Supporting Information

A Bulky and Flexible Electrocatalyst for Highly Efficient Hydrogen Evolution based on the Growth of MoS_2 Nanoparticles on Carbon Nanofibers Foam

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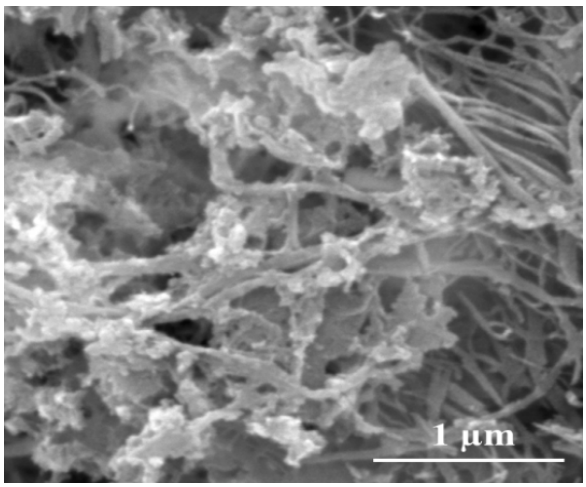

Figure S1. SEM image of the MoS_2/CNFs hybrid by replacing the DMF with water as solvent.

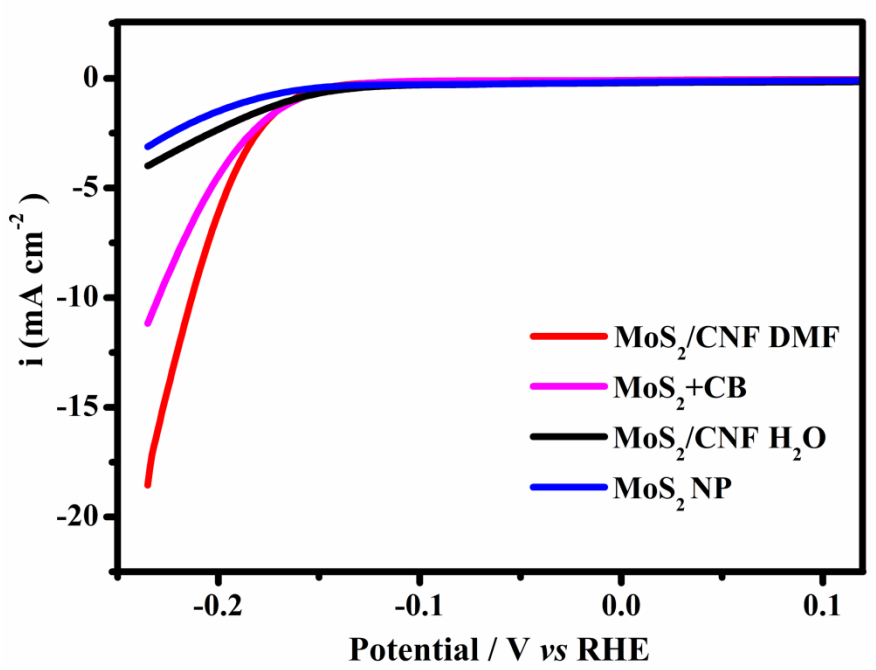

Figure S2. Polarization curve of MoS_2 nanoparticles physically mixed with carbon black (7:3 w/w) and MoS_2/CNFs hybrid by replacing the DMF with water as the solvent.

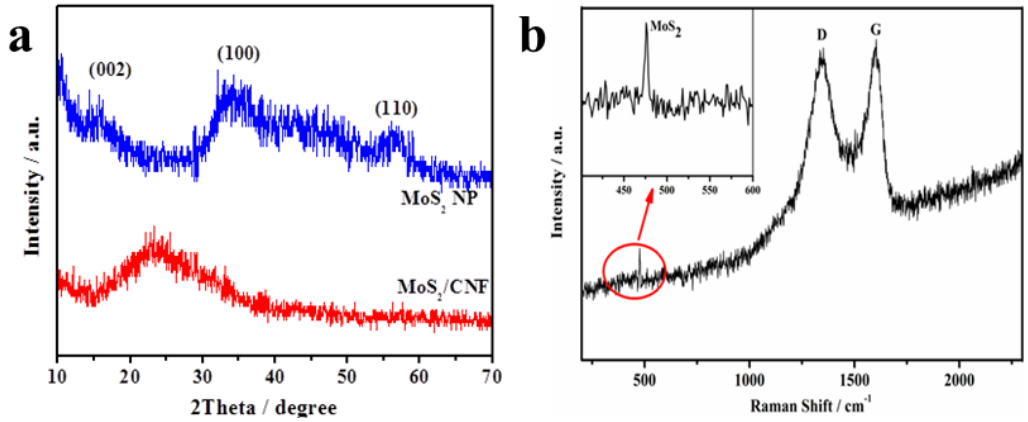

Figure S3. (a) XRD patterns of MoS_2 nanoparticles and MoS_2/CNFs composite. (b) Raman spectroscopy of MoS_2/CNFs composite.

