

## Supporting information

### Self-supported Porous NiMo Electrocatalyst to Boost the Catalytic Activity of Hydrogen Evolution Reaction

*Qingxiang Kong<sup>a,b</sup>, Yulei Li<sup>b</sup>, Qin Zhao<sup>b</sup>, Zhenwei Liu<sup>b</sup>, Song Wu<sup>b</sup>, Xiaoning Tong<sup>b</sup>,*

*Junli Wang<sup>c</sup>, Bangfu Huang<sup>b</sup>, Ruidong Xu<sup>a,b\*</sup>, Linjing Yang<sup>a,b\*</sup>*

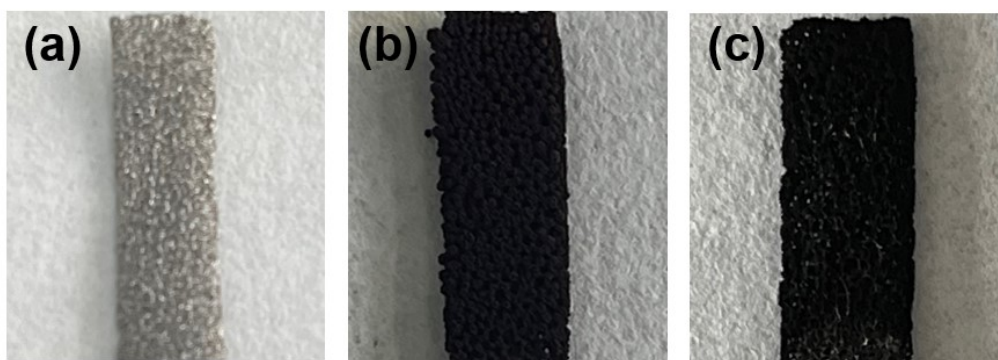
*<sup>a</sup> State Key Laboratory of Complex Nonferrous Metal Resources Clean Utilization, Kunming University of Science and Technology, Kunming 650093, China*

*<sup>b</sup> Faculty of Metallurgical and Energy Engineering, Kunming University of Science and Technology, Kunming 650093, China*

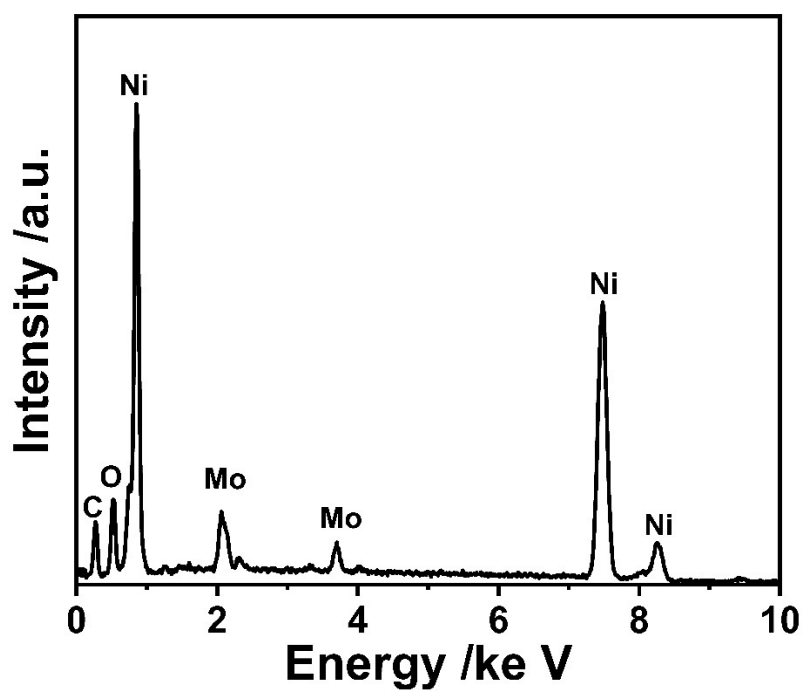
*<sup>c</sup> Research Center for Analysis and Measurement, Kunming University of Science and Technology, Kunming 650093, China*

---

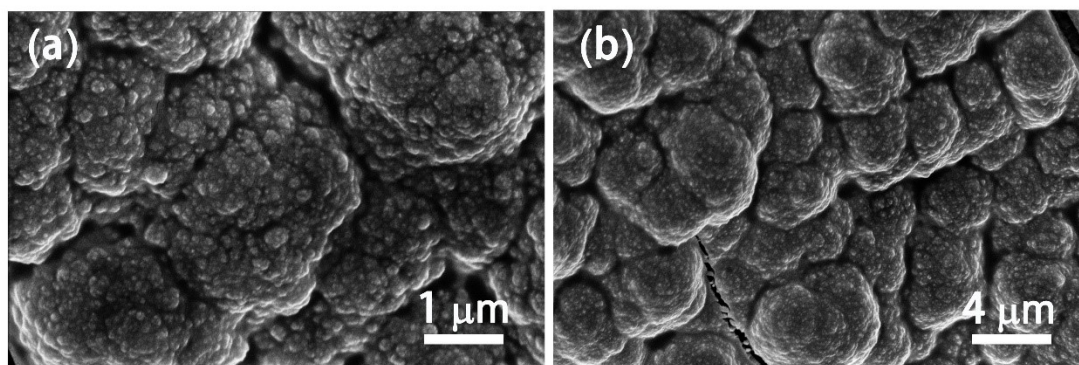
\* E-mail addresses: [rdxupaper@aliyun.com](mailto:rdxupaper@aliyun.com) (R. Xu), [eslinjingyang@kust.edu.cn](mailto:eslinjingyang@kust.edu.cn) (L. Yang).



