

Molybdenum-doped Co_3S_4 nanoarrays as outstanding catalyst for overall water splitting

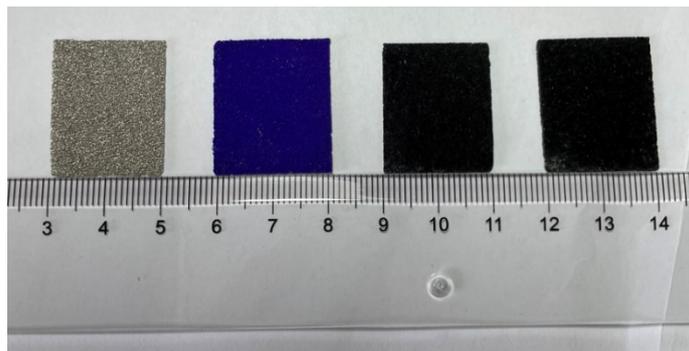


Fig. S1 The photograph of bare NF, Co-MOF/NF, Co_3S_4 /NF, and Mo- Co_3S_4 -0.1/NF.

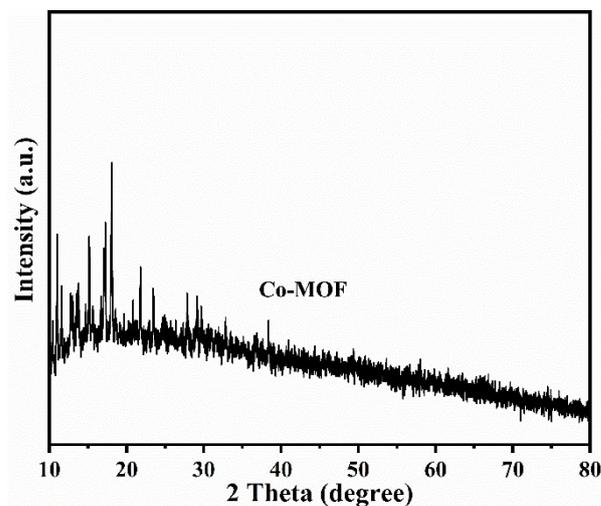


Fig. S2 XRD pattern of Co-MOF.

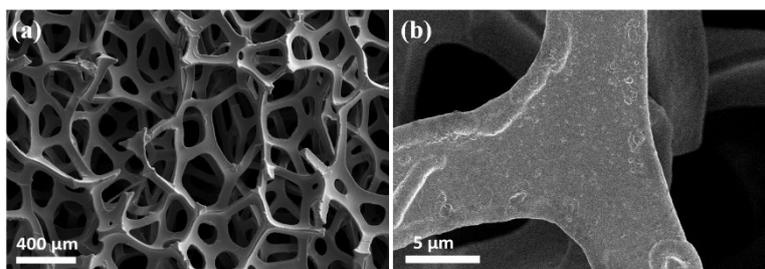


Fig. S3 SEM image of (a, b) bare NF.

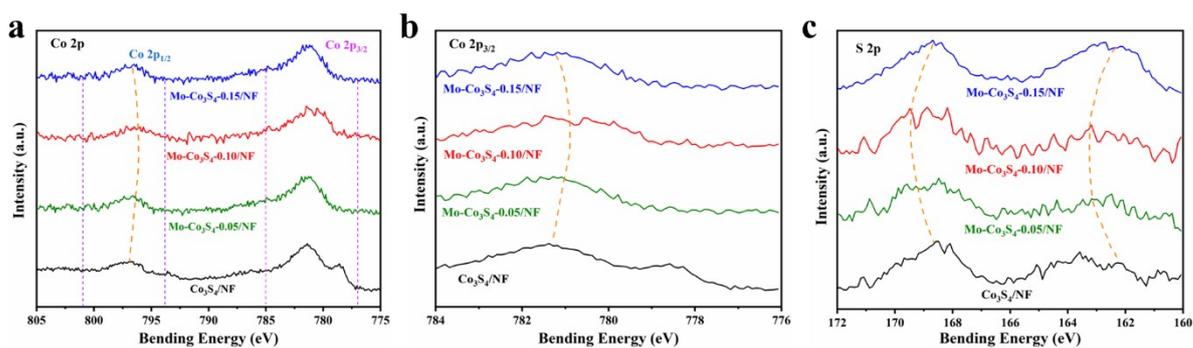


Fig. S4 High resolution of XPS spectra of Mo-Co₃S₄-X/NF: (a)Co2p, (b)Co2p_{3/2}, (c)S2p.

