# Supporting information

## Building an In-rich interphase to stabilize lithium metal anodes with a solid-like electrolyte

Jiashuai Li, Dongze Li, Qiufen Li, Mengxi Bai, Xiang Wang, Xiaoyan Lin, Siyuan Shao, and Ziqi Wang*

Department of Materials Science and Engineering, College of Chemistry and Materials Science, Jinan University, Guangzhou 511443, P. R. China

AUTHOR INFORMATION

**Corresponding Author**

Z.W.* wangzq@jnu.edu.cn

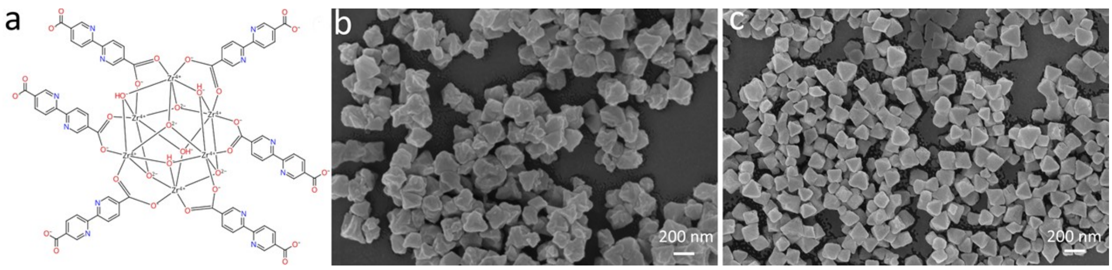


