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Supporting Information

Precise Plasma Engineering of Few-Layer 1T-MoS_2 Self-Supported Electrodes for Bifunctional Energy Storage and Electrocatalysis

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Table S1. Comparison of capacitance retention after cycling based on M-Co(1.5%) with recently reported supercapacitor electrode materials.

Text S1. Experimental section

Chemicals: Sodium molybdate ($Na_2MoO_4 \cdot 2H_2O$), thioacetamide (C_2H_5NS), sodium borohydride ($NaBH_4$), and anhydrous sodium sulfatewere (Na_2SO_4, 99%) were purchased from Sinopharm Chemical Reagent Co. Ltd. (Shanghai, China). All chemicals were used without any further purification.

Text S2. Electrochemical measurement and evaluations

The electrochemical properties are tested by using the three-electrode test method. The three electrodes consist of a counter electrode, a reference electrode and a working electrode. The counter electrode is MoS_2-0, MoS_2-50, MoS_2-100 and MoS_2-150. Cyclic voltammetry (CV), galvanostatic charge-discharge (GCD), and electrochemical impedance spectroscopy (EIS) are all measured in a 1 M Na_2SO_4 solution using a Dutch Ivium (Vertex C. DC) electrochemical station.

To evaluate the electrocatalytic performance of the as-prepared materials, electrochemical tests are conducted using a standard three-electrode system. A mercury/mercury oxide (Hg/HgO) electrode serves as the reference electrode, a platinum plate electrode serves as the counter electrode, and the as-prepared MoS_2-0, MoS_2-50, MoS_2-100 and MoS_2-150 is directly used as the working electrode. All electrochemical measurements are performed in a 0.5 M sulfuric acid (H_2SO_4) electrolyte. The linear sweep voltammetry (LSV) and electrochemical impedance spectroscopy (EIS) curves are both recorded using a Dutch Ivium (Vertex C.DC) electrochemical workstation.

Text S3. Preparation of flexible symmetric supercapacitors (ASC) devices

In the process of fabricating a flexible symmetric supercapacitor (ASC) device, 1 g of polyvinyl alcohol (PVA) powder is first dissolved in 10 mL of deionized water. The resulting solution is then heated to 90 °C under continuous stirring, and 2 mL of 0.5 M Na_2SO_4 solution is added. MoS_2-100 is used as both the positive and negative electrode material in the PVA-Na_2SO_4 gel electrolyte. After curing at room temperature, the flexible ASC device is successfully assembled.

Text S4. Material characterizations

XRD spectra were collected on X-ray diffraction (PANalytical Empyrean) with Cu K radiation (λ = 0.154 nm). Raman spectra were obtained by a spectrometer (TACHI Regulus8220) with 532 nm laser excitation. Materials nanostructure characterizations come from Field emission scanning electron microscope (FE-SEM, Hitachi Regulus8220) and Energy-dispersive X-ray spectroscopy (EDX, Oxford EDX, with INCA software), and transmission electron microscope (TEM, JEM-2100) with configured EDX. Atomic Force Microscope (AFM). Valence structure was collected by X-ray photoelectron spectroscopy (XPS, Thermo ESCALAB 250Xi equipped with monochromatic Al Kα source). Fourier Transform infrared spectroscopy (FTIR).

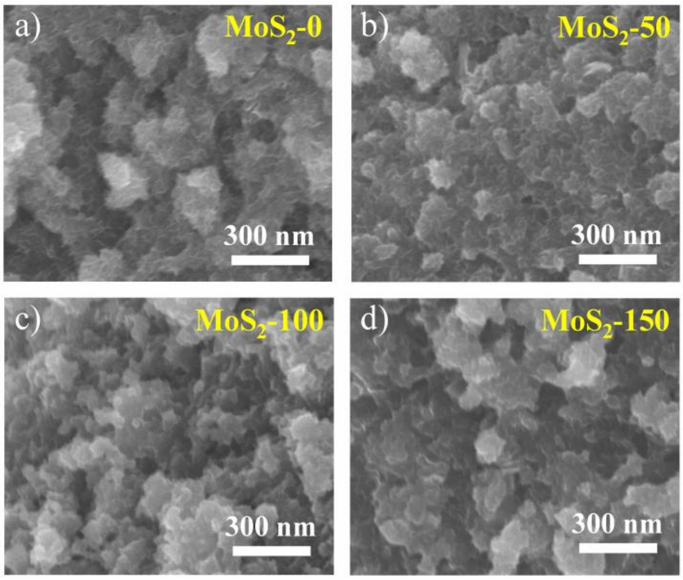

Figure S1. (a-d) SEM images of MoS_2-0, MoS_2-50, MoS_2-100 and MoS_2-150 are shown in sequence.