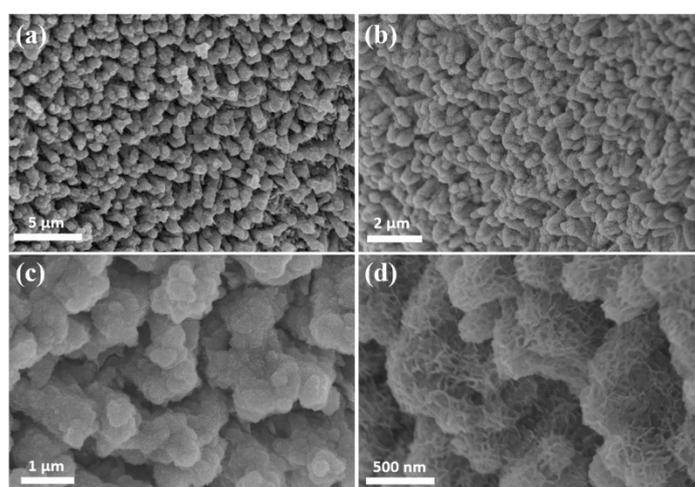


Fig. S5 SEM image of (a,c) Mo-Co₃S₄-0.05/NF and (b,d) Mo-Co₃S₄-0.15/NF.

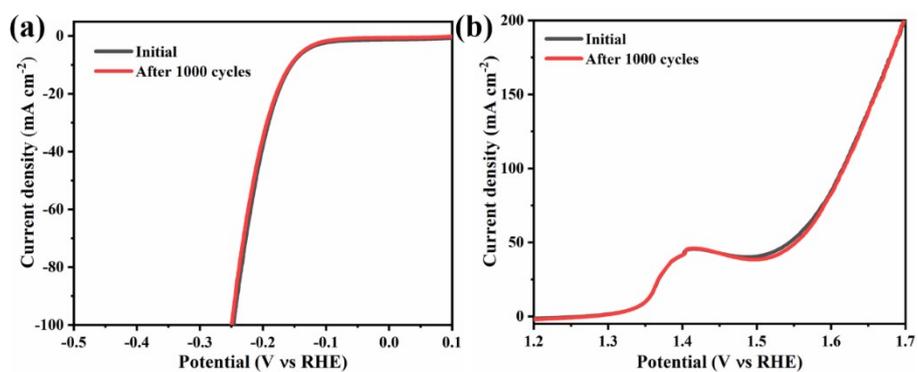


Fig. S6 LSV of the Mo-Co₃S₄-0.1/NF before and after 1000 CV cycles (a) HER and (b) OER.

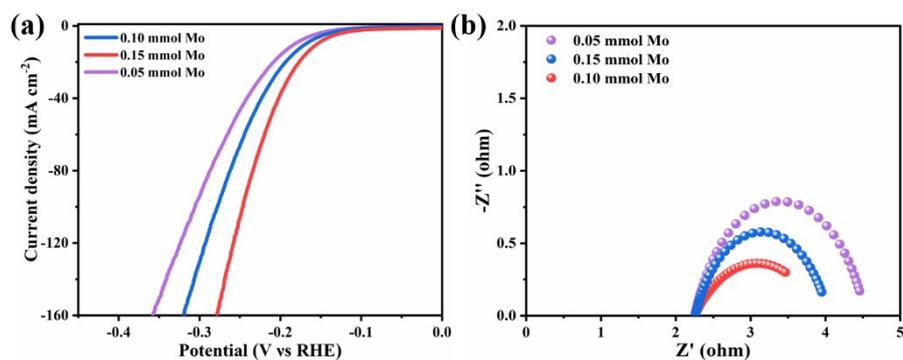


Fig. S7 The LSV curves of HER performance for the Mo-Co₃S₄-0.05/NF, Mo-Co₃S₄-0.10/NF and Mo-Co₃S₄-0.15/NF. (b)The Nyquist plots of the Mo-Co₃S₄-0.05/NF, Mo-Co₃S₄-0.10/NF and Mo-Co₃S₄-0.15/NF.

