Supporting Information

Rational Electrolyte Design and Electrode Regulation Boosting High Capacity Zn-iodine Fiber-Shaped Batteries with Four-Electron Redox Reactions

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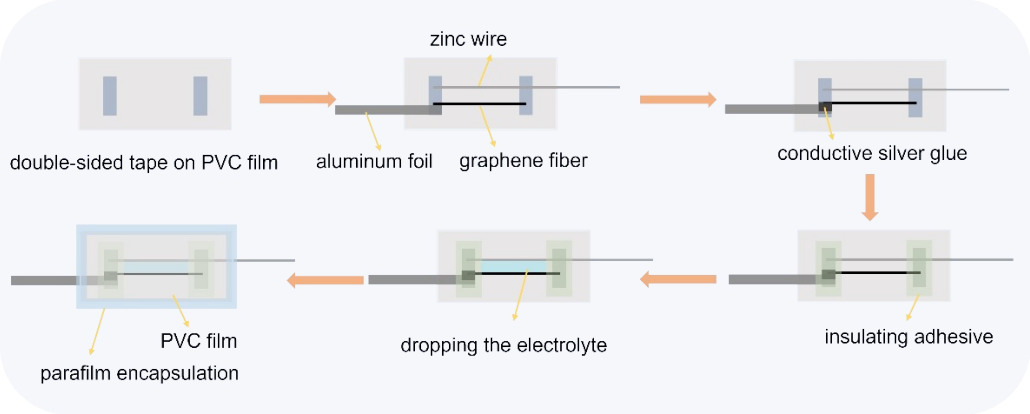

Fig. S1. Schematic illustration of the fabrication of AZIFBs.

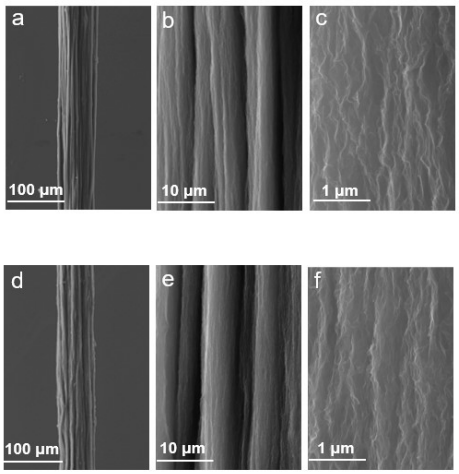

Fig. S2. (a-c) SEM images of GF-160. (d-f) SEM images of GF-200.

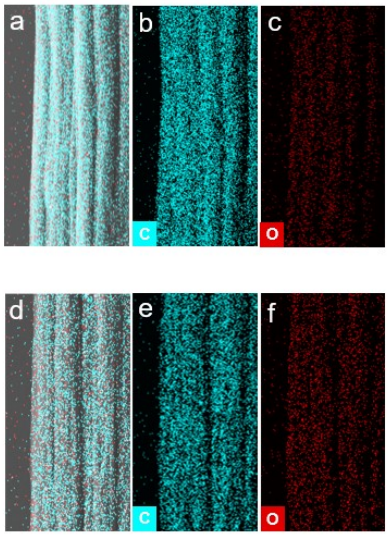

Fig. S3. (a-c) EDS images of GF-160.

(d-f) EDS images of GF-200.

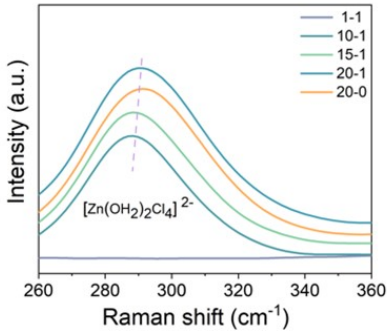

Fig. S4. The Raman spectra of different electrolytes.