**Fig. S1**. (a) Structural formula of MOF-867. SEM images of the as-prepared (a) MOF-867 and (b) In-MOF.

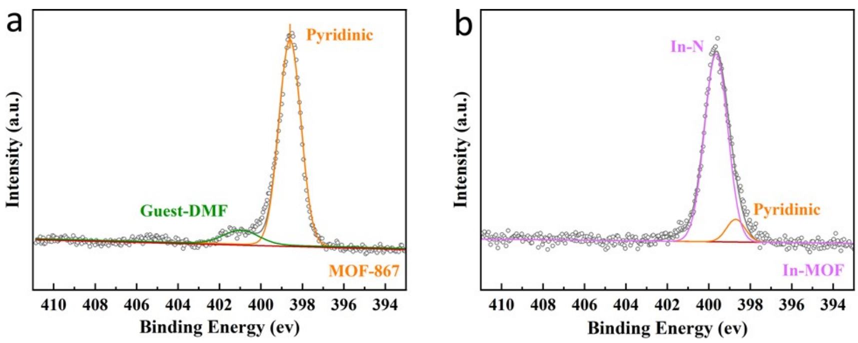


**Fig. S2**. The N 1s XPS spectra of (a) MOF-867 and (b) In-MOF.

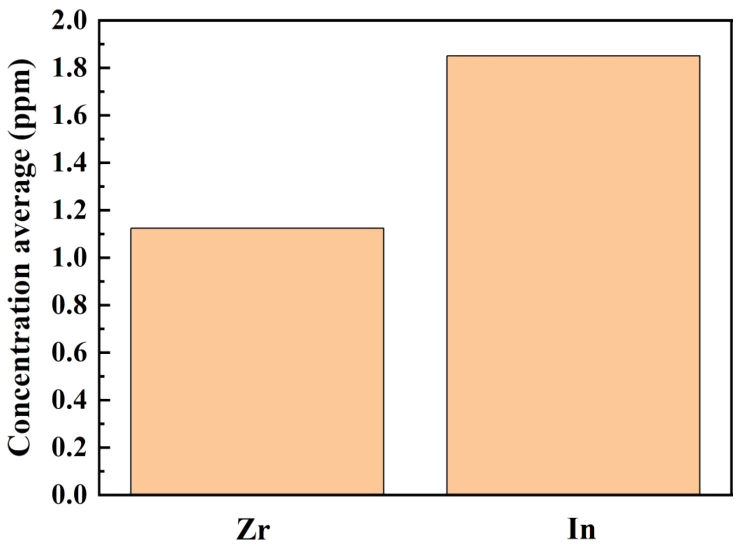


**Fig. S3.** Average Zr and In concentrations in ICP assays.

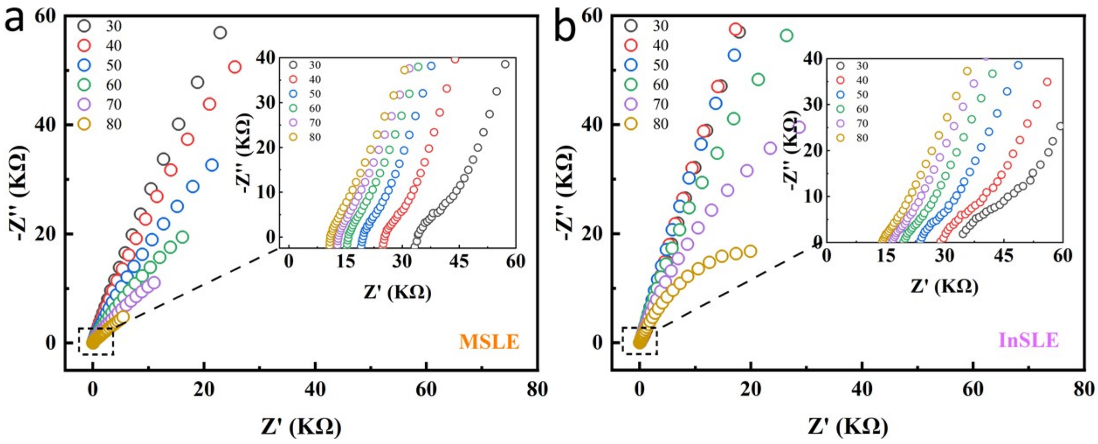


**Fig. S4**. The EIS spectra of the two MOF-based SLEs at different temperatures.

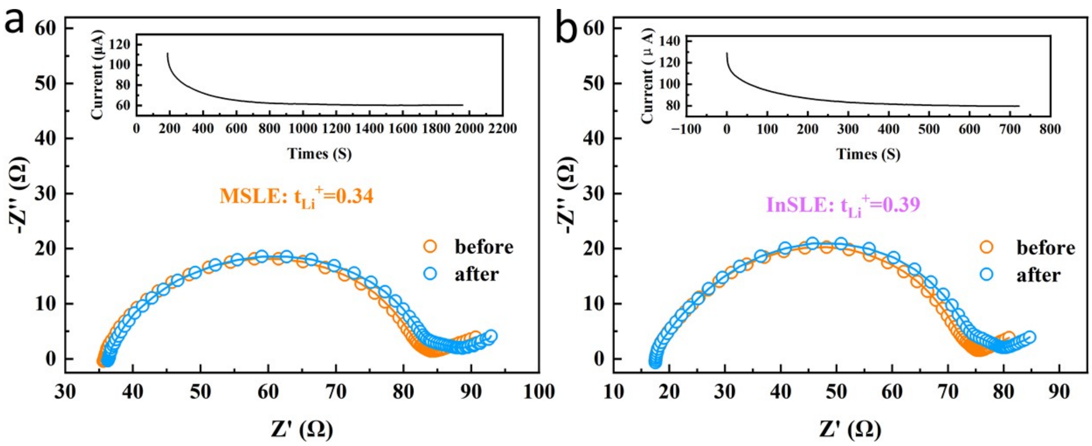


**Fig. S5.** The test for the $t_{Li}^{+}$ of (a) MSLE and (b) InSLE.

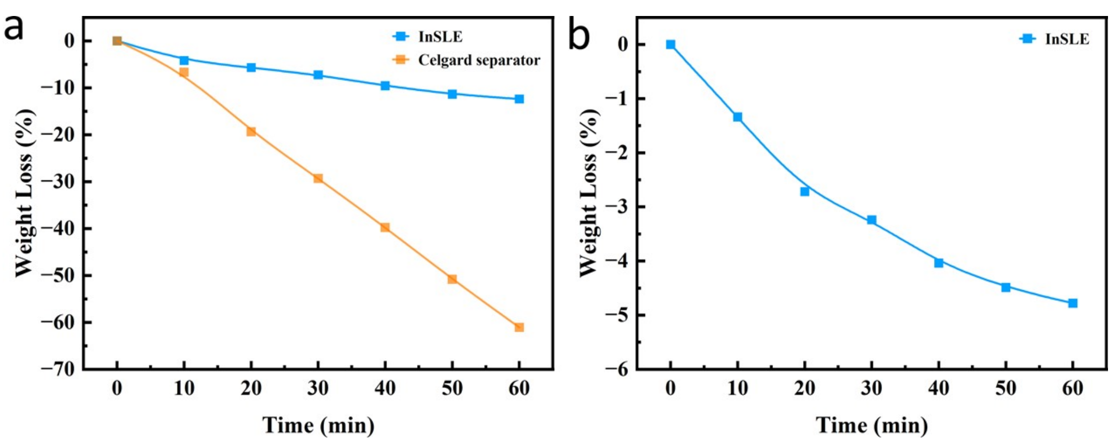