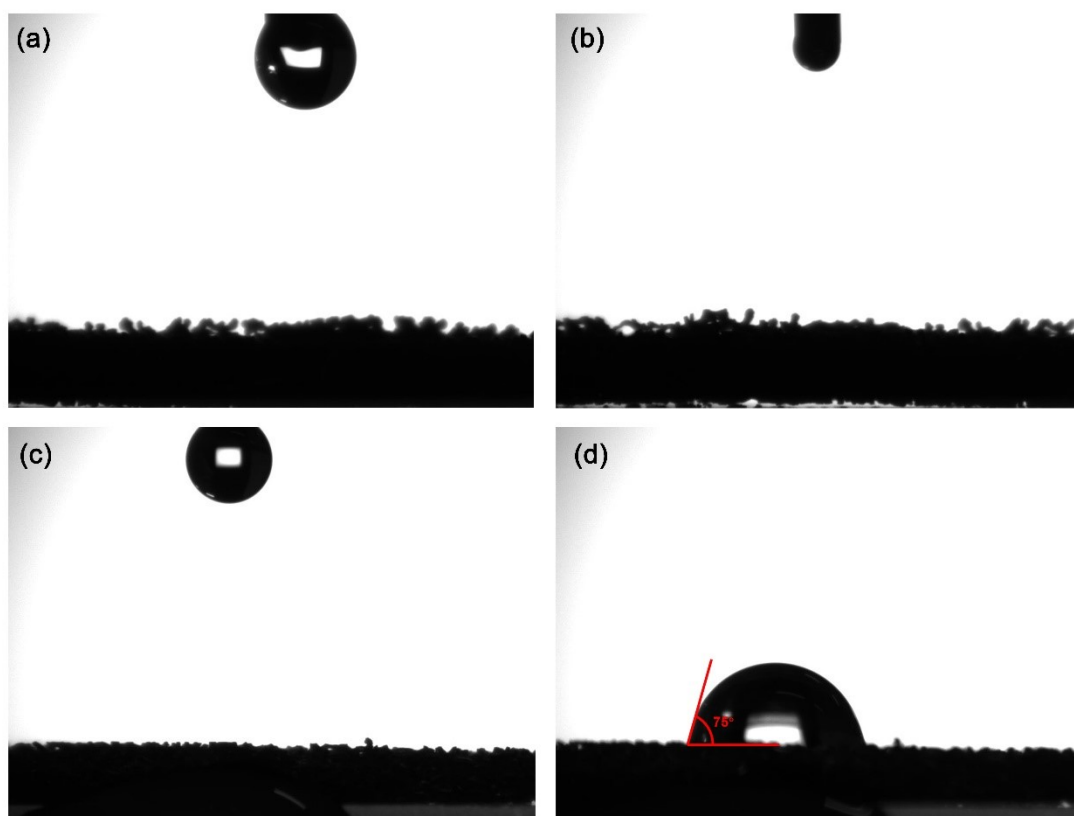
**Fig. S1.** Optical images of (a) NF array (b) Ni/NF array, and NiMo/Ni/NF array. The NiMo/Ni/NF array is darker than the NF array.