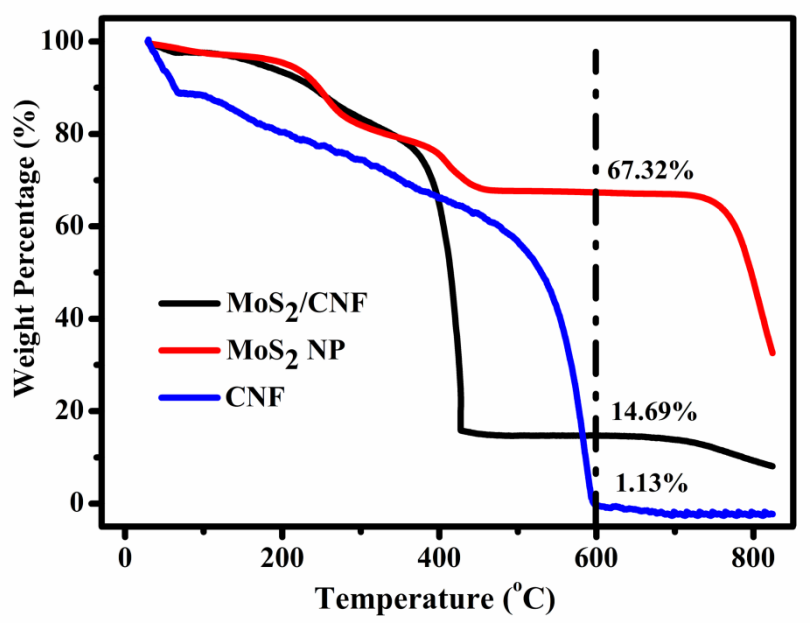

Figure S4. TG curves of the MoS_2/CNFs, the bare MoS_2 nanoparticles and the bare CNFs.

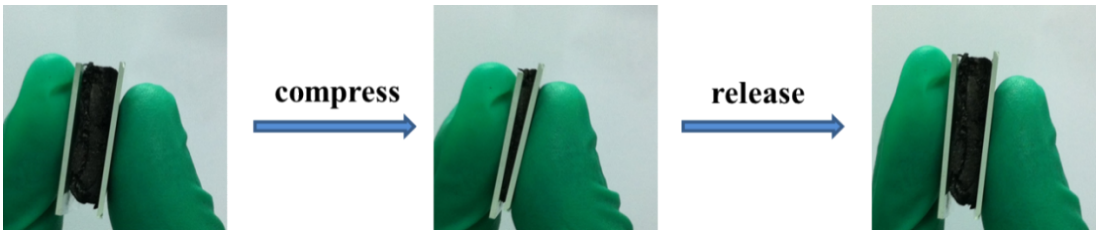

Figure S5. The compression-recovery processes of MoS_2/CNFs.

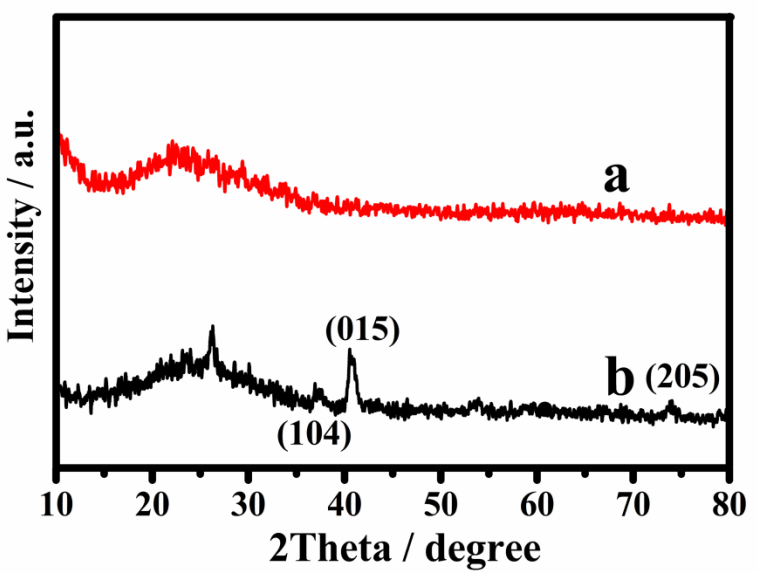

Figure S6. XRD pattern of (a) the as-prepared MoS_2/CNFs and (b) the MoS_2/CNFs composite after annealed at 800 ^oC for 2 h.