**Fig. S6**. Weight loss of the InSLE and the Celgard separator absorbed with 30 μl PC electrolyte at (a) 40 °C and (b) room temperature.

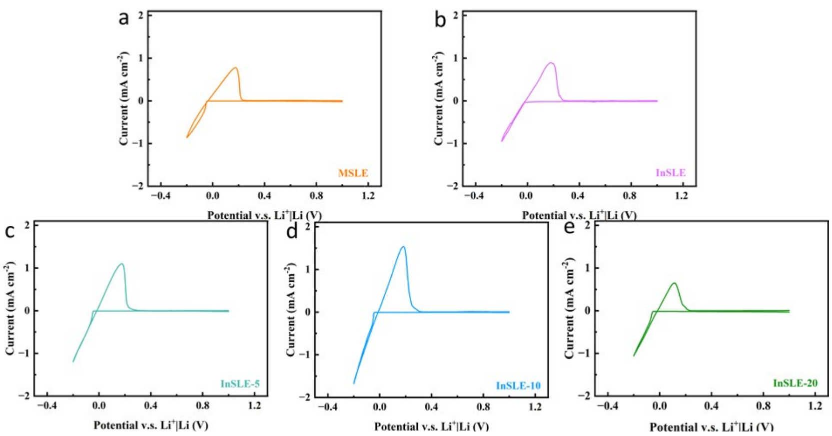


**Fig. S7**. CV profiles of the (a) MSLE ,(b) InSLE (c) InSLE-5, (d) InSLE-10 and (e) InSLE-20 symmetric cells at a scan speed of 0.2 mV s$^{-1}$.

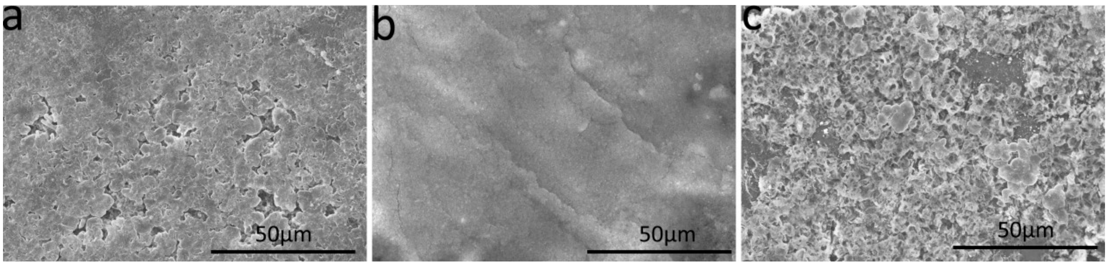


**Fig. S8**. SEM morphologies of the Li metal anodes after 20 cycles of plating/stripping tests with the (a) MSLE, (b) InSLE-10 and (c) InSLE electrolytes.