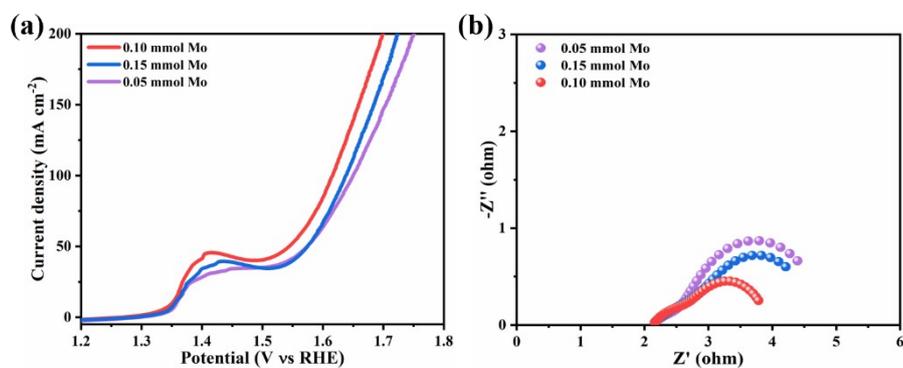


Fig. S8 The LSV curves of OER performance for the Mo-Co₃S₄-0.05/NF, Mo-Co₃S₄-0.10/NF and Mo-Co₃S₄-0.15/NF. (b)The Nyquist plots of the Mo-Co₃S₄-0.05/NF, Mo-Co₃S₄-0.10/NF and Mo-Co₃S₄-0.15/NF measured in 1.0 M KOH.

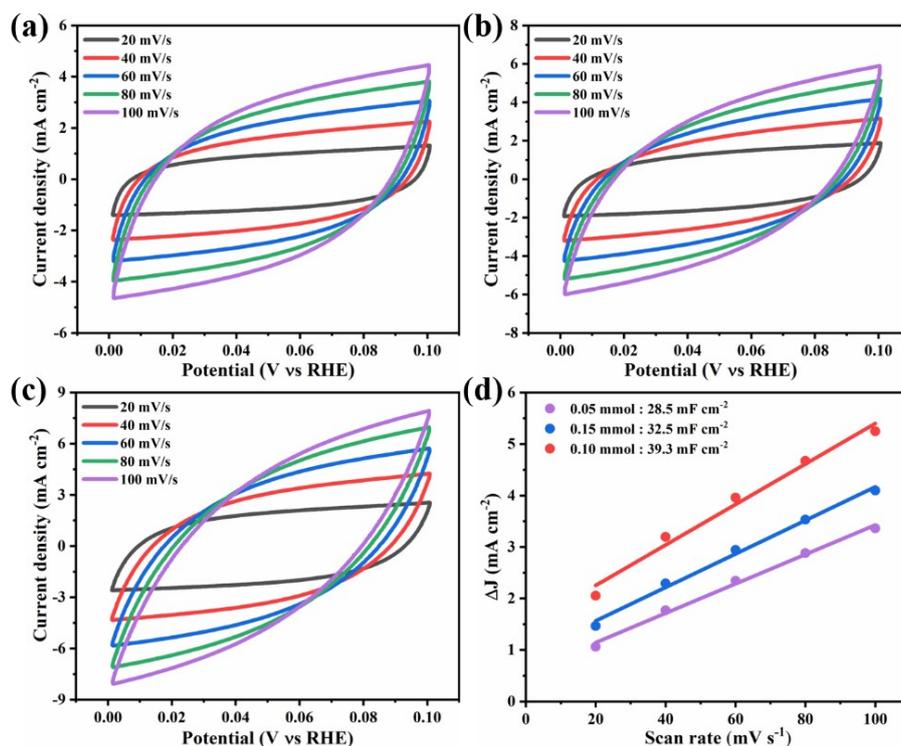


Fig. S9 Cyclic voltammetry curves at different scan rates under for (a) Mo-Co₃S₄-0.05/NF, (b) Mo-Co₃S₄-0.15/NF and (c) Mo-Co₃S₄-0.10/NF under overpotential from 0 to 0.1 V vs. RHE. (d) the C_{dl} values calculated from current densities vs scan rates.