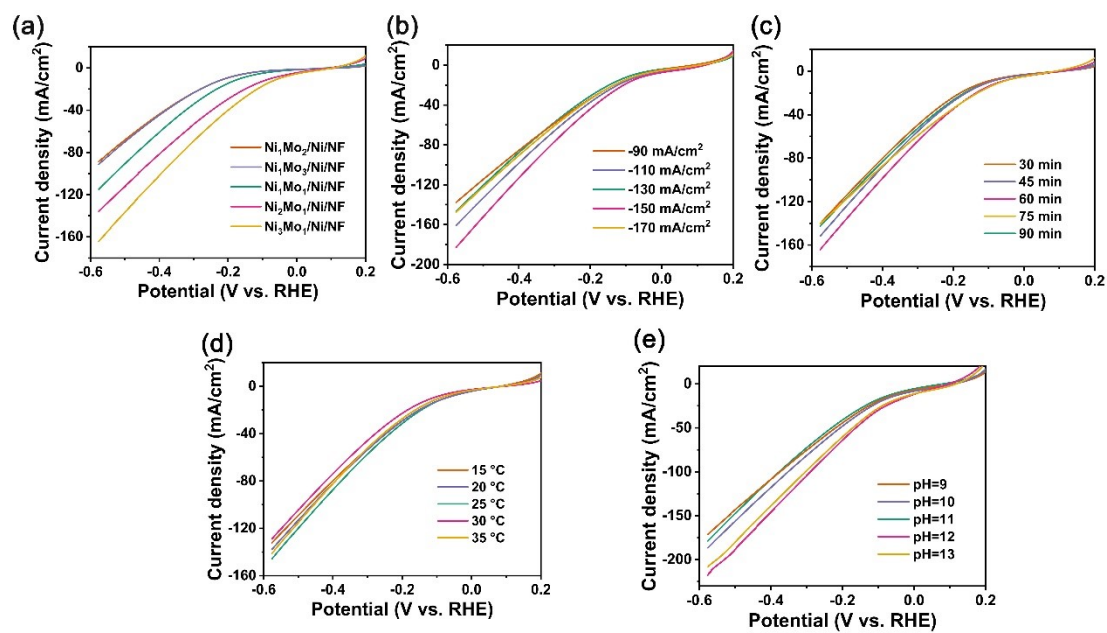
**Fig. S2.** EDS analysis spectra of NiMo/Ni/NF.



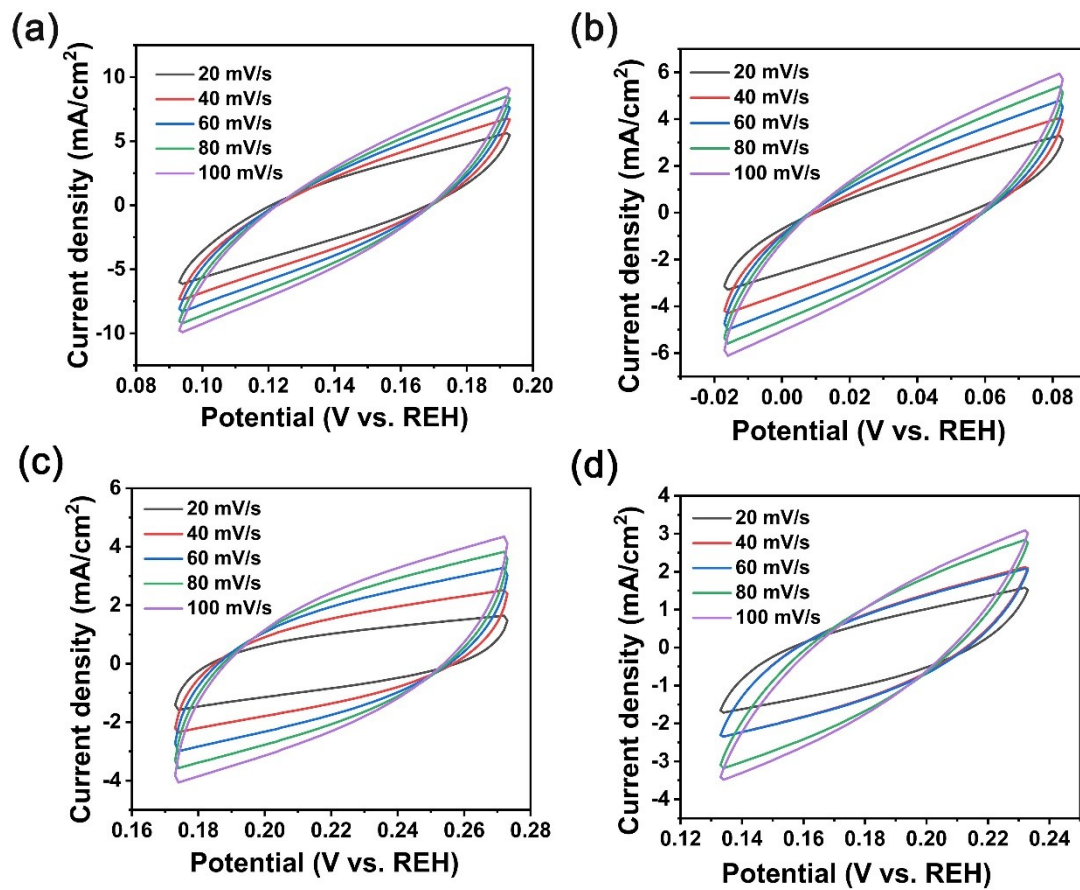
**Fig. S3.** SEM images of NiMo/NF.