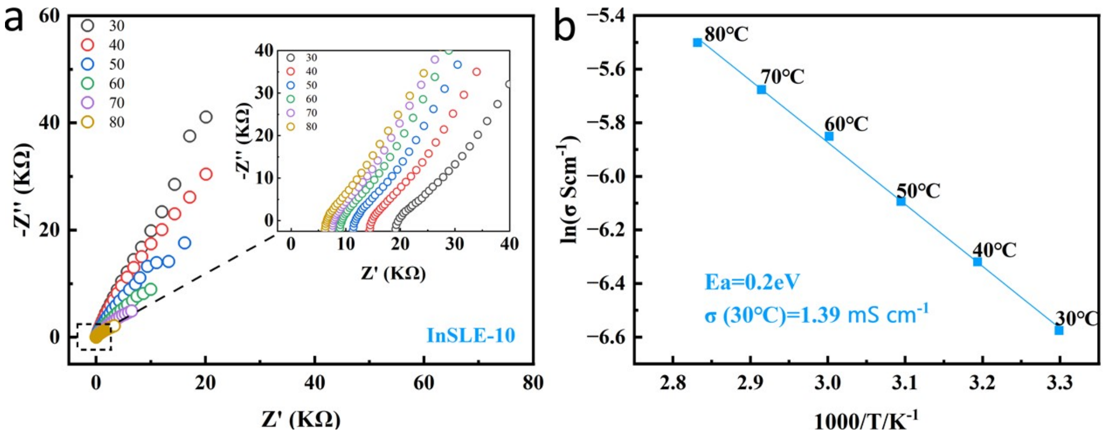


**Fig. S9**. (a) The EIS spectra of the InSLE-10 at different temperatures. (b) Arrhenius plot for the ionic conductivity of InSLE-10.

