Supporting information

Strongly Coupled MoS_2 Nanoflake-Carbon Nanotube Nanocomposite as an Excellent Electrocatalyst for Hydrogen Evolution Reaction

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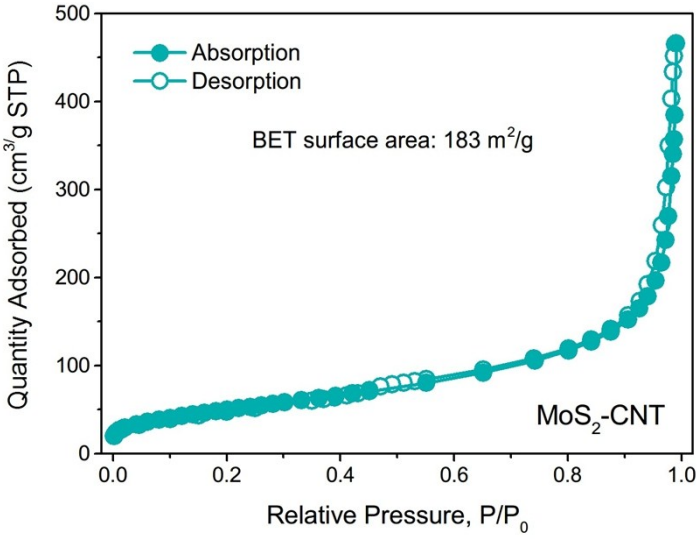

Figure S1. N_2 absorption-desorption isotherm of strongly coupled MoS_2-CNT nanocomposite.

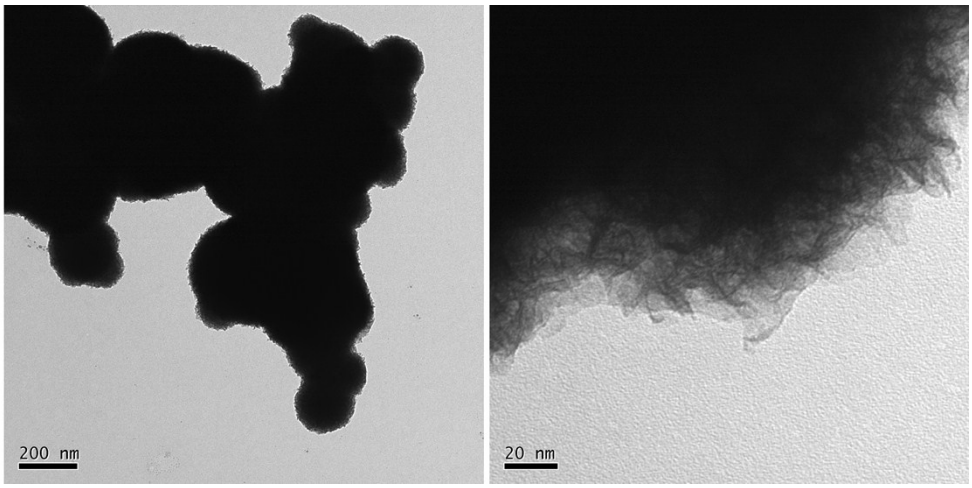

Figure S2. MoS_2 aggregates synthesized without CNT.

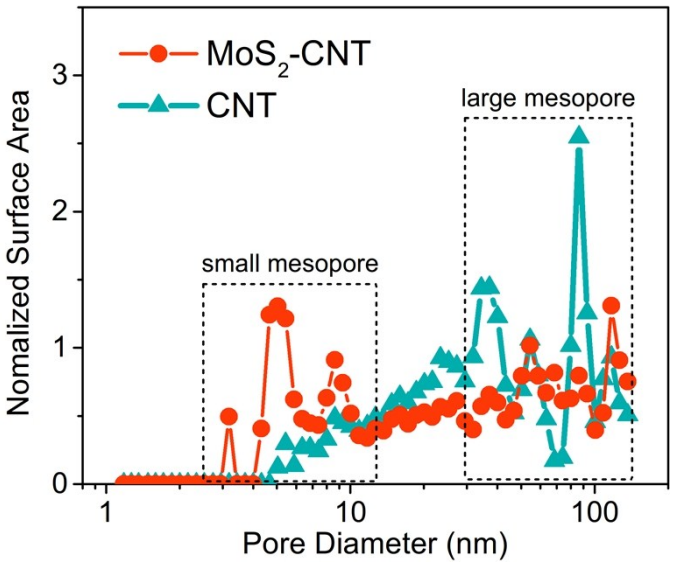

Figure S3. Absorption pore size distributions using DFT model of CNT and strongly coupled MoS_2-CNT.

