.** Nanosheet-assembled $MoS_2$ nanoflowers were prepared through a facile hydrothermal method. In a typical procedure, $Na_2MoO_4$ (1 mmol) and $CSN_2H_4$ (9 mmol) were dissolved in deionized water (65 mL) under stirring to get a transparent solution. Then the solution was transferred into a 100 mL Teflon-lined stainless steel autoclave with a piece of cleaned carbon fiber cloth (3*4 $cm^2$) immersed into the reaction solution. The autoclave was sealed and maintained at 180 $^oC$ for 24 hours, and cooled to room temperature. The carbon fiber cloths were taken out, ultrasonically cleaned for 5 minutes in deionized water and rinsed with ethanol for several times, dried at 70 $^oC$ for 12 hours and finally annealed at 750 $^oC$ for 2 hours in a $H_2$/Ar (5%/95%) atmosphere. The MS-CG were obtained via replacing the deionized water (65 mL) by the deionized water (60 mL) and graphene oxide suspension (5 mL, synthesized through a modified Hummer's method).

**Preparation of plain RGO/$MoS_2$ nanoflowers (MS-PG).** The procedure was carried out in a three-electrode system, using the MS electrode as the working electrode, Ag/AgCl as the reference electrode and Pt foil as the counter electrode. Electrolyte for electrochemical deposition was obtained by dissolving amount of graphene oxide suspension (synthesized through a modified Hummer's method). into $Na_2HPO_4$ solution (100 mL, 0.1 M). The graphene oxide was deposited and partial

reduced through a chronopotentionmetry method at a constant current of 2 mA/cm$^2$ in a potential range of (-2)-0 V for 300 seconds. And then the electrode was rinsed with deionized water several times and dried at 70 $^{o}$C for 6 hours.

**Characterizations.** X-ray diffraction (XRD) measurements were performed by using a Bruker D8 Advance X-ray diffractometer with a non-monochromated Cu Kα X-ray source. Raman spectra were acquired using a Renishaw RM-1000 laser Raman microscopy system. X-ray photoelectron spectroscopy (XPS) analysis was done on VG Multilab 2000. Field emission scanning electron microscopy (FESEM) images were collected using a JEOL JSM-7100F at an acceleration voltage of 20 kV. Transmission electron microscopy (TEM) and high resolution TEM (HRTEM) images were recorded using a JEOL JEM-2100F STEM/EDS microscope. The sample of TEM and HRTEM was peeled off from MS-CG by ultrasonication. Energy dispersive spectroscopy (EDS) were recorded by using Oxford EDS IE250.

**Electrochemical Measurements.** The electrochemical properties were characterized by means of 2016 coin cells using lithium metal foil as the anode, and as-prepared materials without any further treatment as cathode. The electrolyte was 1 M $LiPF_6$/EC (ethylene carbonate) + DMC (dimethyl carbonate) (1:1 vol/vol). The cells were assembled in an argon filled glove-box. Galvanostatic charge–discharge measurements were performed using a multichannel battery testing system (LAND CT2001A). Cyclic voltammetry (CV) and electrochemical impedance spectra (EIS) were performed using an Autolab PGSTAT 302N. All the measurements were carried out at room temperature.

