Supporting Information

Cobalt Sulphide Nanotubes (Co_9S_8) Decorated with Amorphous MoS_x as Highly Efficient Hydrogen Evolution Electrocatalyst

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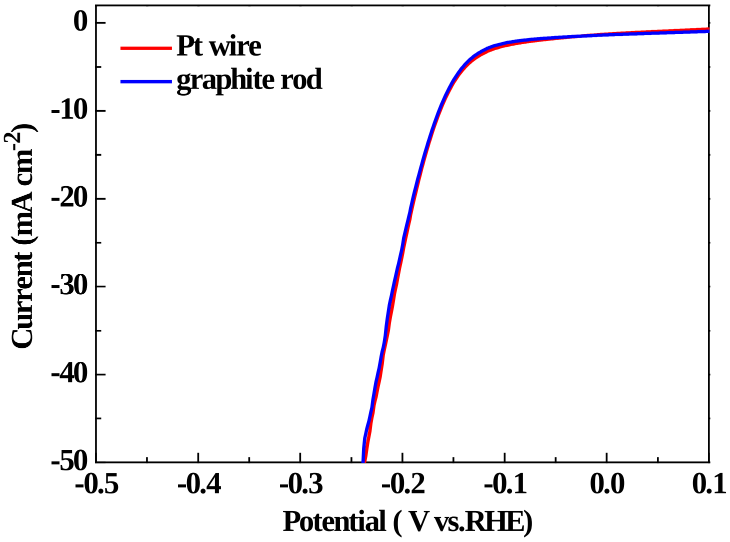

Figure S1. The effect of different counter electrodes on polarization curves of the Co_9S_8 / MoS_x hybrid: red curve represents a Pt wire as counter electrode, and blue curve represents a graphite rod as counter electrode.

From the effect of different counter electrodes on polarization curves (Figure S1) of Co_9S_8 / MoS_x hybrid, it could be observed that the results did not show any obvious difference.

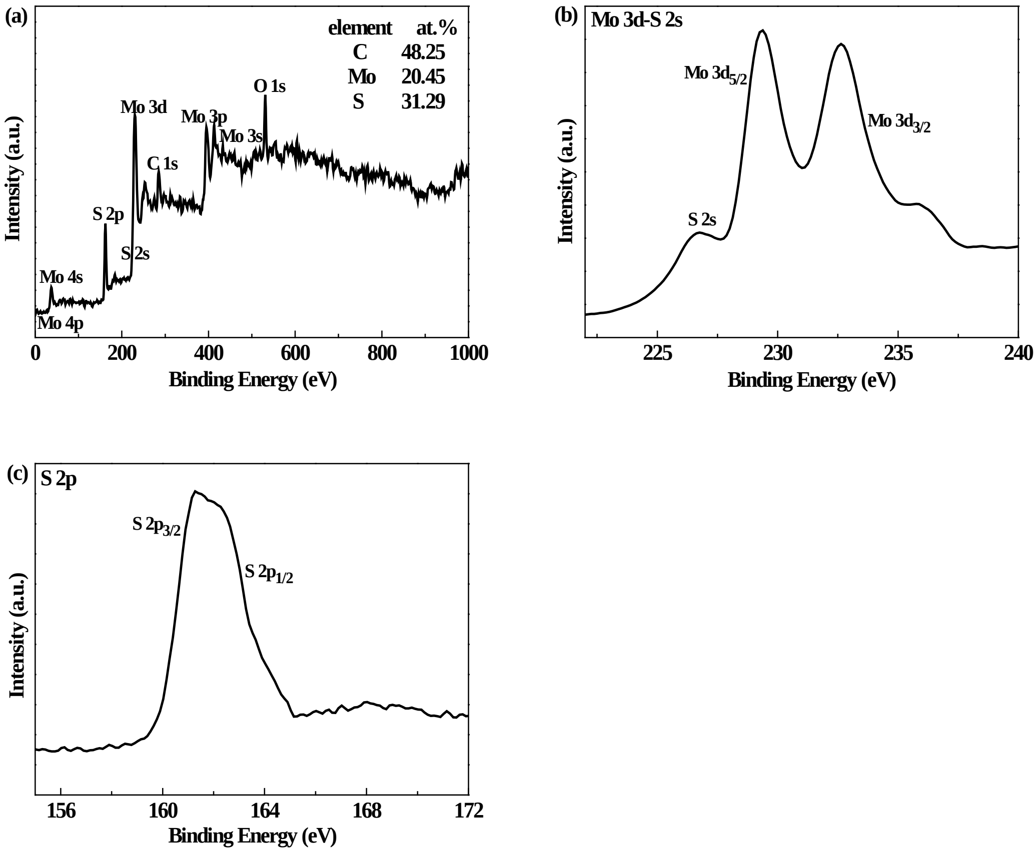

Figure S2. (a) XPS survey spectrum, (b) XP spectrum of Mo 3d-S 2s, and (c) S 2p of the pristine