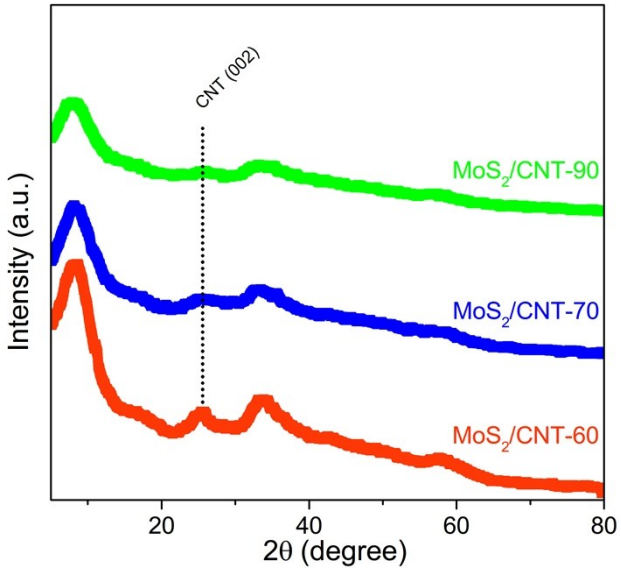

Figure S4. XRD patterns of MoS_2/CNT-60, MoS_2/CNT-70 and MoS_2/CNT-90.

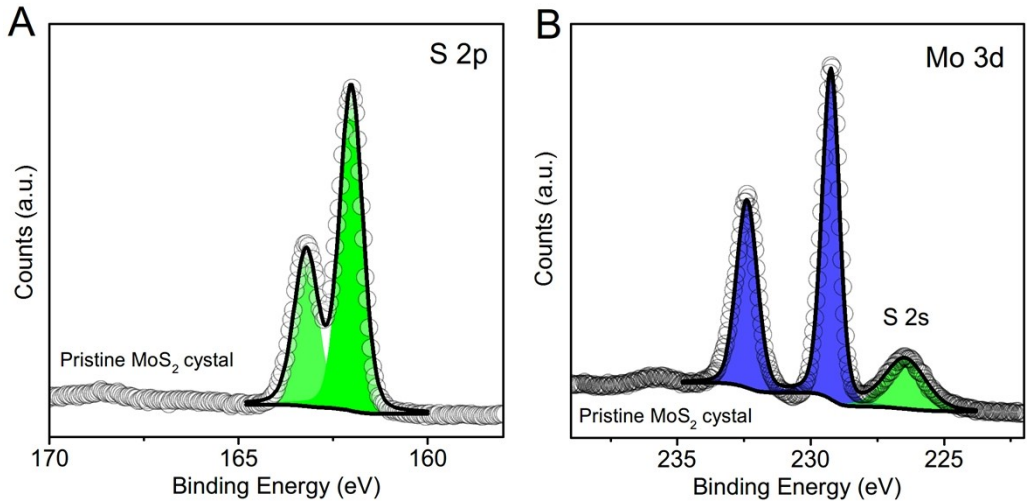

Figure S5. Core-level XPS spectra of pristine MoS_2 crystal (Aladdin, 99.5% metal basis) in the region of (A) S 2p and (B) Mo 3d.

