

Supplementary Information

Defect- and S-rich ultrathin MoS₂ nanosheet embedded N-doped carbon nanofibers for efficient hydrogen evolution

Yaxiao Guo,^{a,b} Xiaoyan Zhang,^{a,b} Xueping Zhang^{a,b} and Tianyan You^{*a}

^a State Key Laboratory of Electroanalytical Chemistry, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun, 130022, China. E-mail: youty@ciac.jl.cn

^b University of Chinese Academy of Sciences, Beijing 100049, China

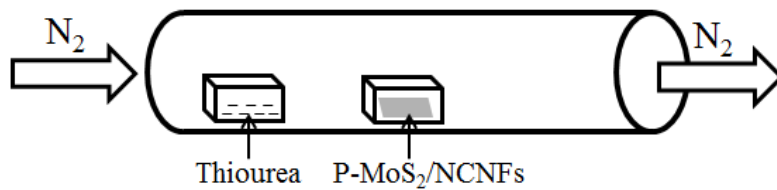


Figure S1. The stabilization and carbonization of MoS₂/NCNFs.

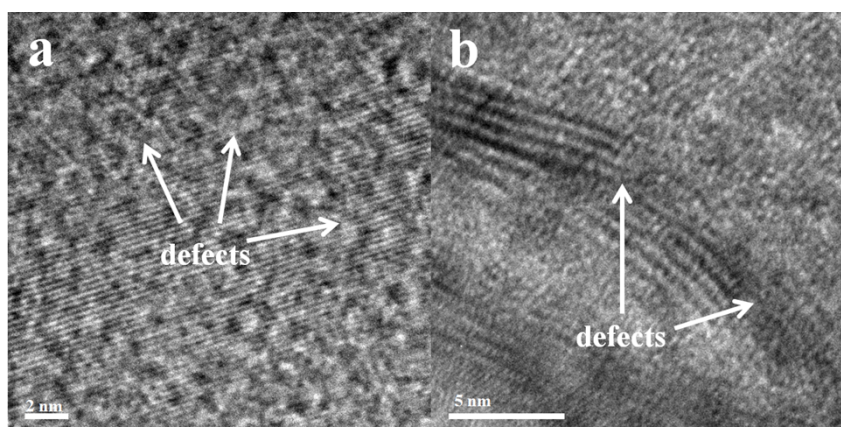


Figure S2. HRTEM images of MoS₂/NCNFs: (a) interplanar, (b) interlayer.

