Supporting Information

A surface carbonization strategy to MoS_2 microspheres for enhancing electrochemical hydrogen evolution activity

Chengwei Fei,† Lixia Cui,† Haiwei Du,* Lina Gu,* Gengsheng Xu and Yupeng Yuan

School of Chemistry and Chemical Engineering, Anhui Province Key Laboratory of Chemistry for Inorganic/Organic Hybrid Functionalized Materials, Anhui University, Hefei 230601, P. R. China

*Corresponding authors

Email: haiwei.du@ahu.edu.cn (H. Du) and gulina77@sina.com (L. Gu)

†These authors contributed equally to this work.

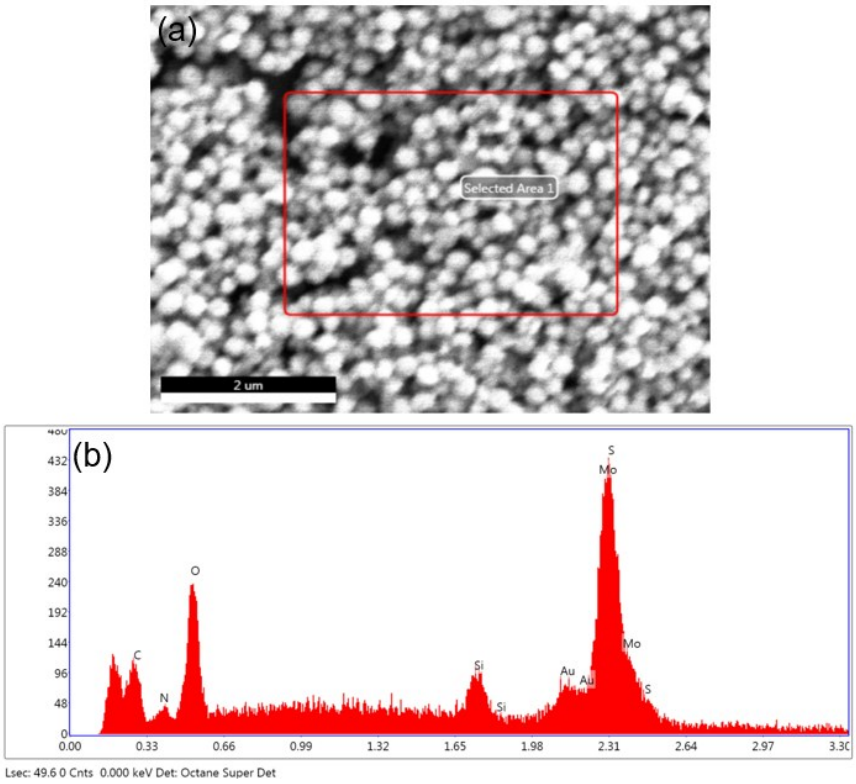

Fig. S1 SEM image with a low magnification (a) of MD-1:1 and EDX spectrum (b). Si and Au are from silicon substrate and conductive coating respectively.

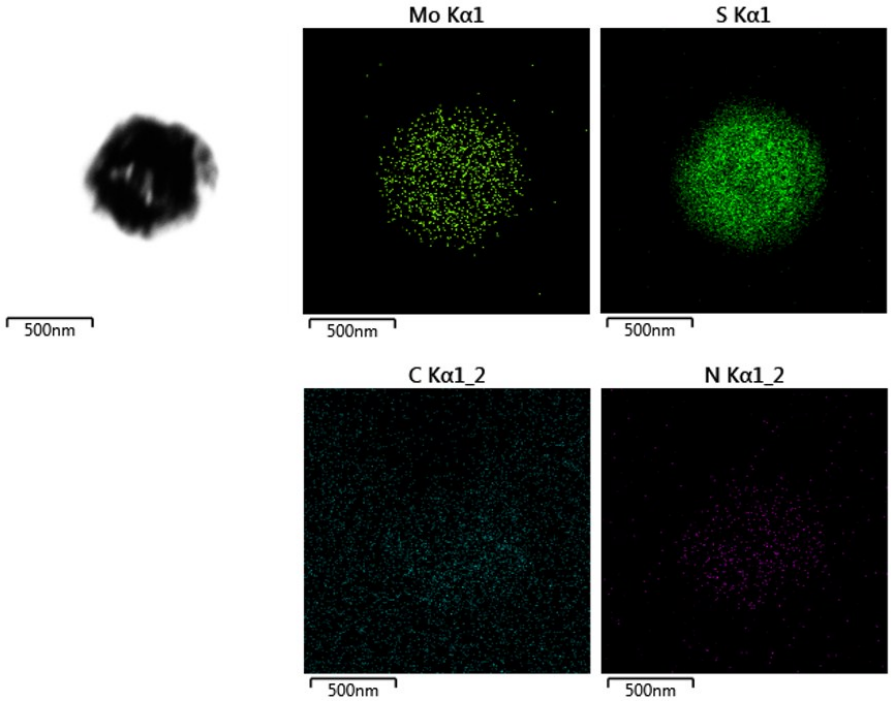

Fig. S2 Bright-field TEM image and elemental mapping of Mo, S, C and N in MD-1:1.