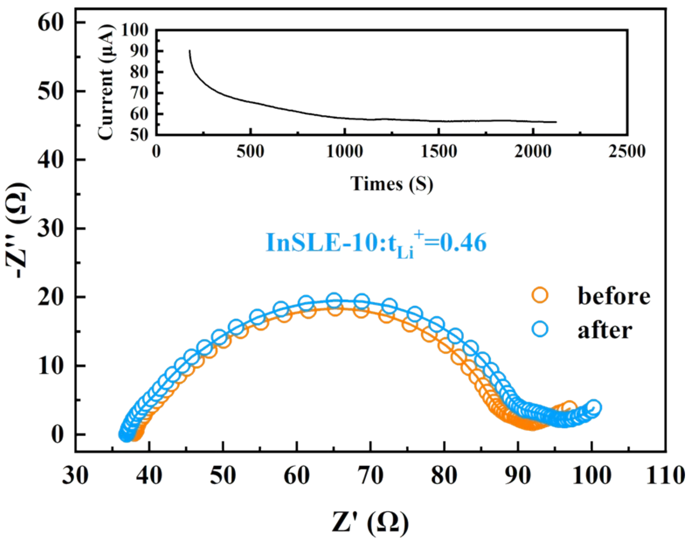


**Fig. S10**. The test for the $t_{Li^+}$ of InSLE-10.

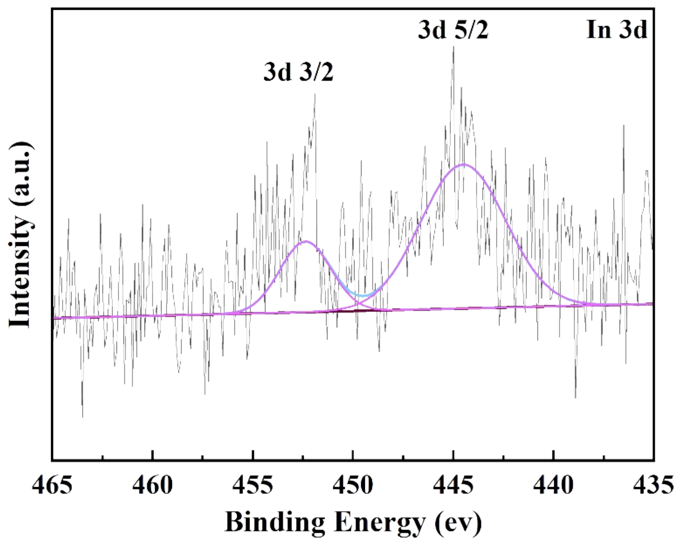


**Fig. S11.** The XPS In 3d spectra of the deposited Li with InSLE-10.

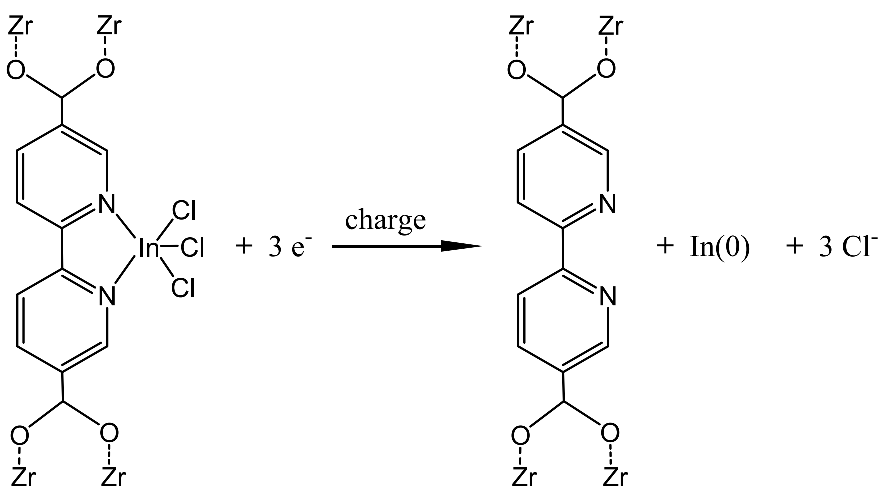


**Fig. S12.** The proposed mechanism for the formation of the In-rich SEI.

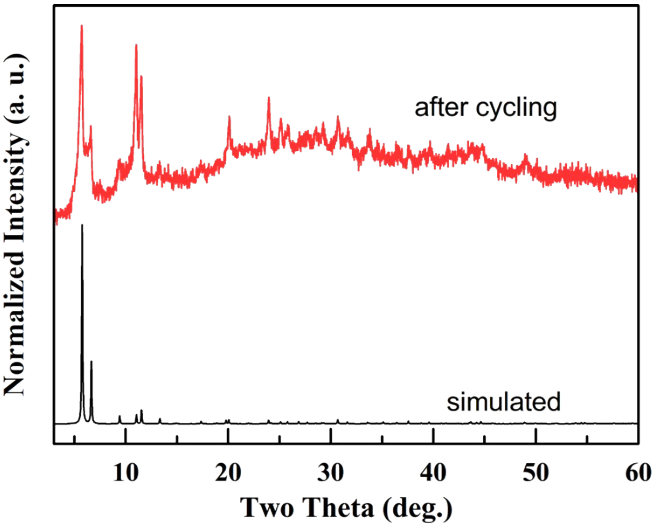