Table S1. ICP-OES data of Mo-Co ₃ S ₄ -0.1/NF.Samples	Sample element content (wt %)		
	Co	Mo	S
Mo-Co ₃ S ₄ -0.1/NF	29.34	3.75	32.47
	29.39	3.73	32.60

Table S2. ICP-OES data of Mo-Co₃S₄-0.1/NF after HER test.

Samples	Sample element content (wt %)		
	Co	Mo	S
Mo-Co ₃ S ₄ -0.1/NF	29.06	3.15	30.49
	29.08	3.13	30.57

Table S3. ICP-OES data of Mo-Co₃S₄-0.1/NF after OER test.

Samples	Sample element content (wt %)		
	Co	Mo	S
Mo-Co ₃ S ₄ -0.1/NF	29.15	2.53	14.15
	29.17	2.49	14.33

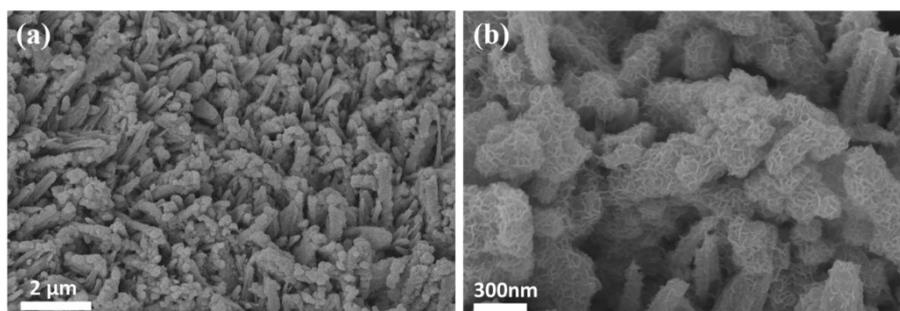


Figure.S10 SEM image of Mo-Co₃S₄-0.1/NF after long-time test for HER.

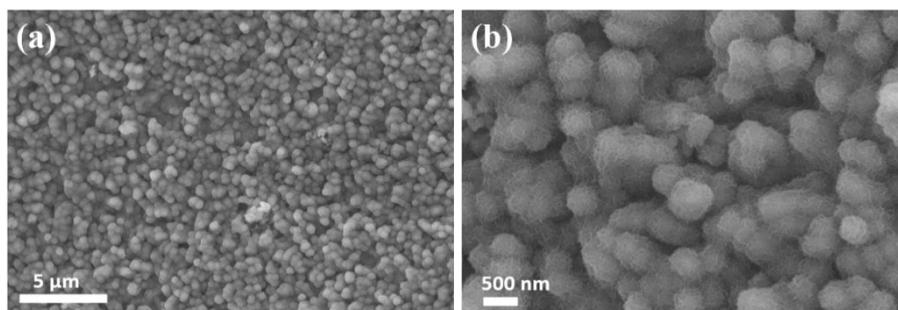


Figure.S11 SEM image of Mo-Co₃S₄-0.1/NF after long-time test for OER.