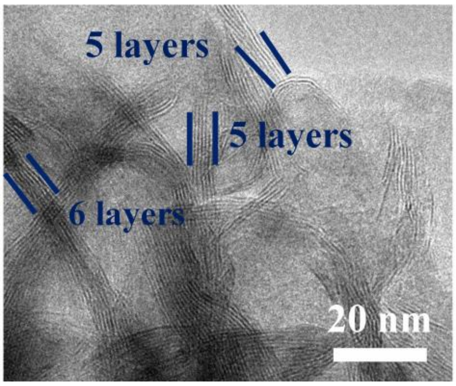

Figure S2. (a-b) TEM images of MoS_2-0 at different magnification.

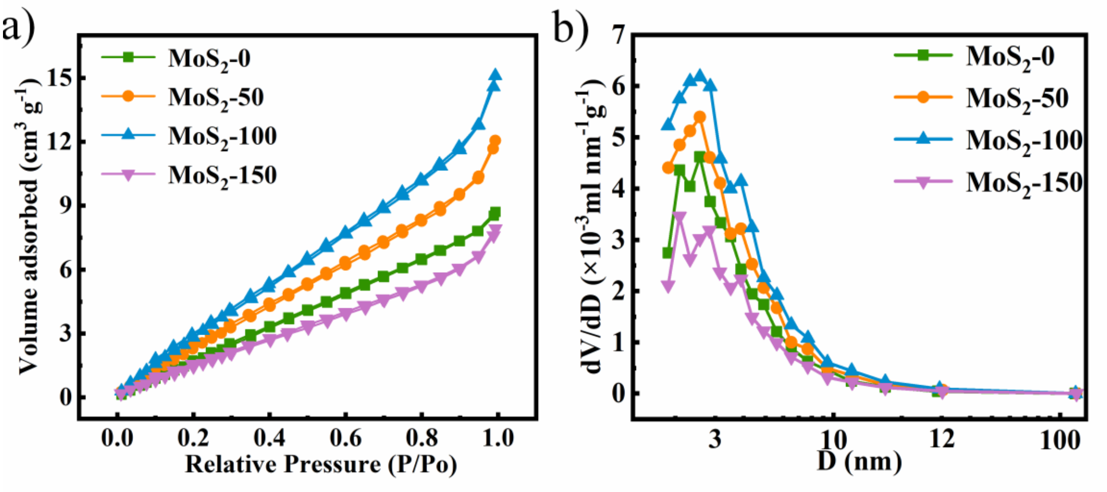

Figure S3. (a) Nitrogen absorption−desorption isotherms. (b) Pore diameter distributions.

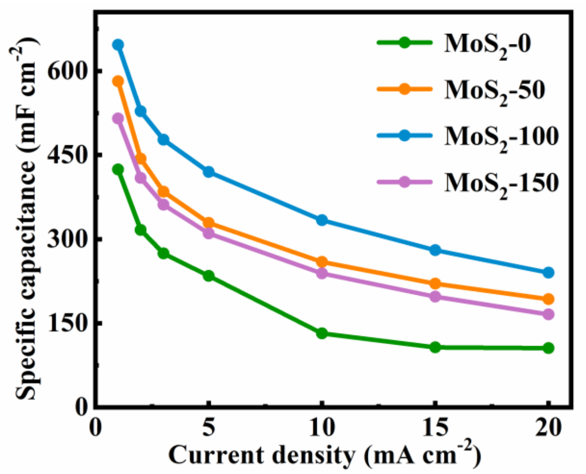

Figure S4. The specific capacitances at 1 mA cm^{-2} to 20 mA cm^{-2} of MoS_2-0, MoS_2-50, MoS_2-100 and MoS_2-150.

Table S1. Comparison of energy density and power density based on MoS_2-100 with recently reported supercapacitor symmetrical device[1–5].

Flexible device	Energy and power density	Refs.
MoS_2-100// MoS_2-100	135.6 μWh cm^{-2} at 800 μW cm^{-2} 45.2 μWh cm^{-2} at 4000 μW cm^{-2}	This work
s-MnO_2/MoS_2// s-MnO_2/MoS_2	3.8 μWh cm^{-2} at 50 μW cm^{-2} 1.1 μWh cm^{-2} at 500 μW cm^{-2}	*J. Power Sources.* **2020**, 450, 227616.
MoS_2 /AIP//MoS_2 /AIP	12.4 μWh cm^{-2} at 6043 μW cm^{-2}	*Adv. Mater.* **2021**, 22, 875-884
1T-MoS_2/Ti_3C_2 MXene// 1T-MoS_2/Ti_3C_2 MXene	17.4 μWh cm^{-2} at 600 μW cm^{-2}	*Adv. Funct. Mater.* **2020,** 30, 1910302
MnO_2 @Ni-mesh// MoS_2 @Ni-mesh	0.86 μWh cm^{-2} at 16 μW cm^{-2}	*J. Power Sources* **2016**, 336, 99-106.
3D NM@ NiCo BH// 3D NM NPC	51.46 μWh cm^{-2} at 750 mW cm^{-2}	*Adv. Funct. Mater.* **2021**, 31, 2100290.

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