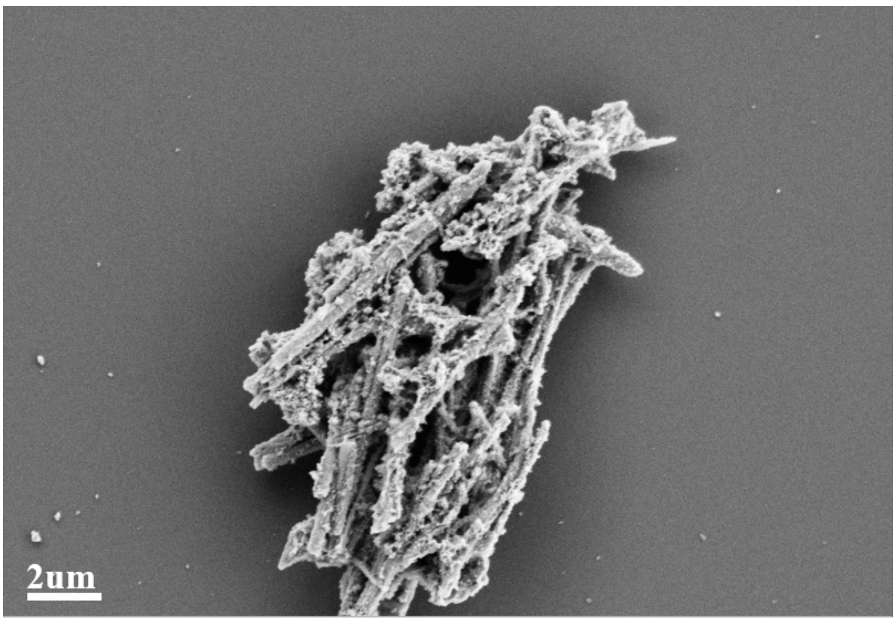

Figure S3. FE-SEM figure of Co_9S_8 / MoS_x -1:2 hybrid.