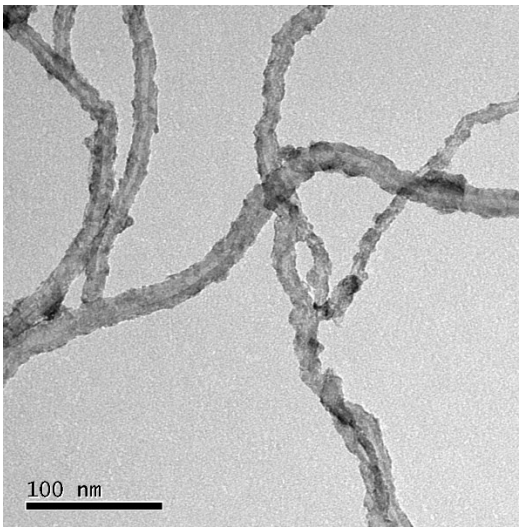

Figure S6. TEM image of MoO_x-CNT synthesized without thiourea.

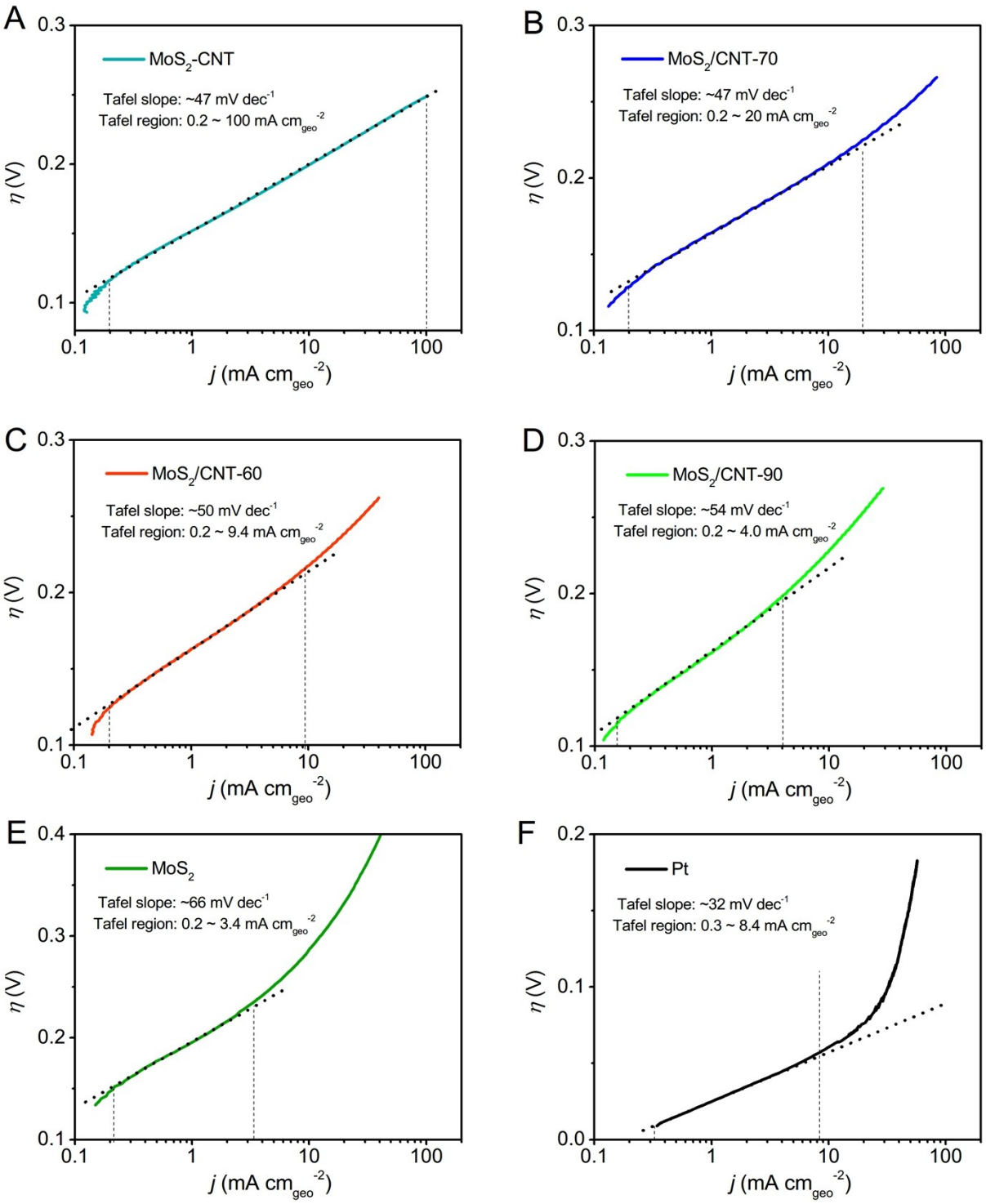

Figure S7. Individual Tafel plots of as-prepared samples (MoS_2-CNT, MoS_2/CNT-60, MoS_2/CNT-70, MoS_2/CNT-90 