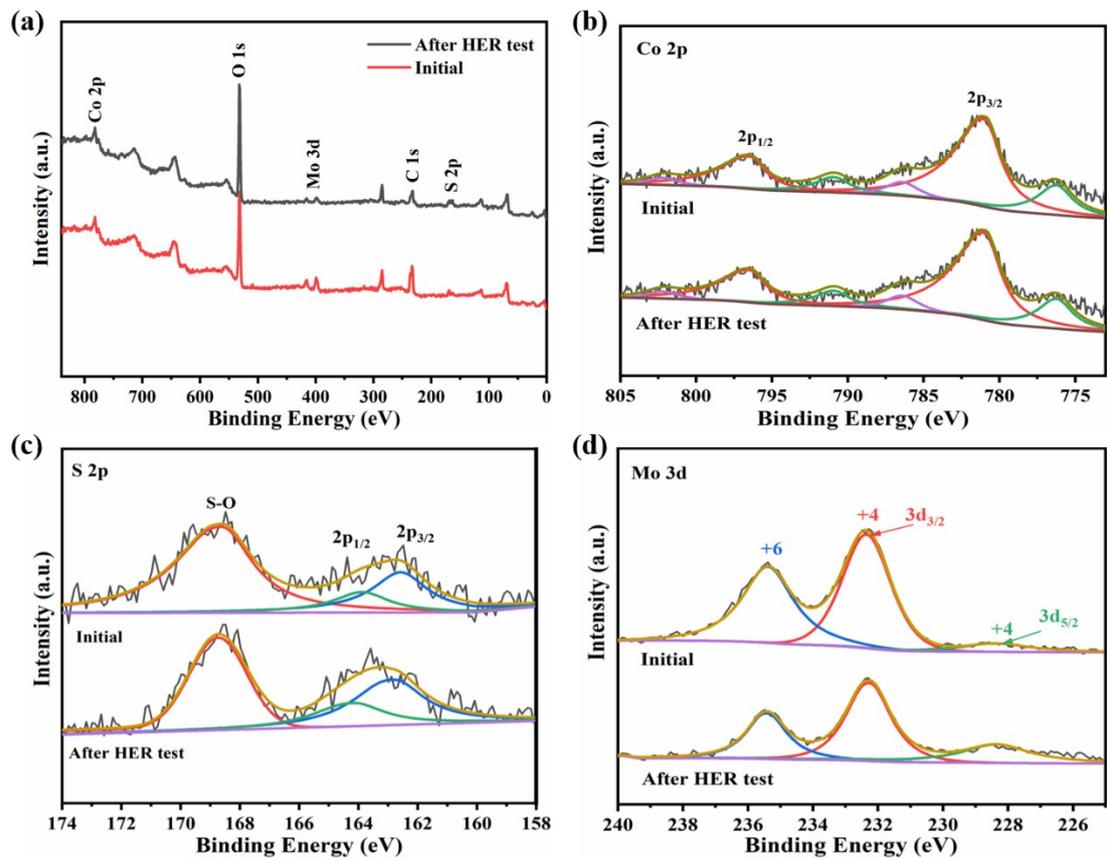


Figure.S12 The high-resolution XPS spectra of (a) Co 2p, (b) S 2p, and (c) Mo 3d of the Mo-Co₃S₄-0.1/NF before and after HER test.