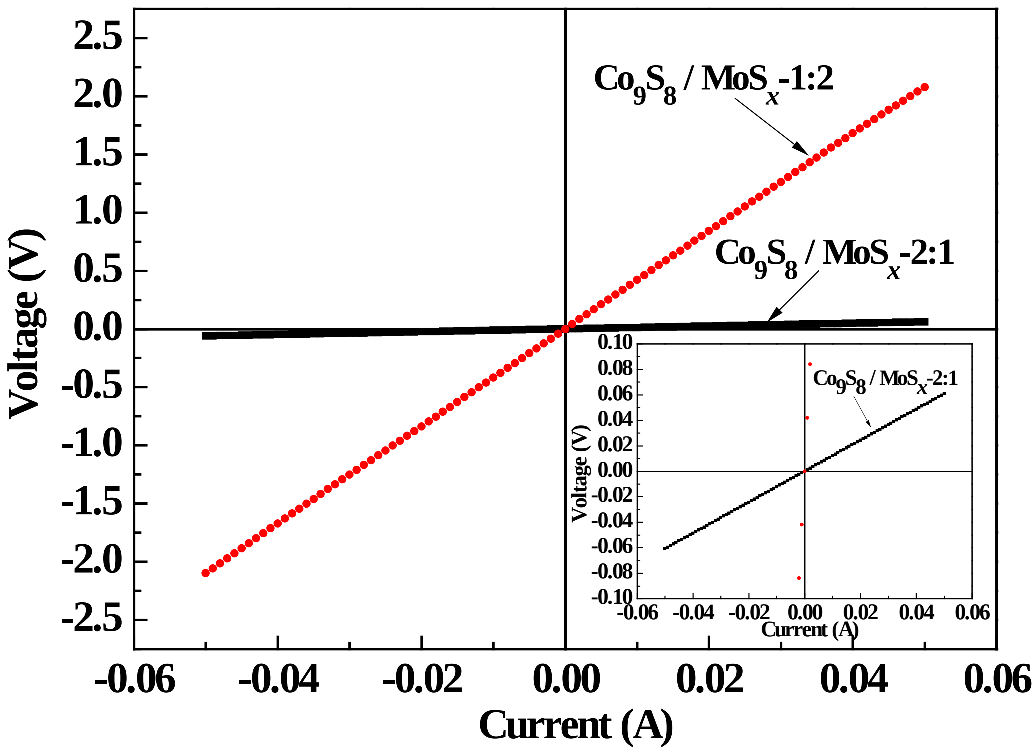

Figure S4. Current-voltage characteristic of Co_9S_8 / MoS_x -2:1 and Co_9S_8 / MoS_x -1:2 at room temperature. Inset is the enlargement of current-voltage characteristic for Co_9S_8 / MoS_x -2:1.

Table S1. Comparison of resistance R (Ω), parameters measured, resistivity ρ values for the Co_9S_8 / MoS_x -2:1 and Co_9S_8 / MoS_x -1:2.

sample	resistance R (Ω)	length L(cm)	cross-sectional area S (cm^2)	resistivity ρ (Ω.cm)
Co_9S_8 / MoS_x -2:1	1.2	0.3	1.5×10^{-2}	0.06
Co_9S_8 / MoS_x -1:2	41.9	0.3	1.5×10^{-2}	2.10

In this case, we adopt the conventional four-point probe technique in the room temperature to measure electrical resistivity of the samples. Firstly, the powder samples were compressed into rectangular bulks with (10 × 10 × 0.15 mm^3). The electrical measurements were conducted using a 4-point test fixture (copper contact wires with a distance of 6 mm between the source electrodes and 3 mm between the measuring electrodes). I-V characteristics were measured by an electrometer Keithley 6220 (as a current source) and an electrometer Keithley 2182A (detecting voltage).