and MoS_2), pristine MoS_2 crystal and standard Pt wire, and their measurements for Tafel slope and the length of Tafel region.

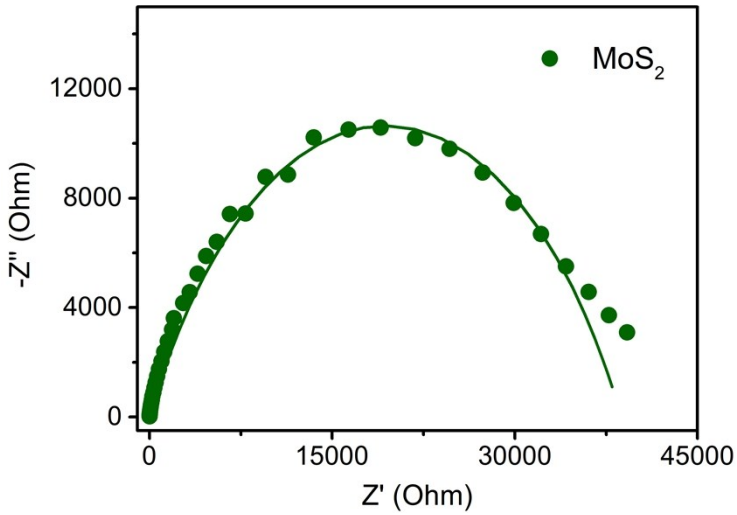

Figure S8. Nyquist plots of MoS_2 aggregates at overpotential of 250 mV.

