Supporting information

Experimental section

Synthesis of MoS_2 ultrathin nanosheets

All the chemicals were of analytical grade. The MoS_2 ultrathin nanosheets were synthesized by the modified literature method.[1] A mixture of 0.6978g $(NH_4)_6Mo_7O_{24}\cdot 4H_2O$ and 1.4158g thiourea were dissolved in 21.8 mL distilled water under vigorous stirring to form a homogeneous solution. After being stirred for 30 min, the mixture was transferred into two 28 mL Teflon-lined stainless steel autoclaves and maintained at 160 °C for 24 h under 0T and 8T (Fig.S1), respectively. Then the reaction system was allowed to cool down to room temperature naturally. The obtained products were collected by centrifugation, washed with distilled water and ethanol, and dried at 60 °C under vacuum.

Characterization

X-ray diffraction (XRD) was performed on a Philips X'Pert Pro Super diffractometer with Cu K_α radiation (λ =1.54178 Å). The field emission scanning electron microscopy (FE-SEM) images were taken on a JEOL JSM-6700F SEM. The transmission electron microscopy (TEM) was carried out on a JEM-2100F field emission electron microscope at an acceleration voltage of 200 kV. The high-resolution transmission electron microscope (HRTEM) (JEOL-2011) was operated at an acceleration voltage of 200 kV. X-ray photoelectron spectra (XPS) were acquired on an ESCALAB MK II with Mg K_α as the excitation source. S and Mo Ratio were determined by inductively coupled plasma atomic emission spectrometry (ICP-AES, Jarrel Ash model 955). Specific surface areas were computed from the results of N_2 physisorption at 77 K (Micromeritics ASAP 2020) by using the BET (Brunauer-Emmet-Teller) and BJH (Barrett-Joyner-Halenda) methods. Atomic force microscopy (AFM) study was performed by means of Veeco DI Nanoscope MultiMode V system.

Electrochemical Measurements

The electrochemical behavior of the products was examined using CR2032 coin type cellsvs. Li with a polypropylene microporous membrane (Celgard 2400) as the separator and 1M LiPF6 in ethylene carbonate and diethyl carbonate (EC:DEC = 1:1, v/v) as the electrolyte. The working electrode was fabricated by compressing a mixture of the active materials, conductive material (acetylene black, ATB), and binder (polyvinylidene fluoride (PVDF)) in a weight ratio of products/carbon/PVDF= 70:20:10 onto a copper foil current collector. The cells were assembled in anargon-filled glove box (MBraun Labmaster 130). The electrochemical performance was measured by a multi-channel battery test system (NEWARE BTS-610) in the voltage range from 0.01 to 3.0 V with different current densities. The cyclic voltammetry curve was measured on a CHI 660D electrochemical workstation (Shanghai Chenhua Instruments Co., Ltd.) from 0 V to 3.0 V, at the rate of 0.2mV/s. After different cycles, the impedance spectra of the same cell were measured in the frequency range of 0.001-100 kHz.

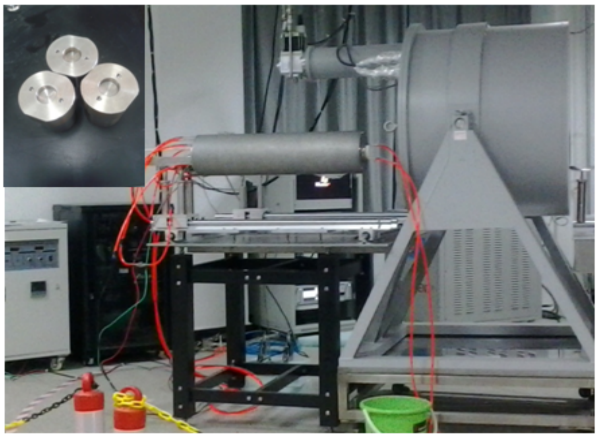

Fig. S1 The superconducting magnet (Cryomagnetics, Inc.). The inset is the Teflon-lined stainless steel autoclaves which can be used in high magnetic field.

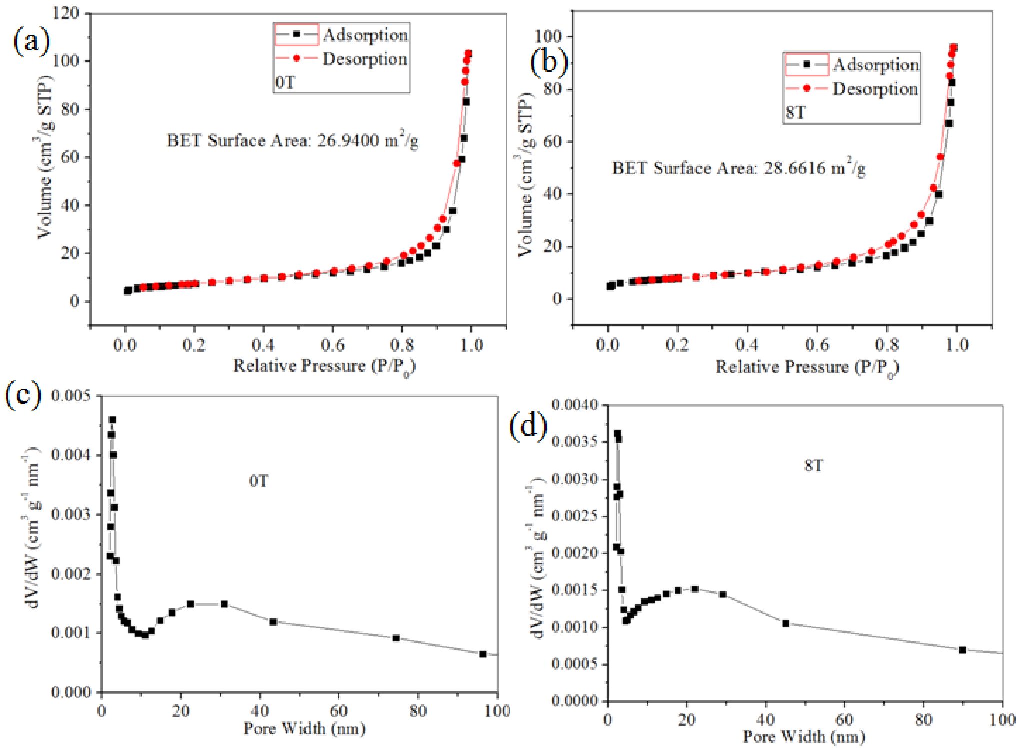

Fig.S2 (a,b) N_2 adsorption/desorption isotherms of O and B. (c,d) pore size distributions of O and B.

Reference

1 J. F. Xie, J. J. Zhang, S. Li, F. Grote, X. D. Zhang, H. Zhang, R. X. Wang, Y. Lei, B. C. Pan and Y. Xie, *J. Am. Chem. Soc.*, 2013, **135**, 17881.