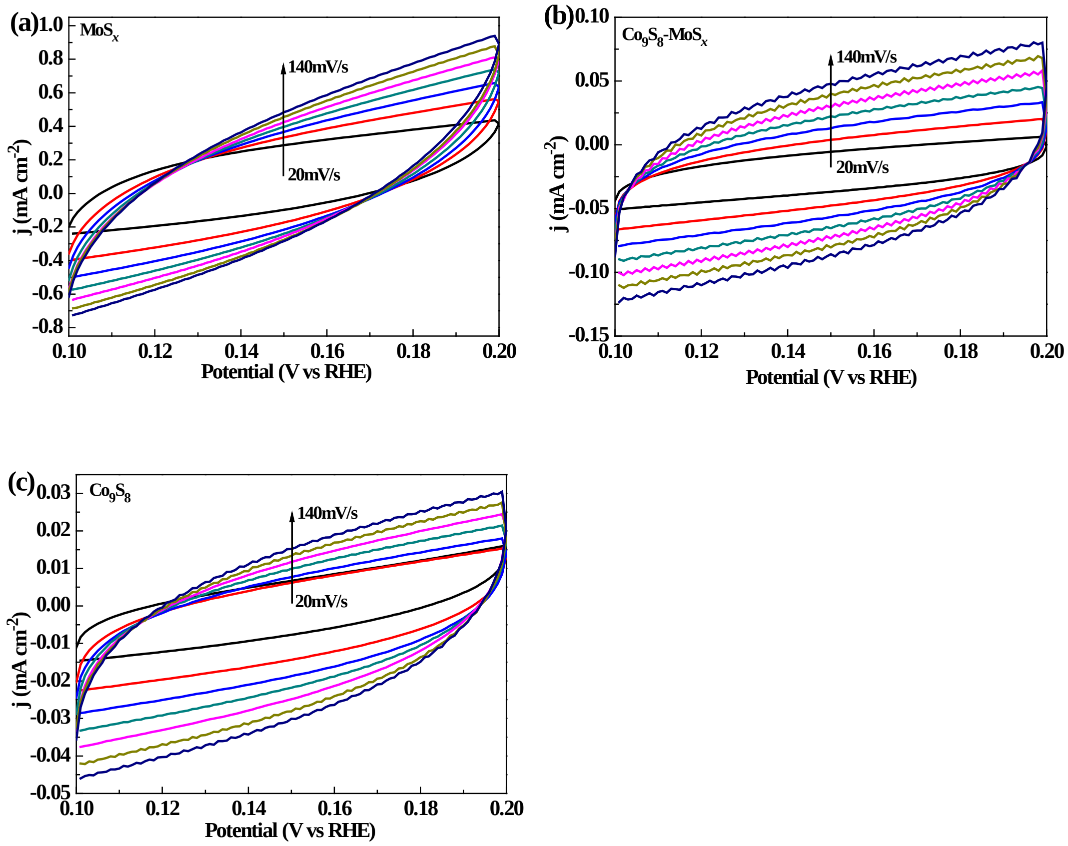

Figure S5. Cyclic voltammograms of the pristine MoS$_x$ (a), physical mixture (Co$_9$S$_8$-MoS$_x$) (b), and Co$_9$S$_8$ nanotubes (c).

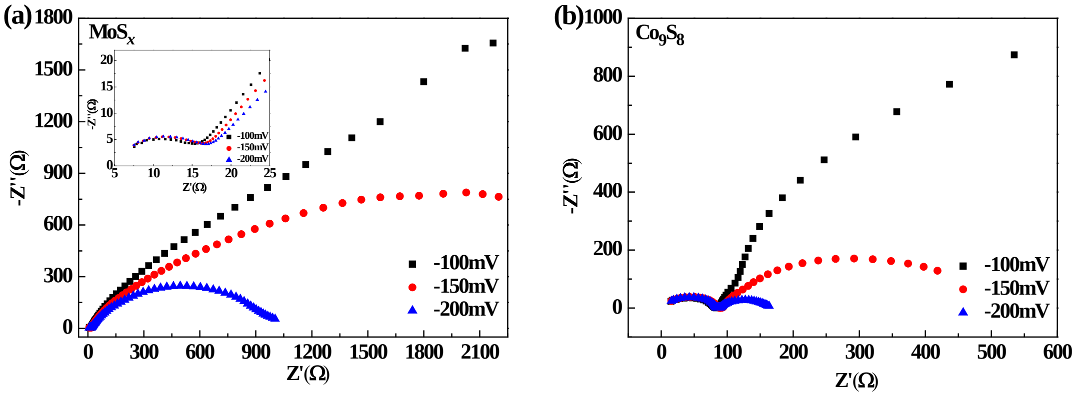

Figure S6. Nyquist plots of the pristine MoS_x (a), and Co_9S_8 nanotubes (b), respectively.

Table S2. Comparison of charge transfer resistance (R_{ct}) values for the pristine MoS_x, Co_9S_8 nanotubes, and Co_9S_8 / MoS_x hybrid.

Sample	η=-100mV(Ω)	η=-150mV(Ω)	η=-200mV(Ω)
MoS_x	7017	2964	971
Co_9S_8	4439	424.3	79.2
Co_9S_8 / MoS_x	474.7	216.2	69.5

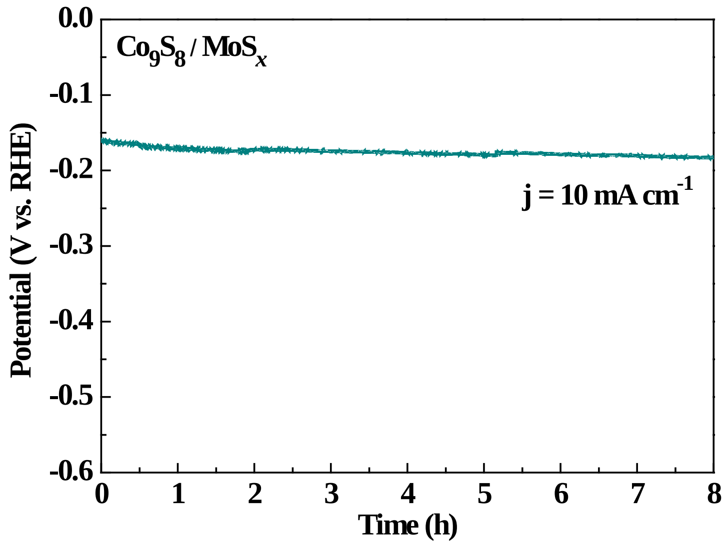

Figure S7. Time dependent potential of Co_9S_8 / MoS_x under a current density of 10 mA cm^{-2}.