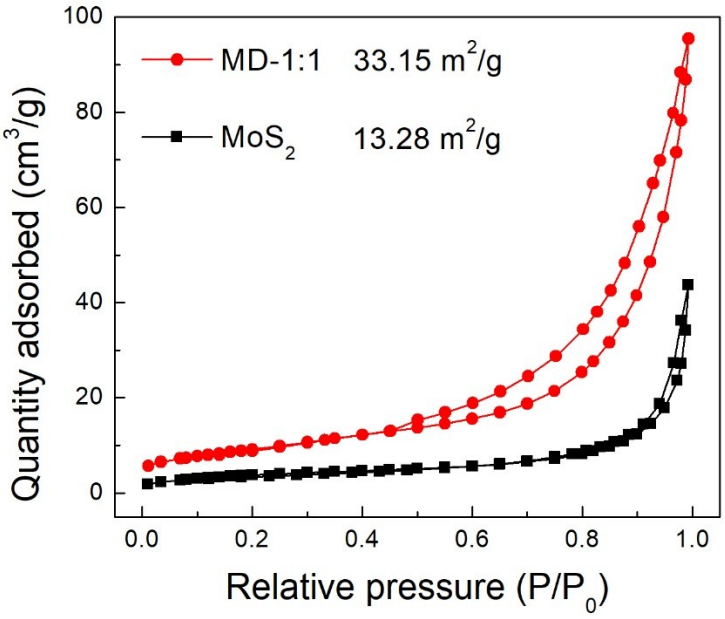

Fig. S3 N_2 adsorption-desorption isotherm of MoS_2 and MD-1:1.

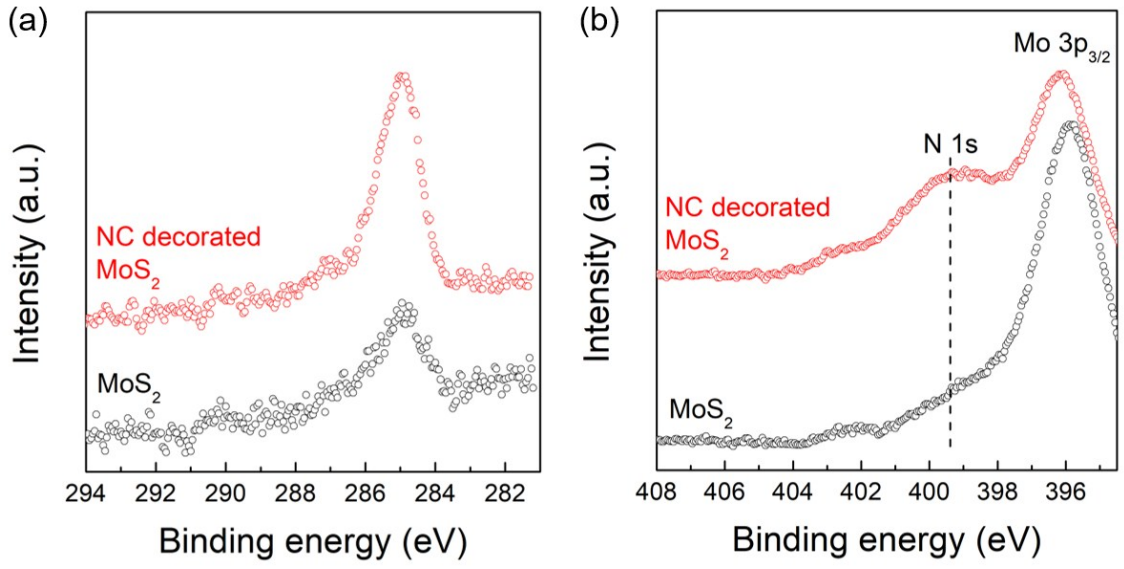

Fig. S4 The C 1s (a) and N 1s (b) spectra of MoS_2 and NC decorated MoS_2. The peak at 396 corresponds to Mo $3p_{3/2}$.