**Fig. S13**. XRD patterns of the SLE after plating/stripping cycling.

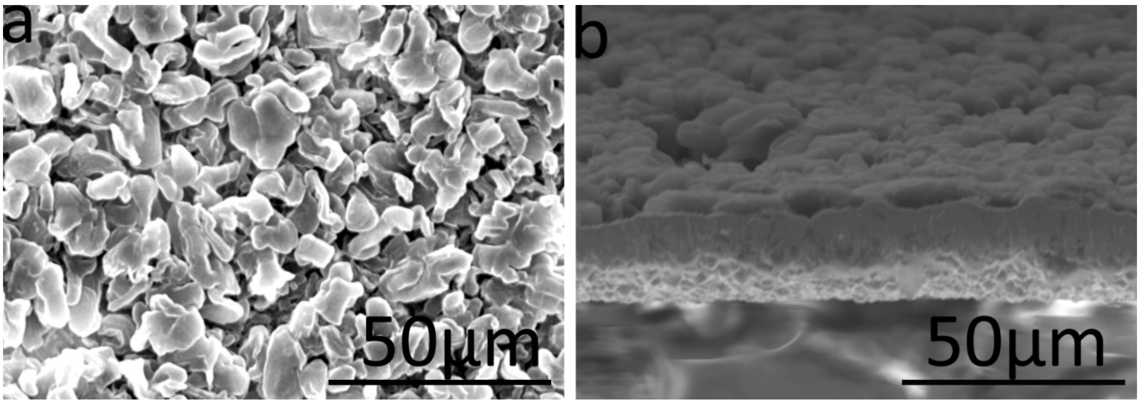


**Fig. S14.** SEM morphologies of the deposited Li (0.1 mA cm$^{-2}$, 1.0 mAh cm$^{-2}$) with the InSLE. (a) Top view. (b) Cross-section view.

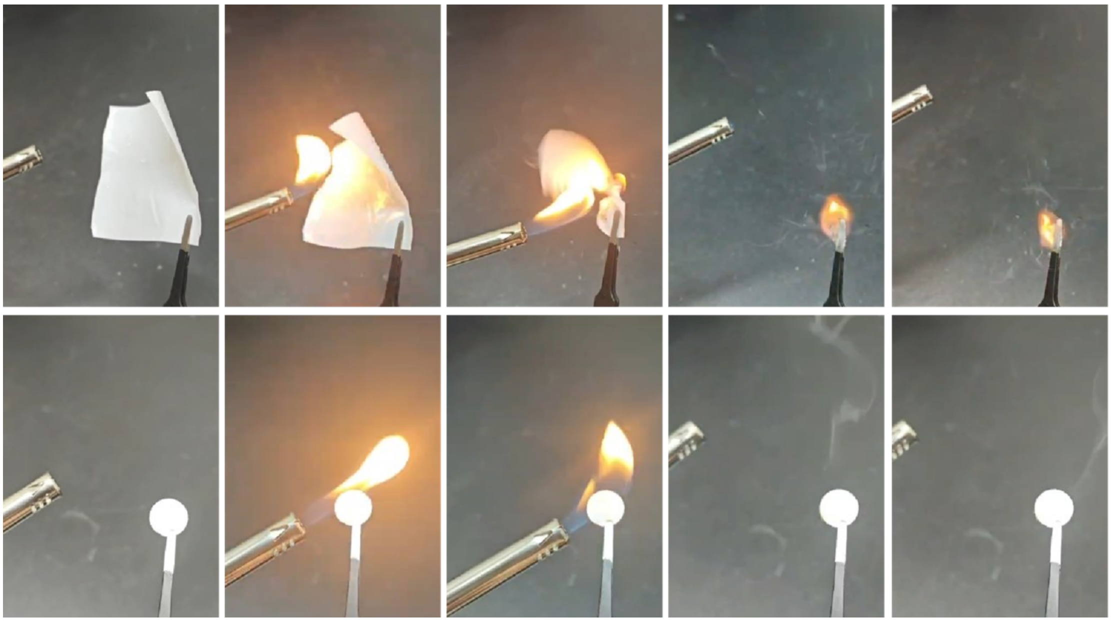

**Fig. S15.** Snapshots taken when the liquid PC electrolyte (on a Celgard separator, top) and the SLE (bottom) were exposed to the flame.

