Supplementary Information (SI) for New Journal of Chemistry.
This journal is © The Royal Society of Chemistry and the Centre National de la Recherche Scientifique 2025

Supplementary Information

Synthesis of sulfur-doped CoLaLDH/MXene composite as an efficient electrocatalyst for oxygen evolution reaction in alkaline medium

Guoyang Lv, [a] Qiulan Lu, [a] Zhengkun Ma, [a] Liqi Wei, [a] Jieying Wei, [a] Xiongdiao Lan, [a] Weiguo Li, [c] Pengru Liu*[a,b,c] and Dankui Liao*[b]

[a]Guangxi Key Laboratory for Polysaccharide Materials and Modifications, School of Chemistry and Chemical Engineering, Guangxi Minzu University, Nanning, 530006, China.

[b]Guangxi Key Laboratory of Petrochemical Resource Processing and Process Intensification Technology, School of Chemistry and Chemical Engineering, Guangxi University, Nanning, 530004, China.

[c]Key Laboratory of Pesticides Development and Application Technology, Ministry of Agriculture and Rural Affairs, Guangxi Key Laboratory of High-efficient Pesticides Development and Application Technology, Guangxi Tianyuan Biochemical Company Limited, Nanning, 530007, China

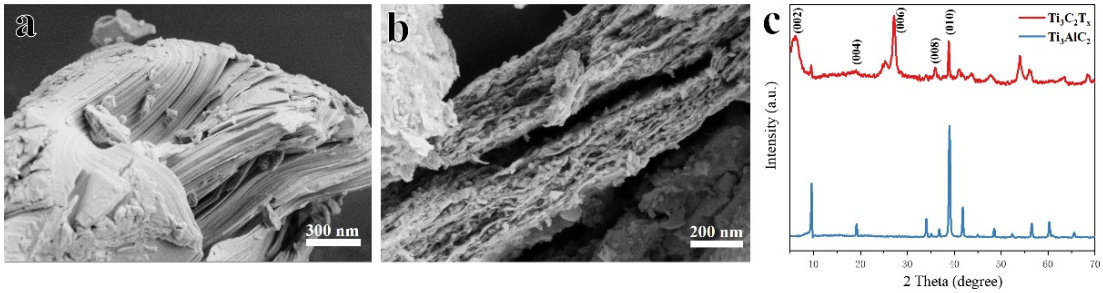

Figure S1. SEM images of (a) MAX phase Ti_3AlC_2, and (b) $Ti_3C_2T_x$ MXene; (c) The XRD patterns of $Ti_3C_2T_X$ and Ti_3AlC_2.

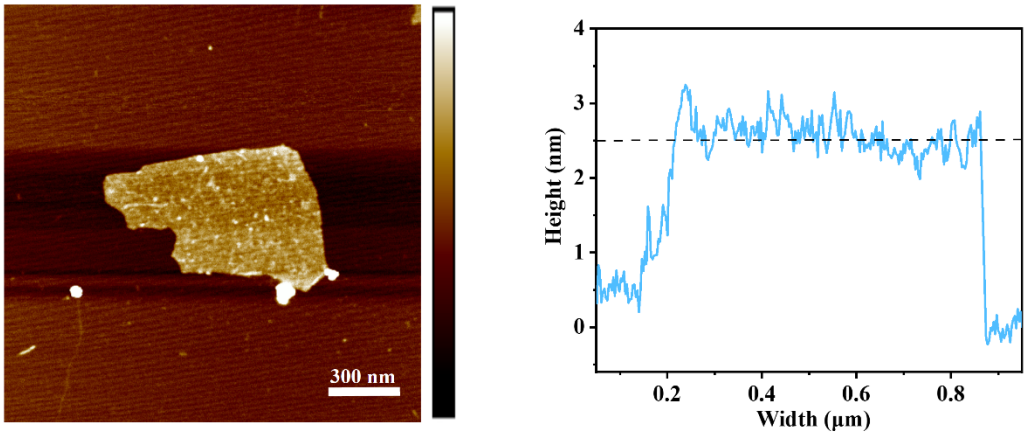

Figure S2. AFM image and height profile of $Ti_3C_2T_x$ MXene.