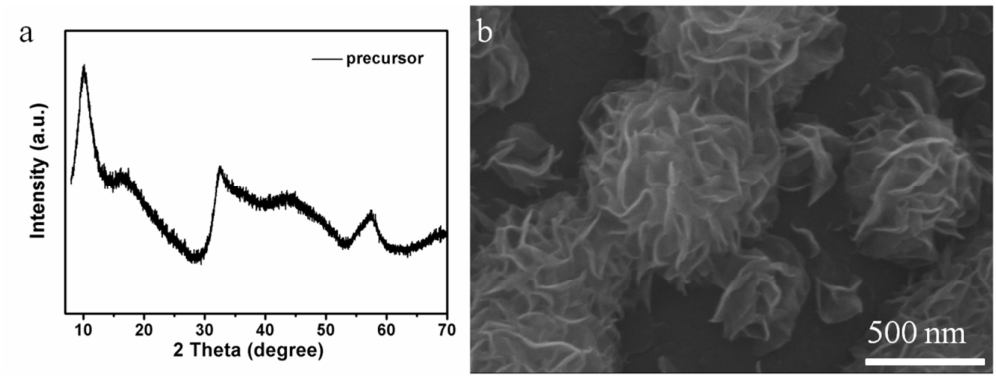


**Figure S1.** (a) XRD pattern and (b) FESEM image of the MS precursor without heat treatment under $H_2$/Ar (5%/95%).

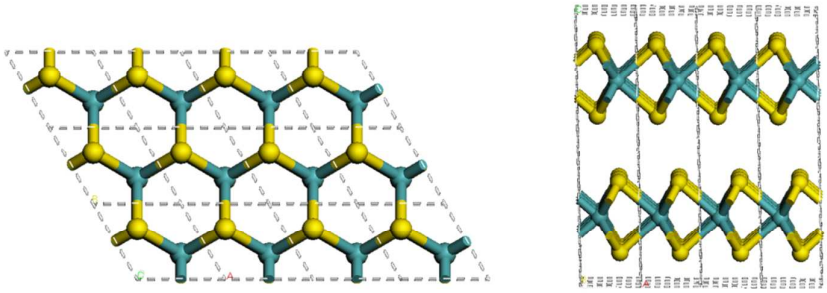

**Figure S2.** Stick and ball lattice structure of the hexagonal 2H phase $MoS_2$. Blue and yellow spheres represent molybdenum (Mo) and surplus (S) atoms, respectively. In detail, the S atoms in the lattice adopt a hexagonal close-packing structure. The Mo atoms are sandwiched between two atomic layers of S, and each Mo is coordinated with six S atoms.