**Fig. S4.** Surface wettability of the NiMo/Ni/NF (a,b) and the NF (c,d).

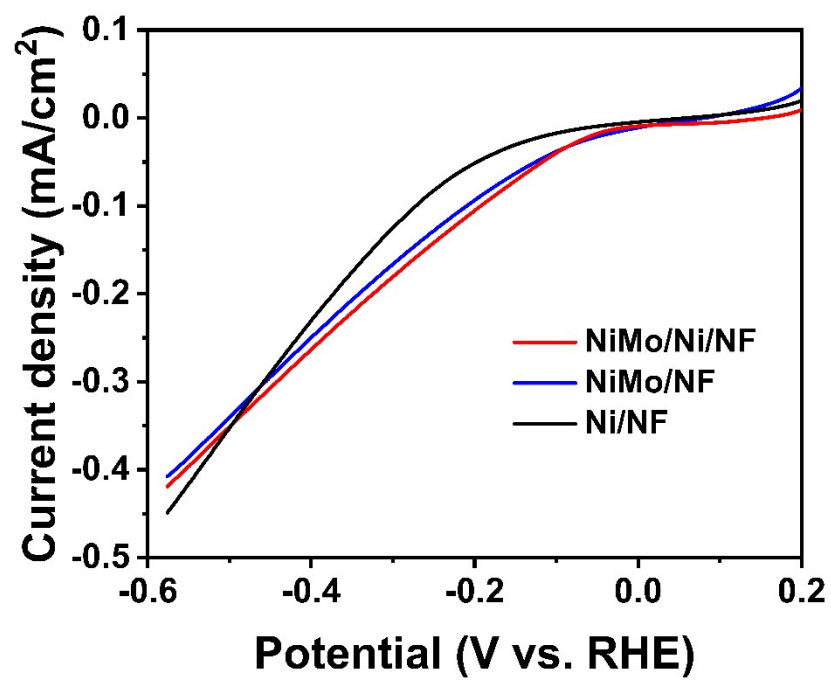


**Fig. S5.** The HER LSV curves of NiMo/Ni/NF in different (a) concentration of Ni and Mo (mM) (b) electrodeposition current density, (c) electrodeposition temperature time, (d) electrodeposition temperature, and (e) electrodeposition pH.



**Fig. S6.** Cyclic voltammograms (CVs) at different scan rates of the prepared samples.

a NiMo/Ni/NF, b NiMo/NF, c Ni/NF, d NF.



**Fig. S7.** HER polarization curves for NiMo/Ni/NF, NiMo/NF, and NF, normalized by electrical surface area (ECSA).

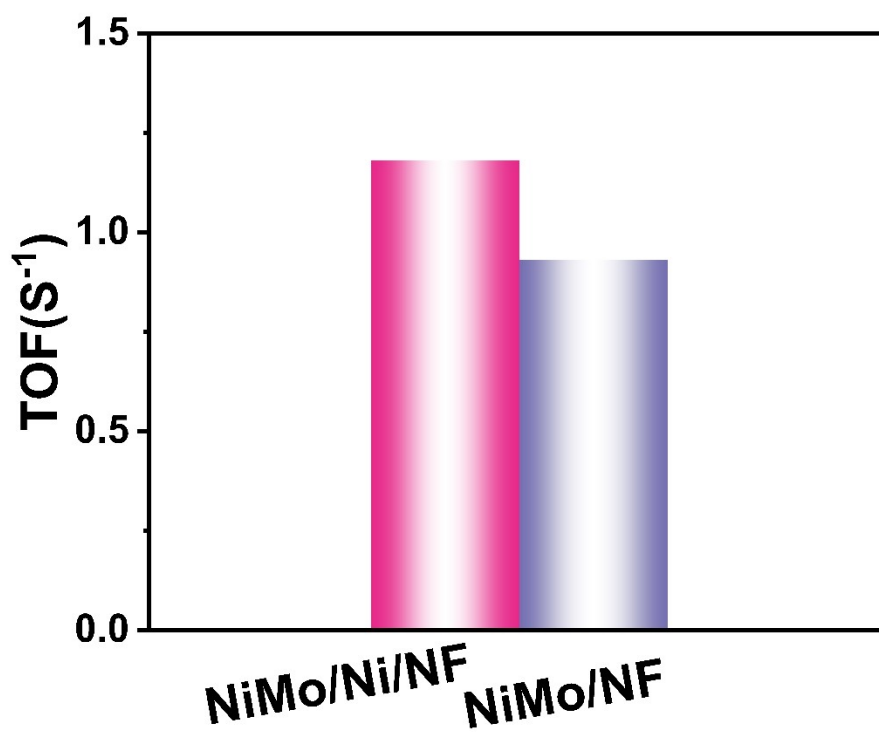


Fig. S8. TOF plots.