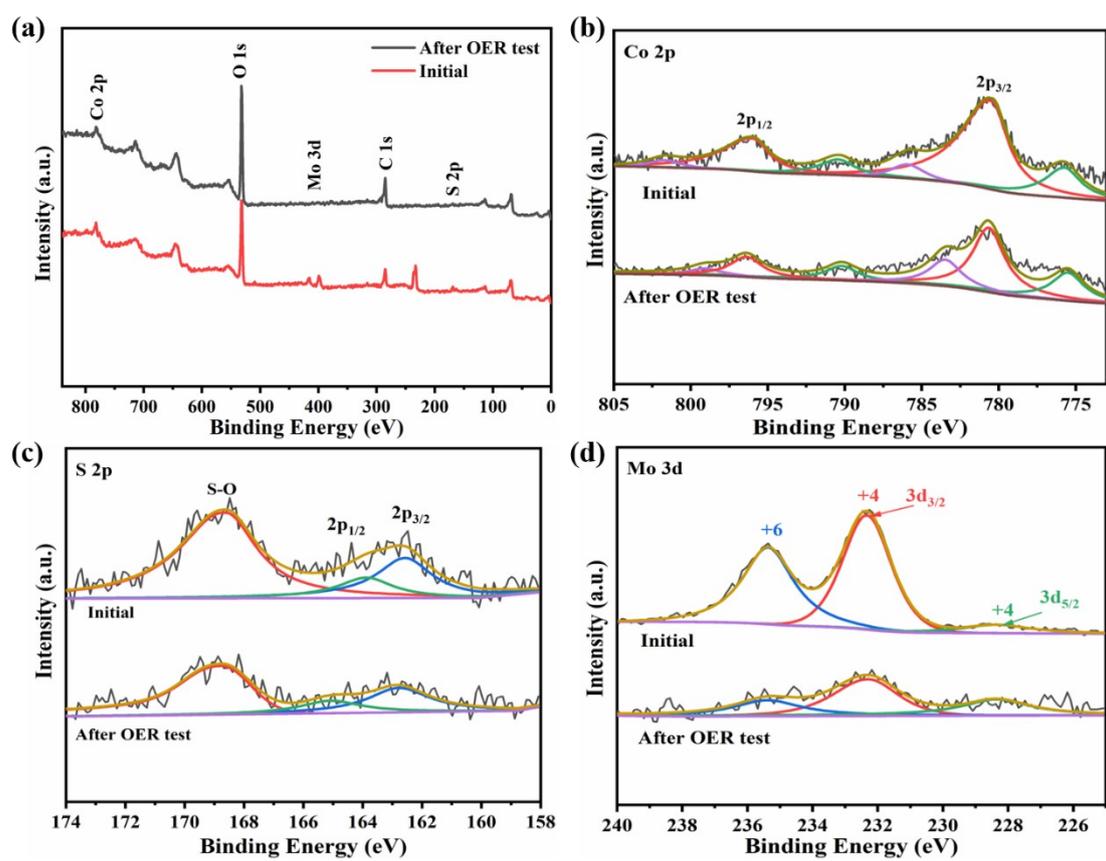


Figure.S13 The high-resolution XPS spectra of (a) Co 2p, (b) S 2p, and (c) Mo 3d of the Mo-Co₃S₄-0.1/NF before and after OER test.

Table S4. Comparison of the HER activity over Mo-Co₃S₄-0.1/NF with several Co-based electrocatalysts in alkaline media.

Samples	HER Overpotential/Current density (mV/mA cm ⁻²)	ref
Mo-Co ₃ S ₄ -0.1/NF	154/10	This work
Ni ₃ S ₂ /Co ₃ S ₄ /FeOOH@NF	158/10	1
CoMoP/Co ₃ O _{4-x} @NF	174/10	2
Co@Co-P@NPCNTs	160/10	3
Co ₉ S ₈ @Co ₉ S ₈ @MoS _{2-x}	173/10	4
Co-Ni ₃ N	194/10	5
CoNiMo/NPC	182/10	6
Ce-doped CoMoP/MoP@C	188/10	7

References:

1. Chen Fan, Xiaoping Shen, Jia Cheng, Leiming Lang, Guangxiang Liu, Zhenyuan Ji and Guoxing Zhu, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 2021, **631**, 127689.
2. Yawen Hao, Gaohui Du, Yi Fan, Lina Jia, Di Han, Wenqi Zhao, Qingmei Su, Shukai Ding and Bingshe Xu, *ACS APPL MATER INTER*, 2021, **13**, 55263-55271.
3. Jiqing Jiao, Wenjuan Yang, Yuan Pan, Chao Zhang, Shoujie Liu, Chen Chen and Dingsheng Wang, *SMALL*, 2020, **16**, 2002124.
4. Jing Li, Guangshe Li, Jianghao Wang, Chenglin Xue, Xiangshuai Li, Shuo Wang, Bingqi Han, Min Yang and Liping Li, *INORG CHEM FRONT*, 2020, **7**, 191-197.
5. Changrong Zhu, An-Liang Wang, Wen Xiao, Dongliang Chao, Xiao Zhang, Nguyen Huy Tiep, Shi Chen, Jiani Kang, Xin Wang, Jun Ding, John Wang, Hua Zhang and Hong Jin Fan, *ADV MATER*, 2018, **30**, 1705516.
6. Xiaobing Yang, Weisen Yang, Xingping Fu, Jiapeng Hu and Juan Chen, *INT J HYDROGEN ENERG*, 2021, **46**, 18318-18325.
7. Tianyun Chen, Yingyan Fu, Wenhao Liao, Yaqi Zhang, Min Qian, Haojiang Dai, Xianfeng Tong and Qinghua Yang, *ENERG FUEL*, 2021, **35**, 14169-14176.