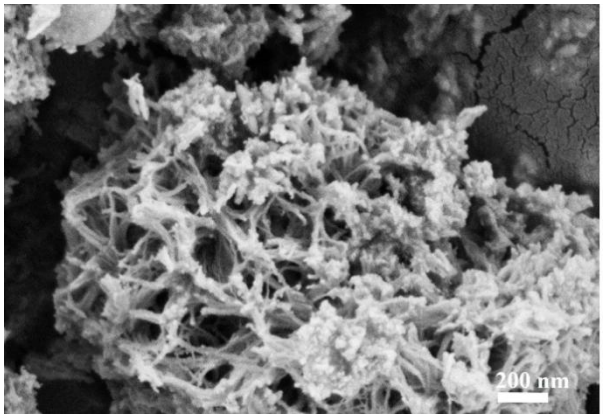

Figure S3. SEM images of CoLaLDH

Table S1. ICP-OES of S-CoLaLDH/MXene

Test element	sample mass m_0(g)	constant volume V_0(mL)	test solution element concentration C_o(mg/L)	dilution factor f	digestion solution/original sample concentration C_1（mg/L)	sample element content W(%)
S	0.0427	10	36.3246	20	726.4920	17.0139%
S	0.0427	10	37.2498	20	744.9960	17.4472%
S	0.0427	10	37.0390	20	740.7800	17.3485%

Table S2. Comparison of OER performance of catalysts in this work and other reported transition metal electrocatalysts in alkaline media.

Catalyst	Electrolyte	J(mA cm^{-2})	η (mV)	Tafel slope ($mV.dec^{-1}$)	References
S-CoLaLDH/MXene	1 M KOH	10	303	57	This work
CoNi-ZIF-67@MXenes	1 M KOH	10	323	65.1	[1]
NiFe-LDH/Co,N-CNF	0.1 M KOH	10	312	60	[2]
nNiFe-LDH/3D MPC	1 M KOH	10	340	71	[3]
NiPS3@MXene	1 M KOH	10	340	82	[4]
Co3O4 QDs/MXene	1 M KOH	10	340	63.97	[5]
NiMo@FG	1 M KOH	10	337	64	[6]
NiFe-LDH@carbon	1 M KOH	10	340	67	[7]
Co-LDH@MXenes	1 M KOH	10	330	82	[8]
NiFeCo-LDH/TiO2/MXenes	1 M KOH	10	320	98.4	[9]
NiCoS/MXenes	1 M KOH	10	365	58.2	[10]
MoSe2/MXenes	1 M KOH	10	340	91	[11]
LaSrCoO3@MXene	1 M KOH	10	330	83.9	[12]

1. Y. Wen, Z. Wei, C. Ma, X. Xing, Z. Li and D. Luo, *Nanomaterials*, 2019, **9**, 775.
2. Q. Wang, L. Shang, R. Shi, X. Zhang, Y. Zhao, G. I. Waterhouse, L. Z. Wu, C. H. Tung and T. Zhang, *Advanced Energy Materials*, 2017, **7**, 1700467.
3. J. Zhang, Q. Cao, X. Yu, H. Yao, B. Su and X. Guo, *Nanomaterials*, 2024, **14**, 1661.
4. L. Zhong, M. Yue, Y. Liang, B. Xi, X. An, Y. Xiao, B. Cheng, S. Lei and S. Xiong, *Advanced Functional Materials*, 2024, **34**, 2407740.
5. H. Zhou, Y. Sun, H. Yang, Y. Tang, Y. Lu, Z. Zhou, S. Cao, S. Zhang, S. Chen and Y. Zhang, *Advanced Science*, 2023, **10**, 2303636.
6. S. Jeong, K. Hu, T. Ohto, Y. Nagata, H. Masuda, J.-i. Fujita and Y. Ito, *ACS Catalysis*, 2019, **10**, 792-799.
7. H. Hu, S. Wageh, A. A. Al-Ghamdi, S. Yang, Z. Tian, B. Cheng and W. Ho, *Applied Surface Science*, 2020, **511**, 145570.
8. C. Li, Z. Dai, W. Liu, P. Kantichaimongkol, P. Yu, P. Pattananuwat, J. Qin and X. Zhang, *Chemical Communications*, 2021, **57**, 11378-11381.

9. N. Hao, Y. Wei, J. Wang, Z. Wang, Z. Zhu, S. Zhao, M. Han and X. Huang, *RSC advances*, 2018, **8**, 20576-20584.
10. X. Wu, B. Huang, Q. Wang and Y. Wang, *Chemical Engineering Journal*, 2020, **380**, 122456.
11. H. Huang, J. Cui, G. Liu, R. Bi and L. Zhang, *ACS nano*, 2019, **13**, 3448-3456.
12. M. O. Madi and M. Tahir, *Journal of Alloys and Compounds*, 2024, **983**, 173730.