Ni_3N/Co_4N nanosheet heterojunction electrocatalyst for hydrogen evolution reaction in alkaline fresh water/simulated seawater

Lixin Zhang,[*a,b] Hao Wei,[b] Hongfang Jiu,[*b] Congli Wang,[b] Yaqin Qin[b], Sicong Che,[b] Zhixin Guo,[b] and Yuxin Han,[b]

[a] Shanxi Key Laboratory of High Performance Battery Materials and Devices，North University of China, Taiyuan, 030051, People’s Republic of China

[b] School of Chemistry and Chemical Engineering, North University of China, Taiyuan 030051.

* Corresponding author.

E-mail address: edwardzlx@163.com (L. X. Zhang), hongfangjiu@163.com (H. F. Jiu).

Table. S1 The HER activity of the Ni_3N/Co_4N compared with other recently reported catalysts in the alkaline (1M KOH) medium.

Catalysts	η (mV)	Tafel slope (mV dec^{-1})	Ref.
Ni_3N/Co_4N	58	93	This work
Pt/C	29	66	1
NiCoN/C	103	-	2
Ni_3N-VN	64	37	3
Co-Ni_3N	194	156	4
Co_3N	113	102.4	5
N-NiCo LDH	100	123	6
C@NiCo12	105	157	7
$MNi_{63}Co_{37}/rGO_5$	115	45	8
$NiCo/NiCo_2S_4$@NiCo/NF	132	58.2	9

1 G. Zhou, G. Liu, X. Liu, Q. Yu, H. Mao, Z. Xiao and L. Wang, *Adv. Funct. Mater.,* 2022, 32, 2107608.

2 J. Lai, B. Huang, Y. Chao, X. Chen and S. Guo, *Adv. Mater.,* 2019,**31**,1805541.

3 H. Yan, Y. Xie, A. Wu, Z. Cai, L. Wang, C. Tian, et al. *Adv. Mater.,* 2019,**31**,1901174.

4 C. Zhu , A. L.Wang, W. Xiao, D. Chao, X. Zhang, N. H.Tiep, et al.*Adv. Mater.,*2018,**30**,1705516.

5 H. W. Choi, D. I. Jeong, S. Woo, S. B. Kwon, S. Wu, J. H. Kim, et al. *Appl. Surf. Sci.,* 2020,**529**,147177.

6 S. Tan, W. Ouyang, Y. Ji and Q. Hong, *J. Alloys Compd.,* 2021,**889**,161528.

7 T. Chen, R. Zhang, G. Chen, J. Huang, W. Chen, X. Wang, D. Chen, C. Li and K. Ostrikov, *Catal Today*, 2019, **337**, 147-154.

8 J. Dong, T. Sun, Y. Zhang, H. Zhang, S. Lu, D. Hu, J. Chen and L. Xu, *J. Colloid Interface Sci.*, 2021, **599**, 603-610.

9 Y. Ning, D. Ma, Y. Shen, F. Wang and X. Zhang, *Electrochim. Acta.* 2018,**265**:19-31.

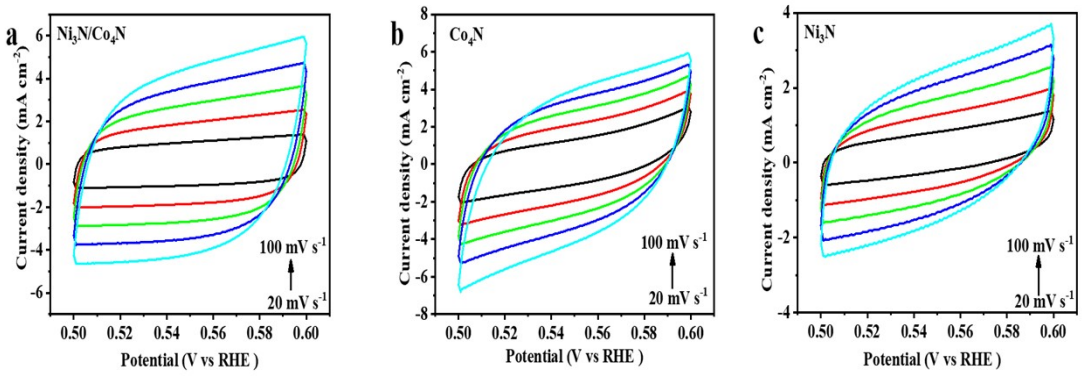

Fig. S1. Cyclic voltammograms of (a) Ni_3N/Co_4N, (b) Co_4N, (c) Ni_3N at the different scan rates varying from 20 to 100 mV s^{-1}.