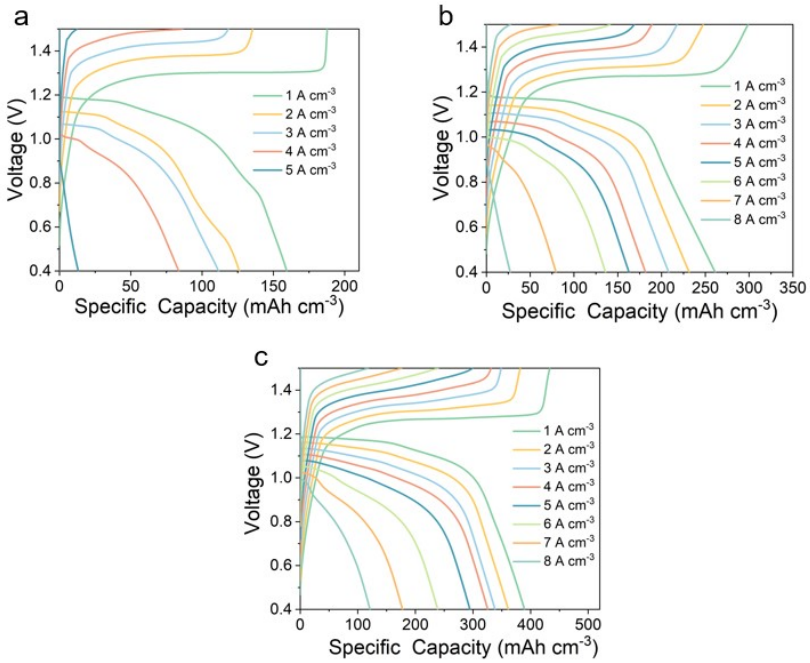

Fig. S5. GCD curves of GF-180 based on various electrolyte of

(a) 10-1, (b) 15-1 and (c) 20-1.

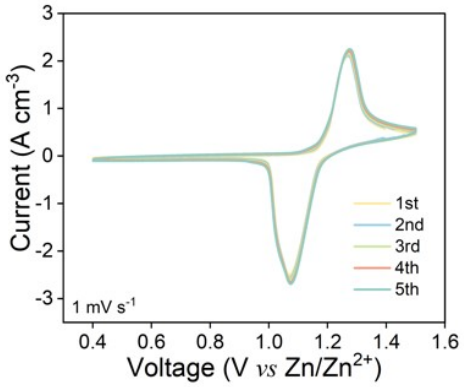

Fig. S6. CV curves of the GF-180 based on 20-1 at a scan rate of 1 mV s^{-1}.

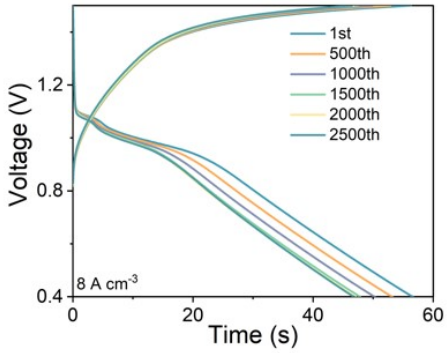

Fig. S7. GCD curves of GF-180 based on 20-1 at 8 A cm^{-3}.

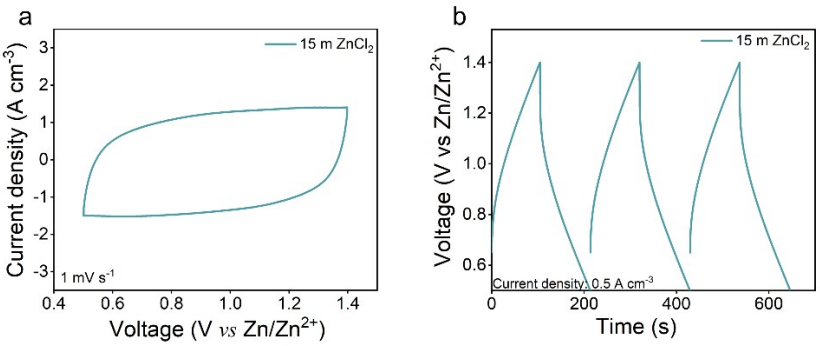

Fig. S8. (a) CV curves and (b) GCD curves of the GF-180 based on 15 m $ZnCl_2$.

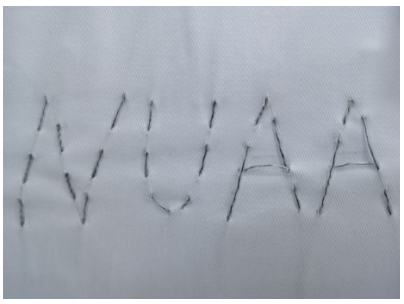

Fig. S9. Photographs of the AZIFBs into textile.