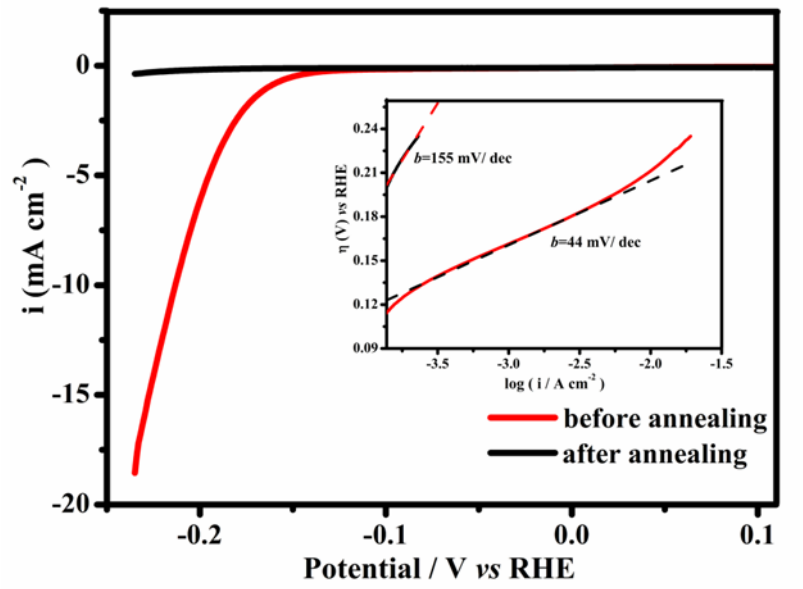

Figure S7. The polarization curves and the Tafel slope (inset) of as-prepared MoS_2/CNFs and MoS_2/CNFs annealed at 800 °C.

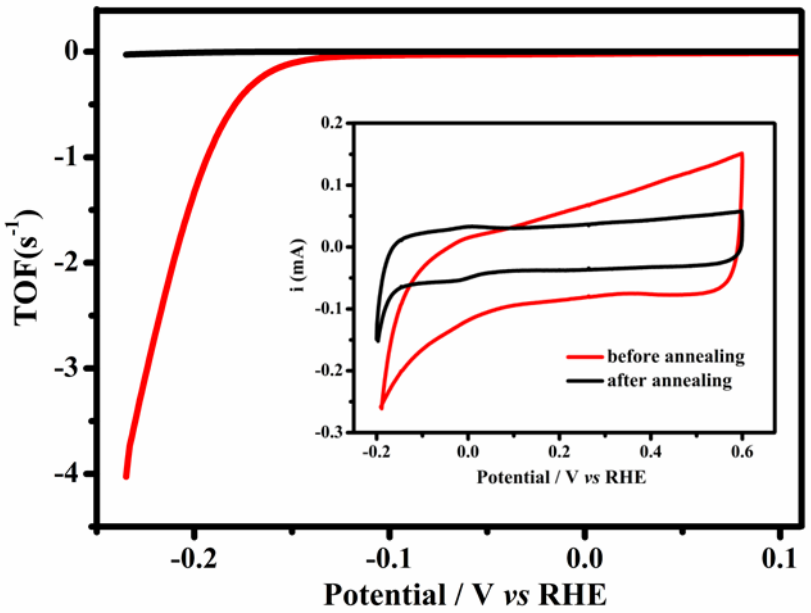

Figure S8. The turnover frequencies and the cyclic voltammograms (inset) of as-prepared MoS_2/CNFs and MoS_2/CNFs annealed at 800 °C.

Assessment of turnover frequency (TOF)

The turnover frequencies (in s^{-1}) were calculated with the following equation:

$$TOF = \frac{i\ 1}{Fn2}$$

I - Current (in A) during the linear sweep measurement.

F- Faraday constant (in C mol^{-1}).

n - Number of active sites (in mol).

The factor 1/2 in the equation represents that two electrons are required to form one hydrogen molecule from two protons ($2H^+ + 2e^{-1} = H_2$).