**Table S1**. Performance comparison of the reported LFP cells using MOF-based electrolytes.

| Materials | Cathodes | Specific Capacity (mAh $g^{-1}$) | Cycle number | Charge/discharge rate | Refs. |
|---|---|---|---|---|---|
| PEO/HKUST-1/LLZO/LiTFSI | LFP | 160 | 400 | 0.1 C@50℃ | [1] |
| HKUST/PIN | LFP | 150 | 100 | 0.1 C@25°C | [2] |
| NiCo-MOF/SN | LFP | 159 | 200 | 0.2 C@25°C | [3] |
| UiO-67/PVDF-HFP/ PVB | LFP | 156 | 200 | 0.1 C@60°C | [4] |
| ZIF-8/PEO/LiTFSI | LFP | 159 | 100 | 0.1 C@30°C | [5] |
| Zn-MOF-74/LiTFSI | LFP | 152 | 100 | 0.1 C@30°C | [6] |
| UiO-66-$NH_2$-LIM/Li-IL | LFP | 160 | 200 | 0.1 C@25°C | [7] |
| UiO-66-NH-M/AIBN | LFP | 155 | 200 | 0.2 C@25°C | [8] |
| UIO-66/SILs | LFP | 160 | 100 | 0.1 C@25°C | [9] |
| ZIF-8/PEO/$LiClO_4$ | LFP | 160 | 120 | 0.1 C@25°C | [10] |
| InSLE-10 | LFP | 165 | 480 | 0.1 C@32°C | This work |

References


1 M. Zhang, A. Yusuf and D.-Y. Wang, *J. Power Sources*, 2024, **591**, 233812.

2 X. Tian, Y. Yi, Z. Wu, G. Cheng, S. Zheng, B. Fang, T. Wang, D. G. Shchukin, F. Hai, J. Guo and M. Li, *Chem. Eng. Sci*, 2023, **266**, 118271.

3 T. Zhao, W. Kou, Y. Zhang, W. Wu, W. Li and J. Wang, *J. Power Sources*, 2023, **554**, 232349.

4 Q. Zhang, T. Wei, J. Lu, C. Sun, Y. Zhou, M. Wang, Y. Liu, B. Xiao, X. Qiu and S. Xu, *J.*

*Electroanal. Chem.*, 2022, **926**, 116935.
5 C. Li, S. Deng, W. Feng, Y. Cao, J. Bai, X. Tian, Y. Dong and F. Xia, *Small*, 2023, **19**, 2300066.
6 P. Dong, X. Zhang, W. Hiscox, J. Liu, J. Zamora, X. Li, M. Su, Q. Zhang, X. Guo, J. McCloy and M.-K. Song, *Adv. Mater.*, 2023, **35**, 2211841.
7 Z. Wu, Y. Yi, F. Hai, X. Tian, S. Zheng, J. Guo, W. Tang, W. Hua and M. Li, *ACS Appl. Mater. Interfaces*, 2023, **15**, 22065.
8 W. Shang, Y. Chen, J. Han, P. Ouyang, C. Fang and J. Du, *ACS Appl. Energ. Mater.*, 2020, **3**, 12351.
9 Z. Liu, Z. Hu, X. Jiang, X. Wang, Z. Li, Z. Chen, Y. Zhang and S. Zhang, *Small*, 2022, **18**, 2203011.
10 Y. Xia, N. Xu, L. Du, Y. Cheng, S. Lei, S. Li, X. Liao, W. Shi, L. Xu and L. Mai, *ACS Appl. Mater. Interfaces*, 2020, **12**, 22930.