Table S1. Number of cycles and capacity retention for fibrous batteries.

Materials	Electrolytes	Cycle numbers	Capacity retention	Refs.
GF-180 (cathode) Zn Wire (anode)	20 m $ZnCl_2$ + 1 m MAI	2500	82.1%	This work
MnO_2-based fiber (cathode) Zn-based fiber (anode)	2 M $ZnSO_4$ + 0.1 M $MnSO_4$	400	65.7%	[1]
InHCF (cathode) NTP@CNTF (anode)	Na_2SO_4-CMC gel electrolyte	300	91.5%	[2]
Na (cathode) ReS_2@CNT fiber (anode)	1 M $NaPF_6$ + EC/DMC/EMC	1500	65.4%	[3]
Na (cathode) G@CNT fiber (anode)	1 M $NaPF_6$ + EC/DMC/EMC	1000	96.8%	[3]
ZnHCF (cathode) Zn NSAs (anode)	$ZnSO_4$−CMC	200	91.8%	[4]
MnHCF (cathode) GO/MoO_3 fiber (anode)	1 M $Al(CF_3SO_3)$	100	91.6%	[5]
KCY@PANI (cathode) Zn wire (anode)	0.5 M HCl	2000	88.1%	[6]
KNHCF/CNTF (cathode) Zn wire (anode)	2 M $ZnSO_4$+0.07 M K_2SO_4	1700	86.3%	[7]
CNTF-NCA-Ag_2O@ PEDOT:PSS (cathode) CNT@Zn nanoflakes (anode)	PVA-KOH gel	200	79.5%	[8]
LMO NWAs/CNTF (cathode) LTP NFs/CNTF (anode)	Li_2SO_4-CMC gel	2000	54.7%	[9]
V-MOF-48@CNTF (cathode) Zn@CNTF (anode)	PVA-$ZnCl_2$ gel	400	84.6%	[10]

References:

1. T. Gao, G. Yan, X. Yang, Q. Yan, Y. Tian, J. Song, F. Li, X. Wang, J. Yu and Y. Li, *Journal of Energy Chemistry*, 2022, **71**, 192-200.
2. Q. Zhang, P. Man, B. He, C. Li, Q. Li, Z. Pan, Z. Wang, J. Yang, Z. Wang and Z. Zhou, *Nano Energy*, 2020, **67**, 104212.
3. Y. Li, Q. Guan, J. Cheng and B. Wang, *Energy & Environmental Materials*, 2022, **5**, 1285-1293.
4. Q. Zhang, C. Li, Q. Li, Z. Pan, J. Sun, Z. Zhou, B. He, P. Man, L. Xie and L. Kang, *Nano letters*, 2019, **19**, 4035-4042.
5. T. Xiong, B. He, T. Zhou, Z. Wang, Z. Wang, J. Xin, H. Zhang, X. Zhou, Y. Liu and L. Wei, *EcoMat*, 2022, **4**, e12218.
6. G. Shim, M. X. Tran, G. Liu, D. Byun and J. K. Lee, *Energy Storage Materials*, 2021, **35**, 739-749.
7. F. Liu, S. Xu, W. Gong, K. Zhao, Z. Wang, J. Luo, C. Li, Y. Sun, P. Xue and C. Wang, *ACS nano*, 2023, **17**, 18494–18506.
8. C. Li, Q. Zhang, E. Songfeng, T. Li, Z. Zhu, B. He, Z. Zhou, P. Man, Q. Li and Y. Yao, *Journal of Materials Chemistry A*, 2019, **7**, 2034-2040.
9. X. Zhang, Z. Xu, S. Kong, X. Wang, X. Lan, Z. Ma, Y. Feng, Z. Yong, Y. Yao and Q. Li, *Journal of Energy Storage*, 2023, **64**, 107249.
10. B. He, Q. Zhang, P. Man, Z. Zhou, C. Li, Q. Li, L. Xie, X. Wang, H. Pang and Y. Yao, *Nano Energy*, 2019, **64**, 103935.