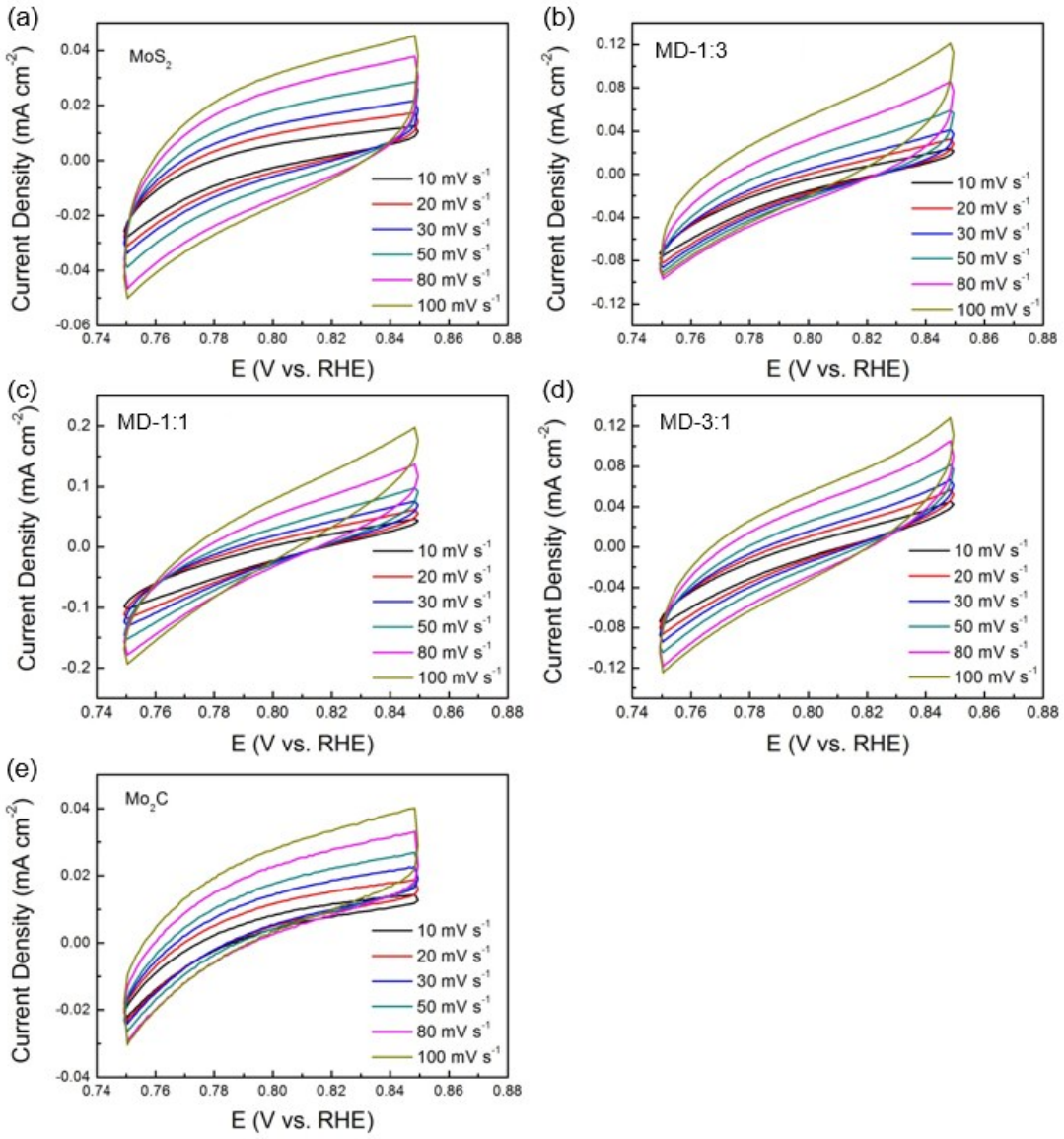

Fig. S5 CV curves (a-e) of the electrocatalysts at different scan rates in 1 M KOH.