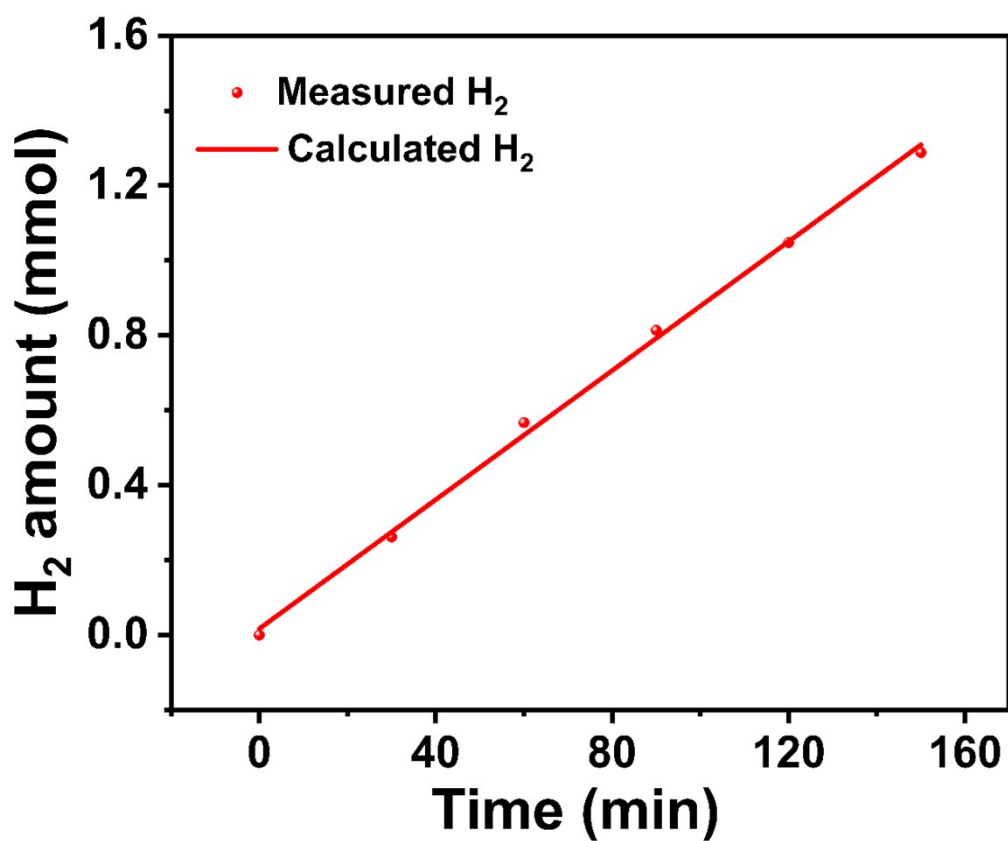


Fig. S9. Faradaic efficiency measurement of NiMo/Ni/NF.

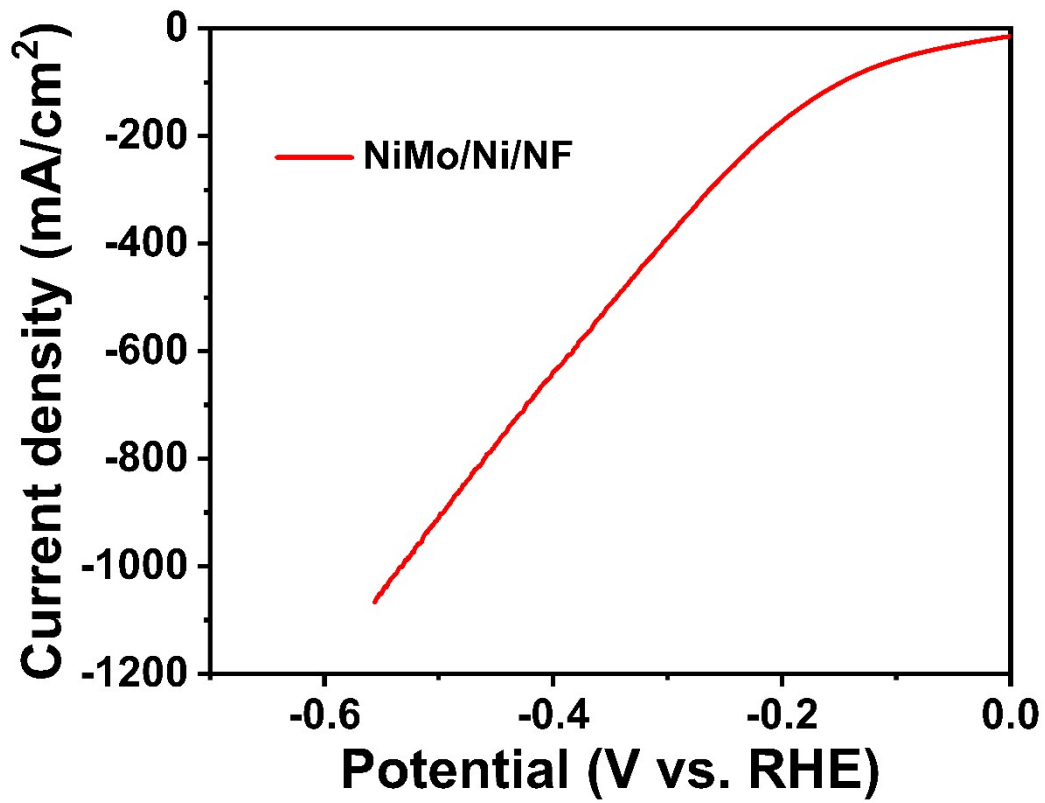


Fig. S10. LSV plots.