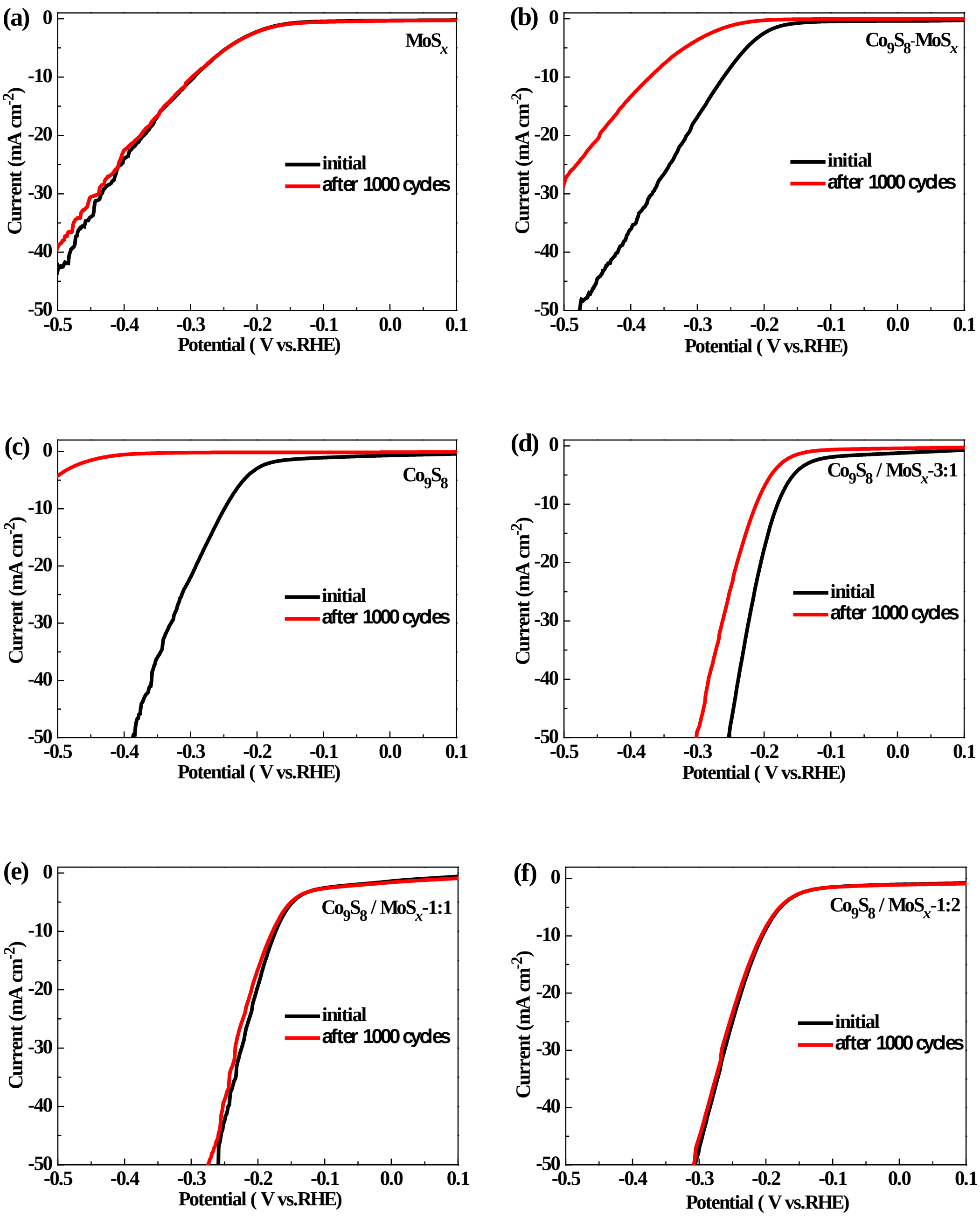

Figure S8. The durability test for the pristine MoS$_x$ (a), Co$_9$S$_8$-MoS$_x$ (b), Co$_9$S$_8$ nanotubes (c), Co$_9$S$_8$ / MoS$_x$ -3:1 (d), Co$_9$S$_8$ / MoS$_x$ -1:1 (e), and Co$_9$S$_8$ / MoS$_x$ -1:2 (f).