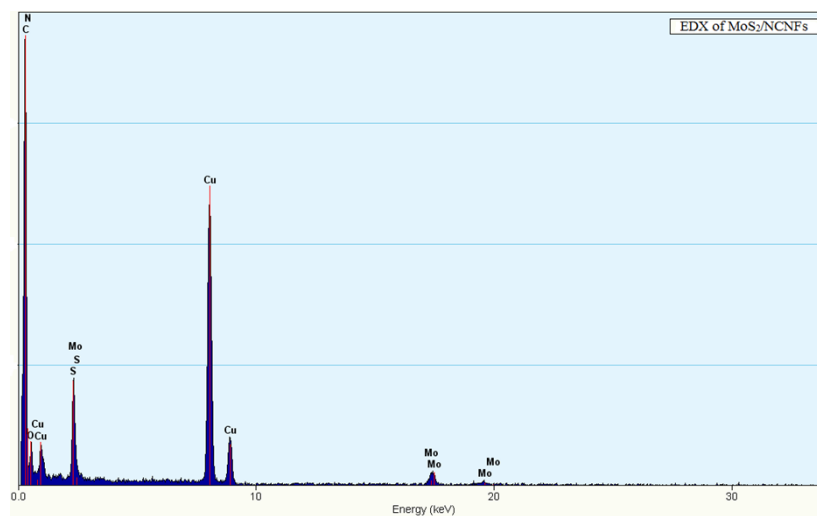


Figure S3. The energy dispersive X-ray (EDX) spectra of MoS₂/NCNFs

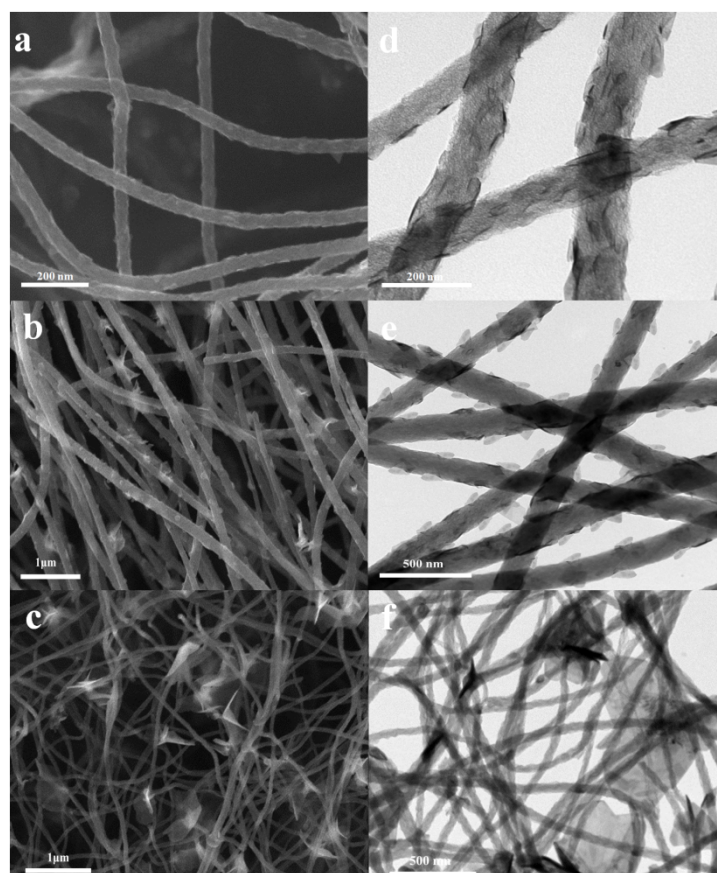


Figure S4. SEM and TEM images of the MoS₂/NCNFs prepared at different heating rates: (a, d) 5, (b, e) 10 and (c, f) 15 °C min⁻¹.

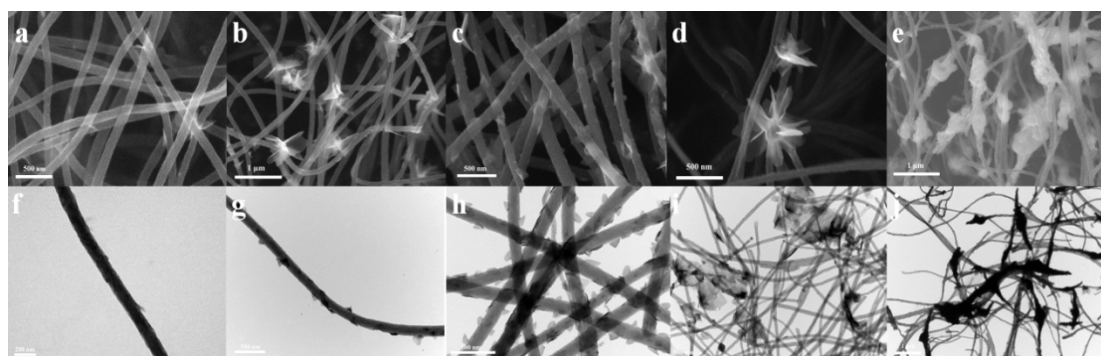


Figure S5. SEM and TEM images of the MoS₂/NCNFs prepared at different concentration of Mo precursor: (a, f) 1.0 mM, (b, g) 1.5 mM, (c, h) 2.0 mM, (d, i) 2.5 mM and (e, j) 3.0 mM.

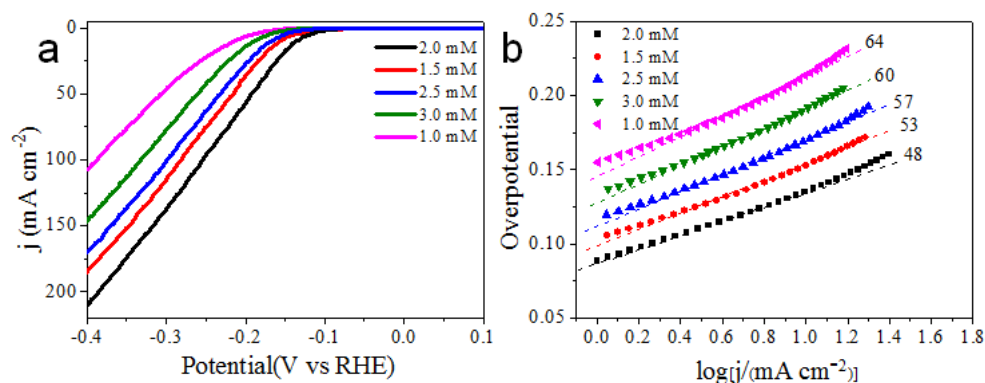


Figure S6. Polarization curves (a) and the corresponding Tafel plots (b) of MoS₂/NCNFs prepared at different concentration of Mo precursor.