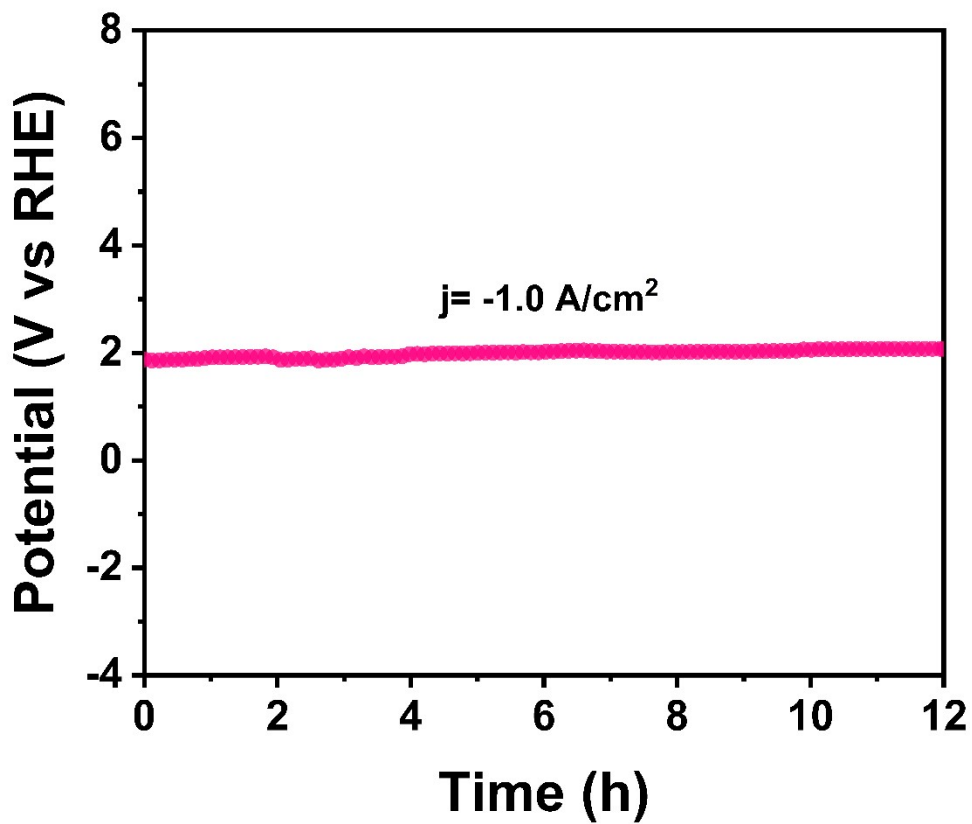


Fig. S11. Stability test plots.