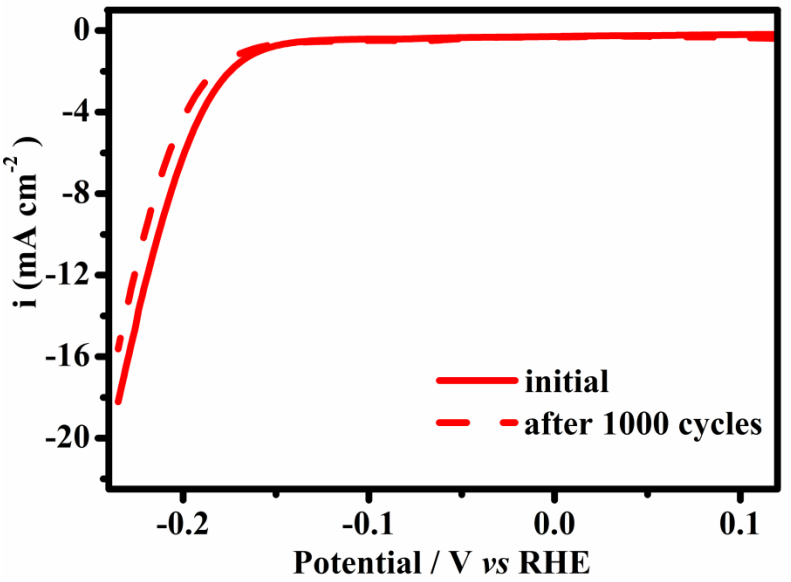

Figure S9. The durability test of the 3D MoS_2/CNFs electrode.

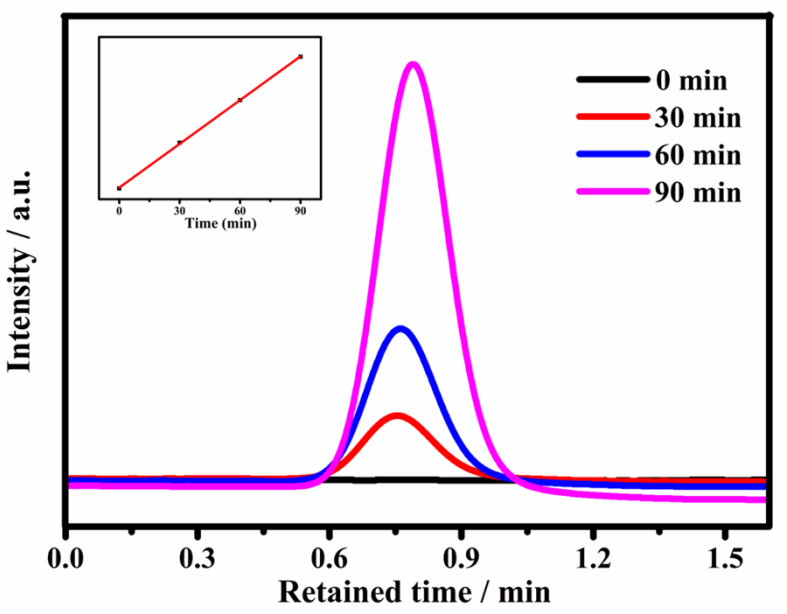

Figure S10. The GC curve to detect gas production at the potential of -0.35 V (*vs.* RHE).

Table S1. Comparion of HER performance in acidic media for MoS_2/CNFs with other MoS_2-based HER electrocatalysts.

Catalyst	Tafel slope (mV/dec)	Current density (i)(mA cm^{-2})	Overpotential at the corresponding i (mV)	Reference
MoS_x-coated sponge	185	71	200	(6)
double-gyriod MoS_2/FTO	50	2	190	(7)
MoO_3-MoS_2/FTO	50-60	10	300	(8)
MoS_2/mesoporous graphene	42	100	200	(18)
MoS_x/graphene - protected 3D Ni foams	42.8	45	200	(19)
MoS_2 nanoflower /rGO	95	10	250	(20)
MoS_2/CNT	44.6	14	200	(21)
MoS_2/RGO	41	10	150	(23)
MoS_2/CNF fiber mats	45	25	120	(25)
MoS_2/CNFs	44	16	230	This work

Supplementary Movies

Movie S1. This movie shows MoS_2/CNFs foam operated from +0.12 V to -0.23 V *vs*. RHE to drive HER.

Movie S2. This movie shows pristine CNF operated from +0.12 V to -0.23 V *vs*. RHE to drive HER.