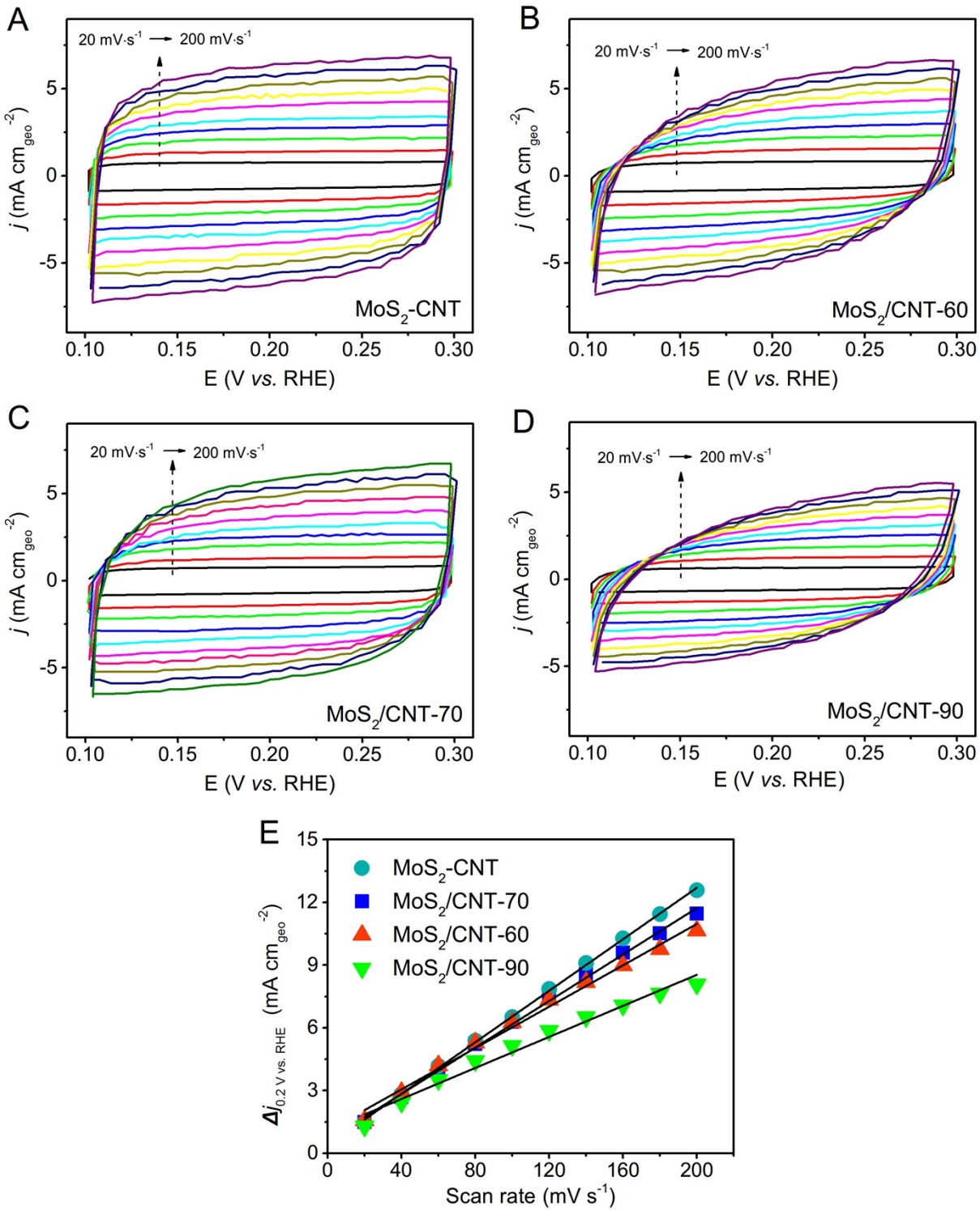

Figure S9. Cyclic voltammogram curves of (A) MoS_2-CNT, (B) MoS_2/CNT-60, (C) MoS_2/CNT-70 and (D) MoS_2/CNT-90 in the region of 0.1-0.3 V *vs.* RHE, and their differences in current density variation ($\Delta j = j_a - j_c$) at potential of 0.2 V *vs.* RHE plotted against scan rate from 20 to 200 mV s^{-1}.

Table S1. Comparison of HER performance of strongly coupled MoS_2-CNT nanocomposite with other MoS_2/nanocarbons electrocatalysts.

Catalyst	Onset η (η_0, mV)	Current density (j, mA cm^{-2})	Corresponding η (η_j, mV)	Electrochemical double layered capacitance (C_{dl}, mF cm^{-2})	R_{CT} (Ω)	Ref.
MoS_2@OMC	120	-10	178~192	N.A.	~900 @η=100 mV	[1]
MoS_2/rGO hydrogel	125	-12	200	29.6	N.A.	[2]
MoS_2/NCNFs	N.A.	-65.6	200	22.7	N.A.	[3]
MoS_2 NPs/RGO	~100	N.A.	N.A.	N.A.	~250 @η=120 mV	[4]
MoS_2 nanoparticles on mesoporous graphene foams	100	-100	200	N.A.	33 @η=150 mV	[5]
MoS_2 NSs/RGO	~140	-23	200	N.A.	155 @η=170 mV	[6]
MoS_2⊥RGO	N.A.	-10	172	6.045	N.A	[7]
MoS_x on crumpled graphene balls	130	-220	300	N.A.	N.A.	[8]
MoS_x/N-doped CNT	~75	-10	~110	N.A.	~150 @η=200 mV	[9]
MoS_2/VGNS	160	N.A.	N.A.	7.96	39.2 @open circuit	[10]
MoS_2/CA	140	-9.68	200	N.A.	N.A.	[11]
pBC-N/MoS_2	108	-8.7	200	16.5	N.A.	[12]
C/MoS_2@G	165	-100	~360	N.A.	13.2 @η=300 mV	[13]
Strongly coupled MoS_2-CNT	~100	-850 -15	290 208	31	12 @η=250 mV	This work

References

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