Table S1. Electrochemical parameters of the MoS₂/NCNFs prepared at different concentration of Mo precursor.

Concentration	Overpotentials at current density of 10 mA cm ⁻² (mV)	Current density at $\eta = 200$ mV (mA cm ⁻²)	Tafel slopes (mV dec ⁻¹)	J_0 (μ A cm ⁻²)
1.0 mM	215	6.8	64	4.7
1.5 mM	156	40.4	53	16.3
2.0 mM	135	65.6	48	24.2
2.5 mM	167	28.2	57	10.4
3.0 mM	188	14.7	60	7.0

Table S2. Electrochemical parameters of different MoS₂ catalysts

Catalyst	Mass loading (mg cm ⁻²)	Tafel slopes (mV dec ⁻¹)	Overpotentials at current density of 10 mA cm ⁻² (mV)	Current density at $\eta = 200$ mV (mA cm ⁻²)	Current density at $\eta = 300$ mV (mA cm ⁻²)	J_0 (μ A cm ⁻²)
Oxygen-incorporated MoS₂ nanosheets¹⁶	0.285	55	N/A	N/A	126.5	12.6
Defect-rich MoS₂ nanosheets¹⁷	0.285	50	N/A	13	70	8.91
S-rich MoS₂-NCNFs³⁷	0.857	38	120	N/A	N/A	N/A
MoS_x/NCNT³⁸	0.102	40	110	N/A	N/A	33.11
MoS₂ nanosheets within graphite⁴⁴	0.200	41	N/A	23	N/A	N/A
MoS₂/RGO⁵⁰	0.204	43	172	N/A	N/A	N/A
Defect- and S-rich MoS₂/NCNFs (current work)	0.217	48	135	65.6	N/A	24.2

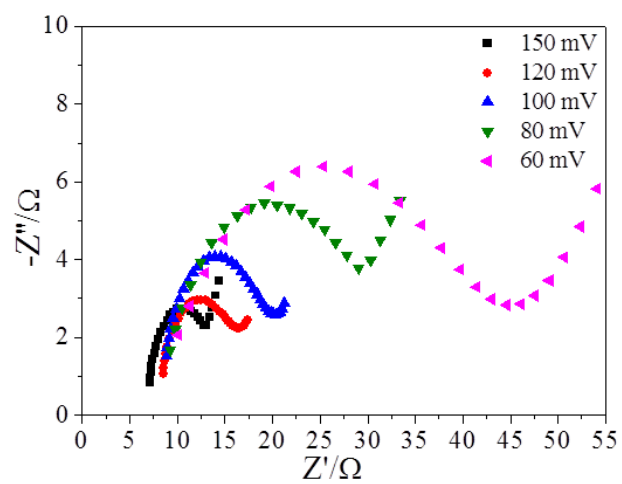


Figure S7. Nyquist plots of MoS₂/NCNFs at various overpotentials of 60 mV, 80 mV, 100 mV, 120 mV and 150 mV.

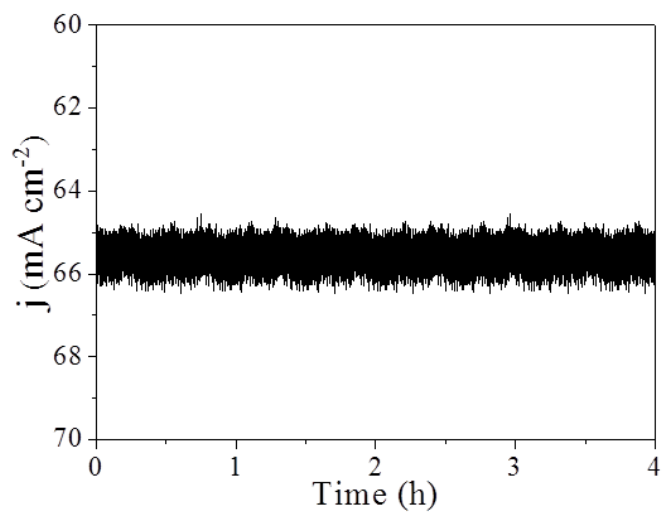


Figure S8. Potentiostatic electrolysis of MoS₂/NCNFs for 4 h. The potential we applied is 200 mV vs RHE after iR correction.