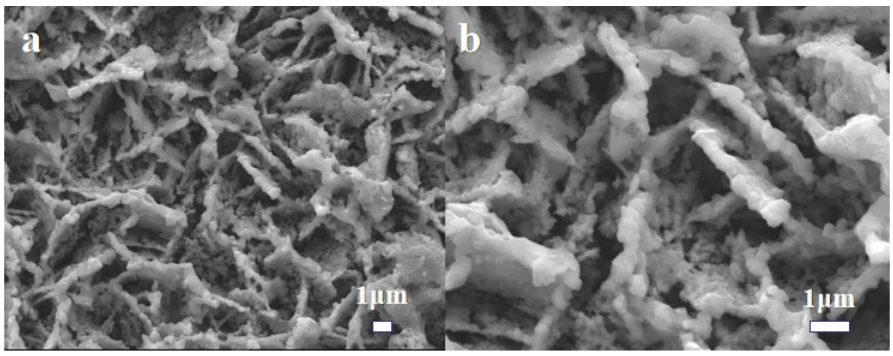

Fig.S2 The SEM images of Ni_3N/Co_4N in 1 M KOH after durability test

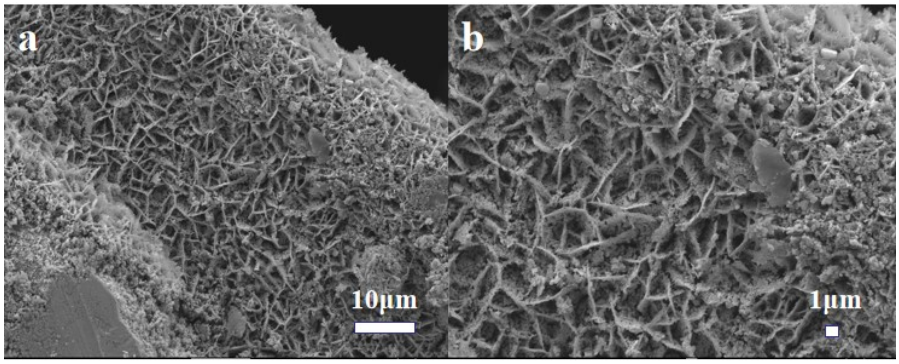

Fig.S3 The SEM images of Ni_3N/Co_4N in alkaline simulated seawater after durability test.