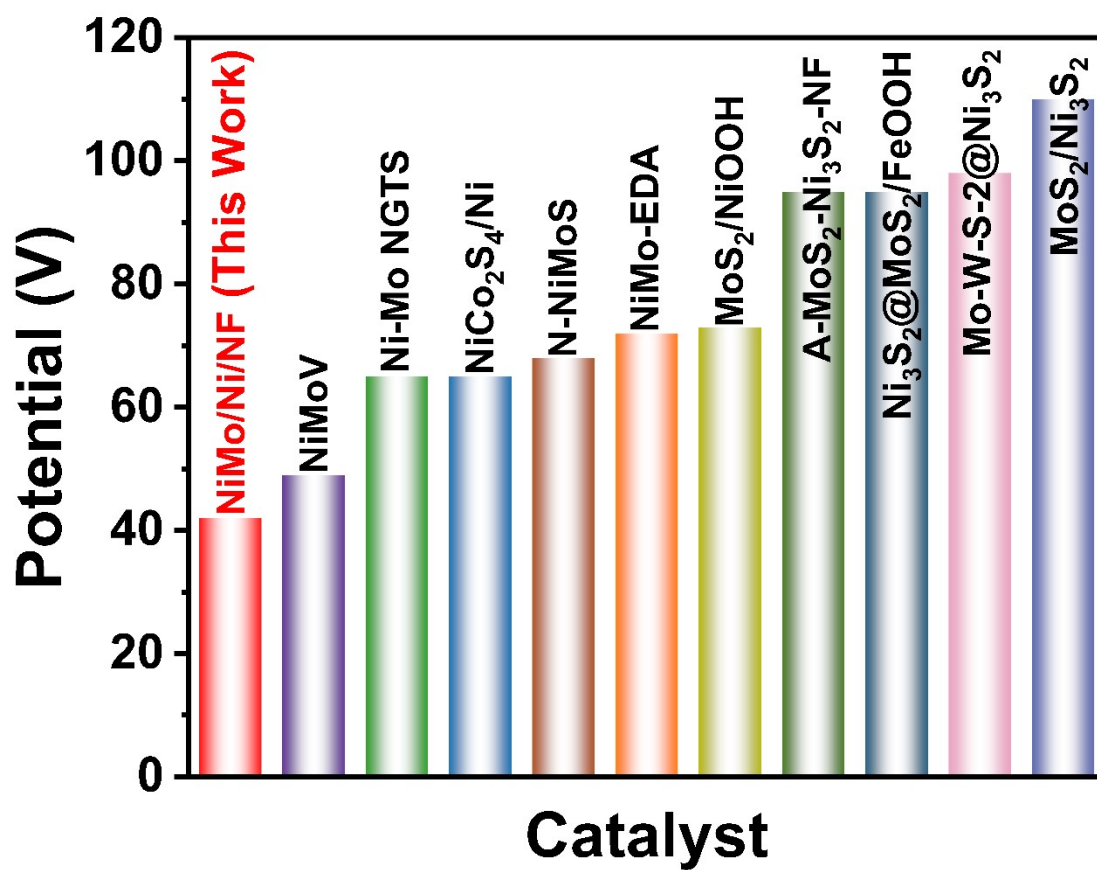
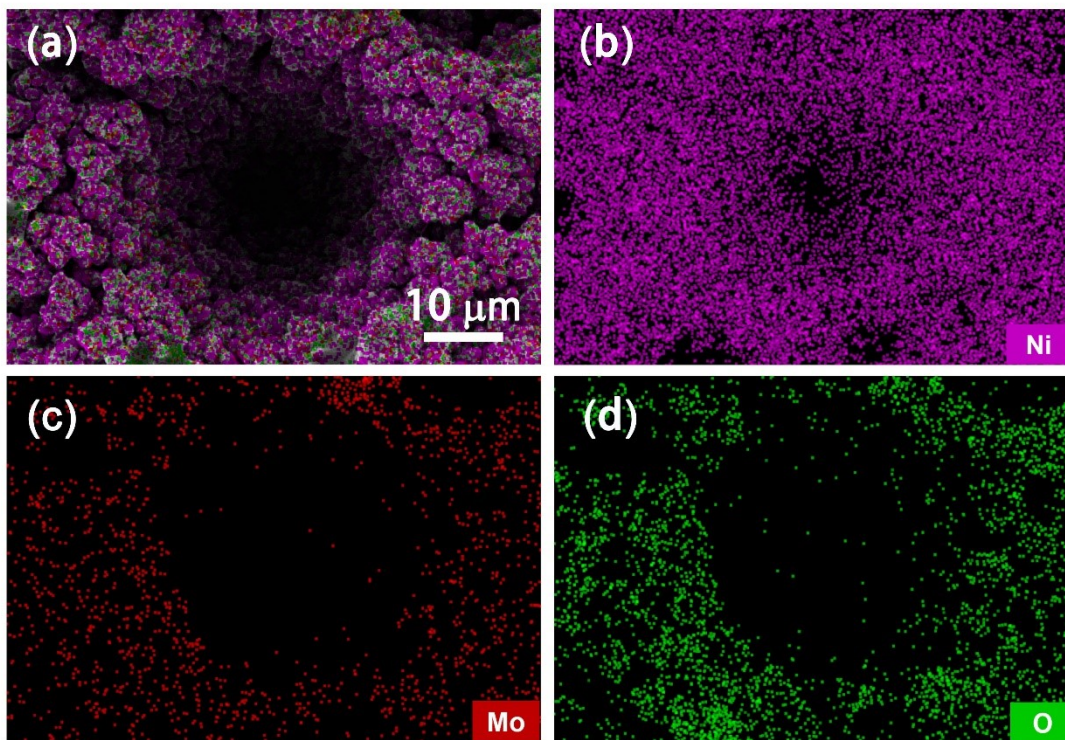
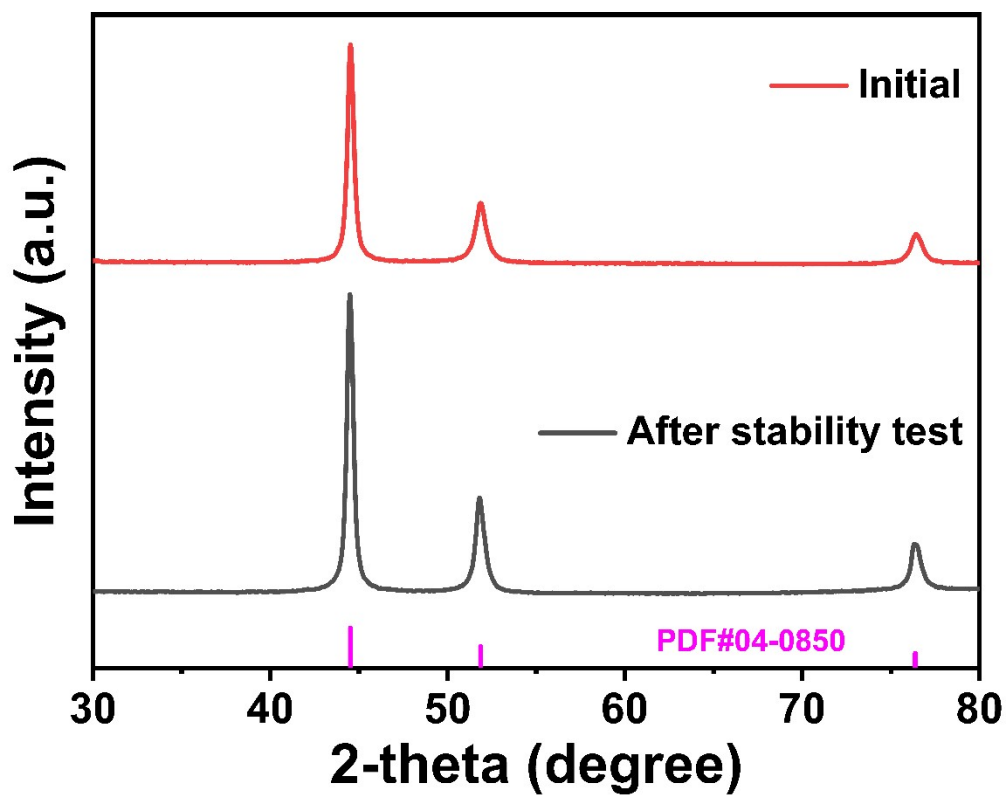