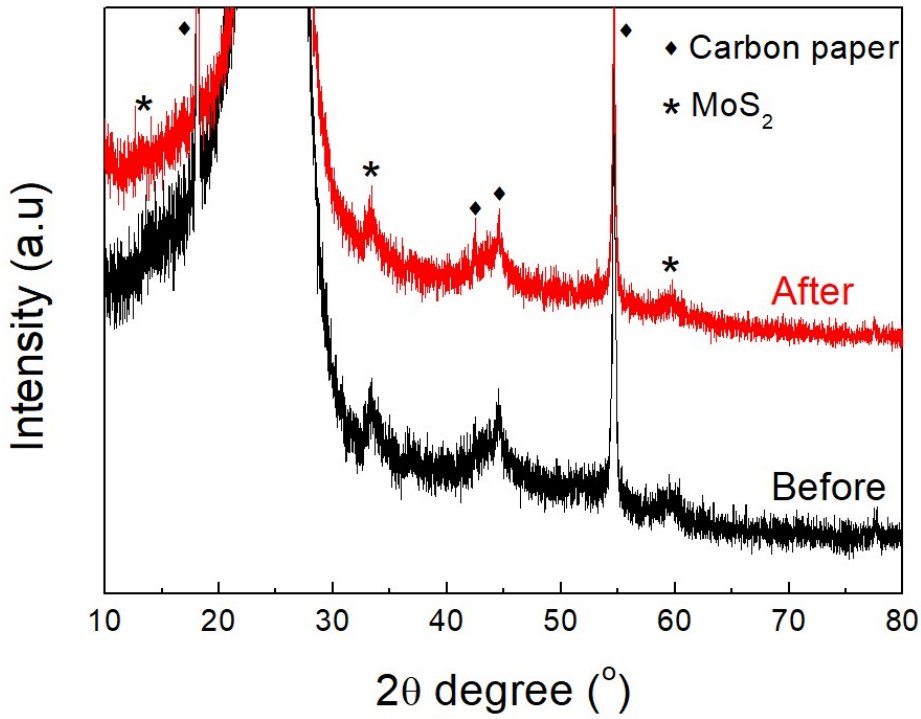

Fig. S6 XRD patterns of MD-1:1 catalyst before and after long-term HER test under alkaline condition (1 M KOH).

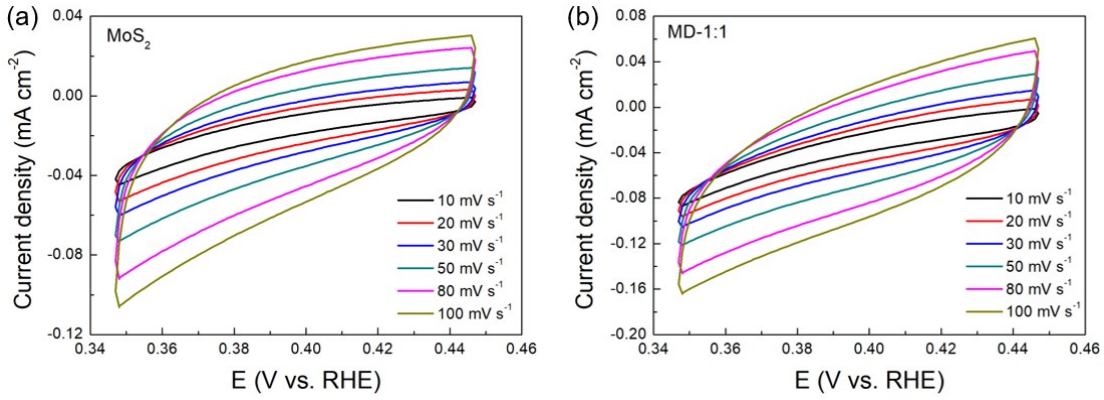

Fig. S7 CV curves of MoS_2 (a) and MD-1:1 (b) at different scan rates in 0.5 M H_2SO_4.

Table S1 Comparison of the HER performance of various MoS_2-based electrocatalysts.

Catalysts	Electrolyte	Current density @ 300 mV (mA cm^{-2})	Ref.
MoS_2 nanosheet-C_3N_4 heterojunction	0.5 M H_2SO_4	-0.508	[1]
$(PMo_{12}/MoS_2)_4$ [a]	0.5 M H_2SO_4	-0.499	[2]
Ni-doped MoS_2	0.5 M H_2SO_4	-2.368	[3]
Ta-doped MoS_2	0.5 M H_2SO_4	-0.205	[4]
NC decorated MoS_2	0.5 M H_2SO_4	-3.172	This work

[a] Treated by oxygen plasma treatment for 15 min.

References

[1] Y. Liu, H. Zhang, J. Ke, J. Zhang, W. Tian, X. Xu, X. Duan, H. Sun, M. O. Tade and S. Wang, *Appl. Catal. B*, 2018, **228**, 64-74.

[2] J. Huang, X. Deng, H. Wan, F. Chen, Y. Lin, X. Xu, R. Ma and T. Sasaki, *ACS Sustain. Chem. Eng.*, 2018, **6**, 5227-5237.

[3] H. Wang, C. Tsai, D. Kong, K. Chan, F. Abild-Pedersen, J. K. Nørskov and Y. Cui, *Nano Res.*, 2015, **8**, 566-575.

[4] X. J. Chua, J. Luxa, A. Y. S. Eng, S. M. Tan, Z. k. Sofer and M. Pumera, *ACS Catal.*, 2016, **6**, 5724-5734.