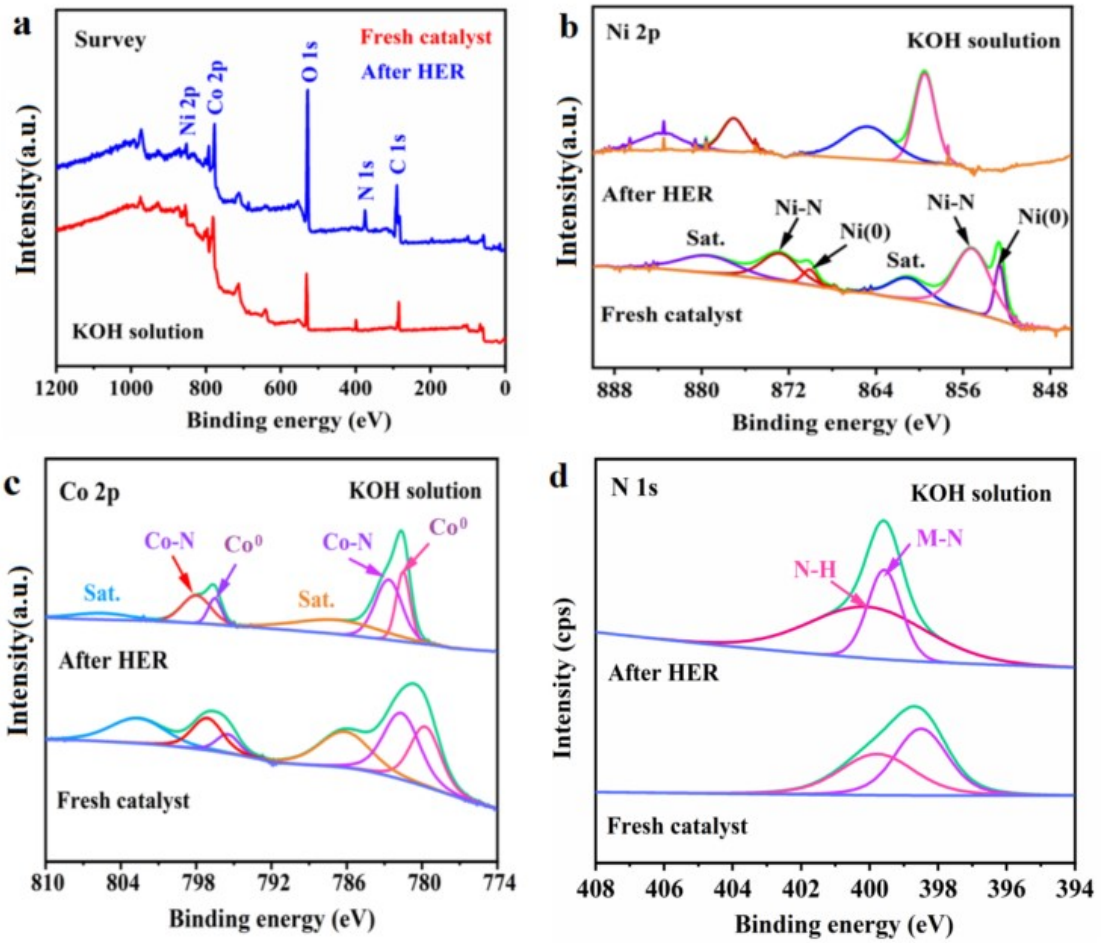

Fig.S4 The XPS spectrum of Ni_3N/Co_4N in 1 M KOH after durability test.

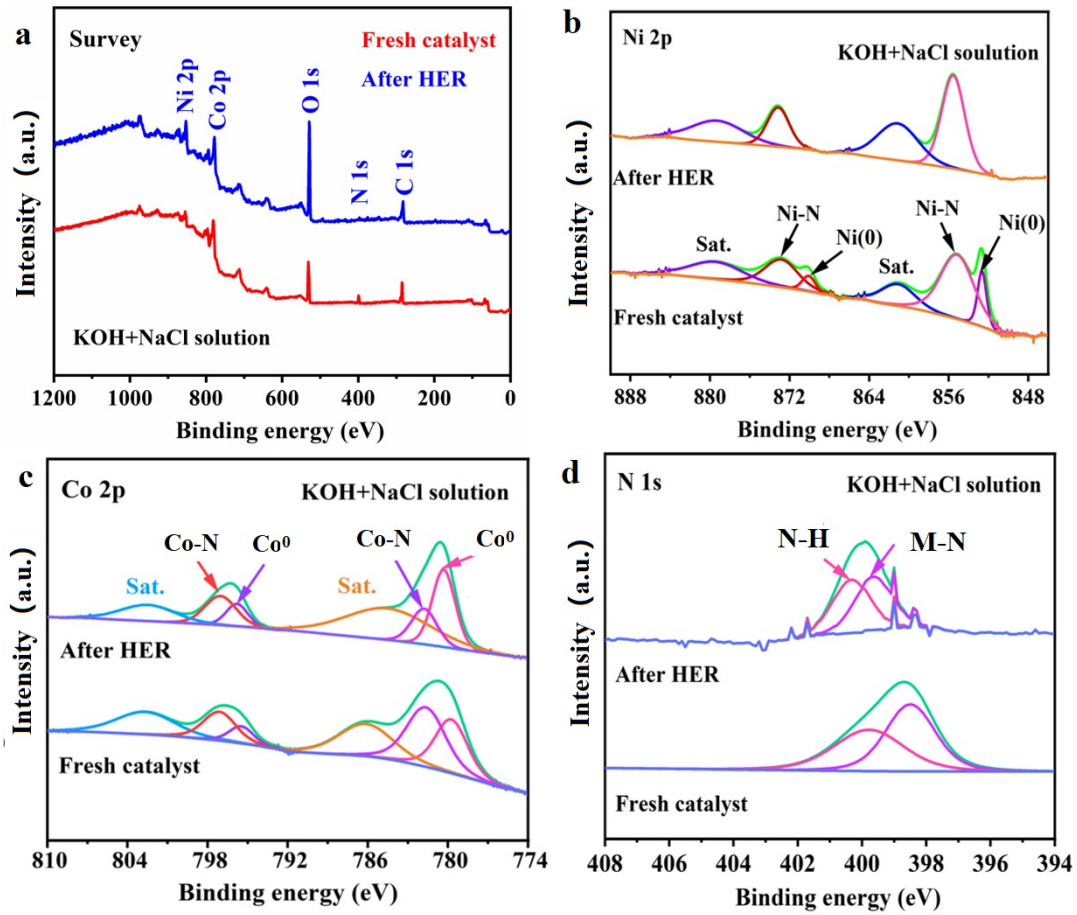

Fig.S5 The XPS spectrum of Ni_3N/Co_4N in alkaline simulated seawater after durability test.