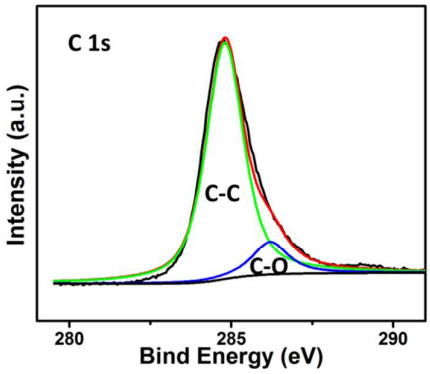


**Figure S3.** The high resolution C 1s spectrum of MS-CG.

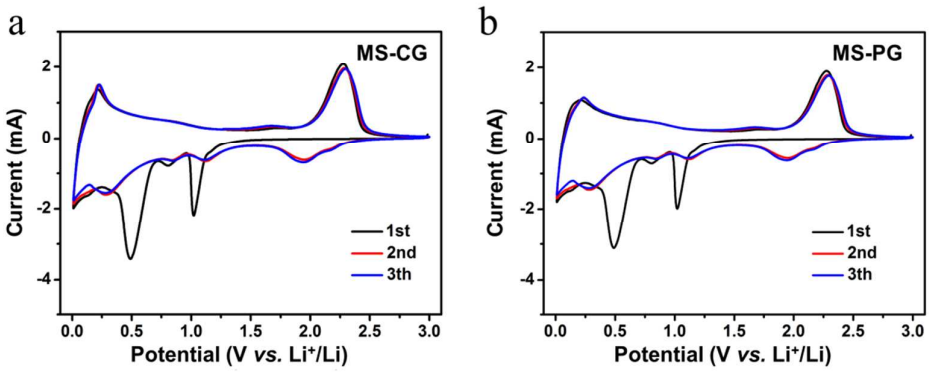


**Figure S4.** CV curves of the first three cycles of the MS-CG (a) and the MS-PG (b).

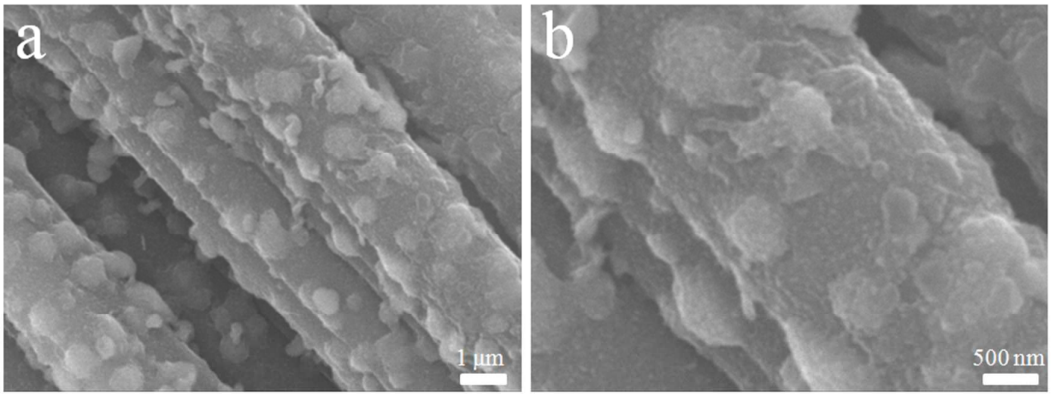


**Figure S5.** FESEM images of MS-CG materials after 250 cycles.

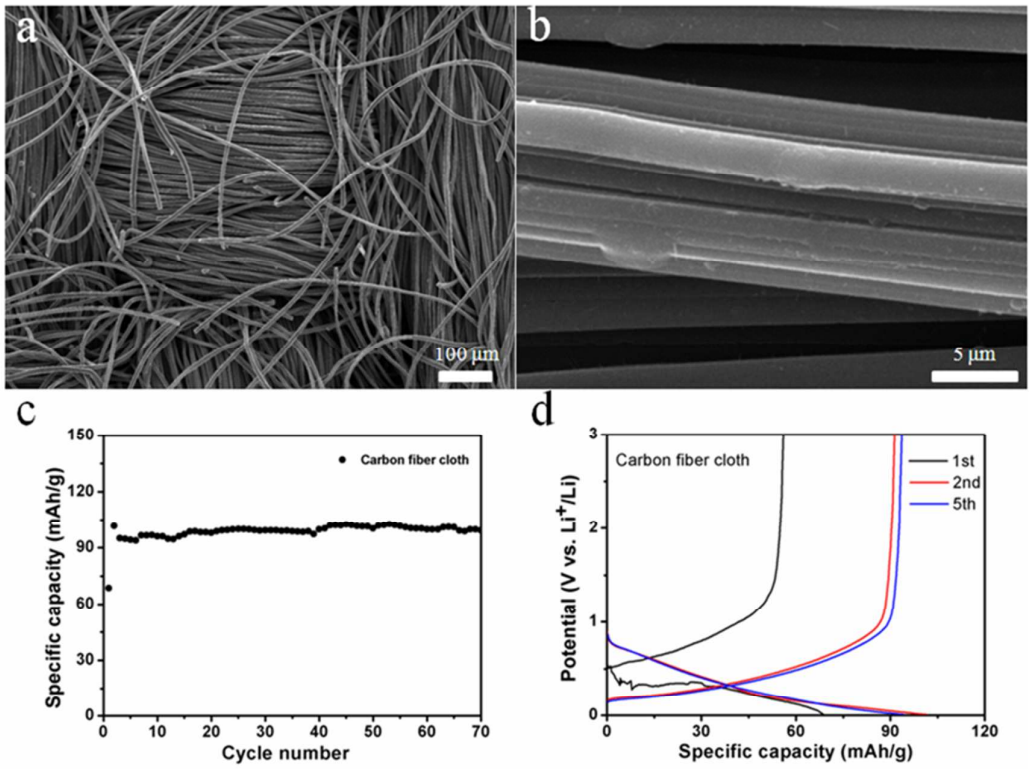


**Figure S6.** (a, b) FESEM images of bare carbon fiber cloth. (c) Cycling performance and (d) charge/discharge profiles of bare carbon fiber cloth at a current density of 100 mA/g.