Fig. S12. Comparison of the voltage @ 10 mA/cm<sup>2</sup> of recently reported in various electrocatalysts.



**Fig. S13.** Corresponding EDX mapping images of the NiMo/Ni/NF after the HER stability test for 70 h.



**Fig. S14.** XRD spectra comparison of fresh NiMo/Ni/NF electrocatalyst and NiMo/Ni/NF electrocatalysts after the HER stability tests.

**Table S1.** Comparison of the potentials at 10 mA cm<sup>-2</sup> with recently reported HER catalysts

Catalyst	Electrolyte	Overpotential (mV) at 10 mA cm <sup>-2</sup>	Tafel slope (mV dec <sup>-1</sup> )	Reference
NiMo/Ni/NF	1.0 M KOH	42	44	This work
N-NiMoS		68	86	1
Ni <sub>3</sub> S <sub>2</sub> @MoS <sub>2</sub> /FeOOH		95	85	2
MoS <sub>2</sub> /NiOOH		73	75	3
NiMo-EDA		72	89	4
MoS <sub>2</sub> /Ni <sub>3</sub> S <sub>2</sub>		110	83	5
NiMoV		49	48.3	6
A-MoS <sub>2</sub> -Ni <sub>3</sub> S <sub>2</sub> -NF		95	107.5	7
Mo-W-S <sub>2</sub> @Ni <sub>3</sub> S <sub>2</sub>		98	92	8
Ni-Mo NGTS		65	67	9
NiCo <sub>2</sub> S <sub>4</sub> /Ni		65	84.5	10

## Reference

1. C. Huang, L. Yu, W. Zhang, Q. Xiao, J. Zhou, Y. Zhang, P. An, J. Zhang and Y. Yu, *Appl. Catal. B*, 2020, **276**, 119137.
2. Y. Li, K. Dastafkan, Q. Sun, Y. Ma, X. Wang, X. Yang, Z. Wang and C. Zhao, *Electrochim. Acta*, 2021, **379**, 138042.
3. X. Zhang and Y. Liang, *Adv. Sci.*, 2018, **5**, 1700644.
4. W. Gao, W. Gou, X. Zhou, J. G. Ho, Y. Ma and Y. Qu, *ACS Appl. Mater. Interfaces*, 2018, **10**, 1728-1733.
5. J. Zhang, T. Wang, D. Pohl, B. Rellinghaus, R. Dong, S. Liu, X. Zhuang and X. Feng, *Angew. Chem. Int. Ed.*, 2016, **55**, 6702-6707.
6. Y. Lin, D. Ding, S. Zhu, Q. Wen, H. Li, Z. Li, Y. Liu and Y. Shen, *Nano Res.*, 2023, **17**, 1232–1241.
7. M. Hu, Y. Qian, S. Yu, Q. Yang, Z. Wang, Y. Huang and L. Li, *Small*, 2024, **20**, 2305948.
8. M. Zheng, J. Du, B. Hou and C.-L. Xu, *ACS Appl. Mater. Interfaces*, 2017, **9**, 26066-26076.
9. T. Wang, Y. Guo, Z. Zhou, X. Chang, J. Zheng and X. Li, *Acs Nano*, 2016, **10**, 10397-10403.
10. L. Ma, Y. Hu, R. Chen, G. Zhu, T. Chen, H. Lv, Y. Wang, J. Liang, H. Liu, C. Yan, H. Zhu, Z. Tie, Z. Jin and J. Liu, *Nano Energy*, 2016, **24**, 139-147.