Supplementary Information (SI) for Journal of Materials Chemistry A.

Supporting Information

Triple-Function of Hydroxyacetone in Suppressing Water Activity Toward Long-Lived Aqueous Zinc-Ion Batteries

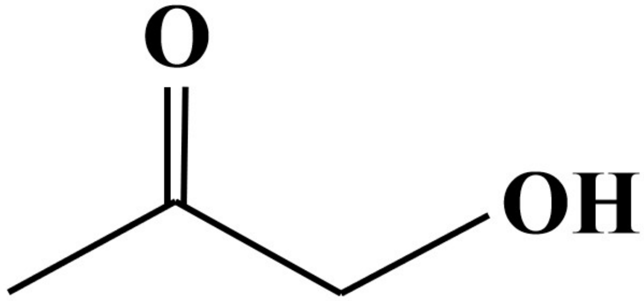

Fig. S1. Schematic diagram of hydroxyacetone structure.

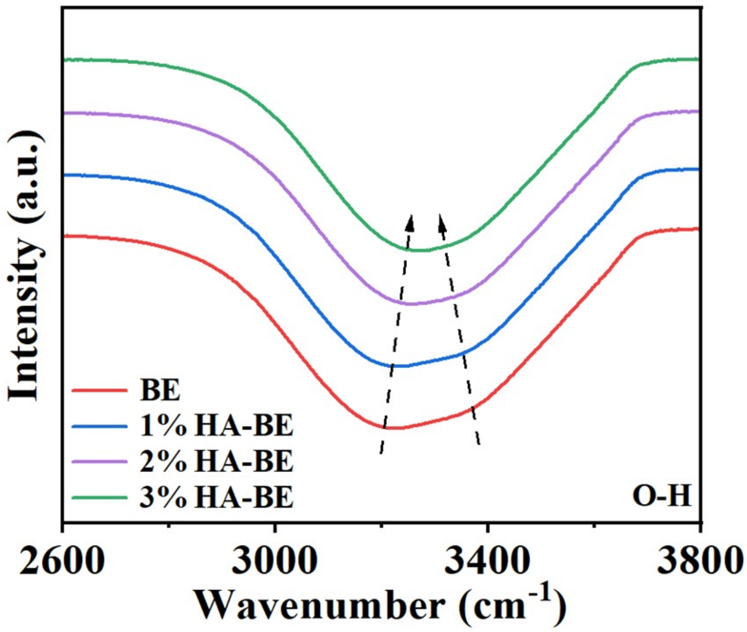

Fig. S2. FTIR spectra of O-H bond stretching vibrations for different HA concentrations.

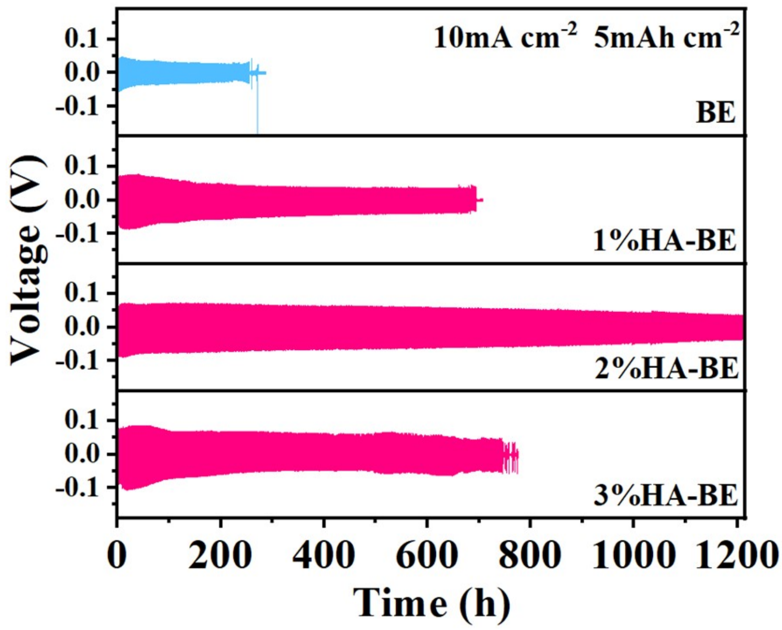

Fig. S3. Constant current cycling of Zn||Zn symmetric cells with different electrolytes.

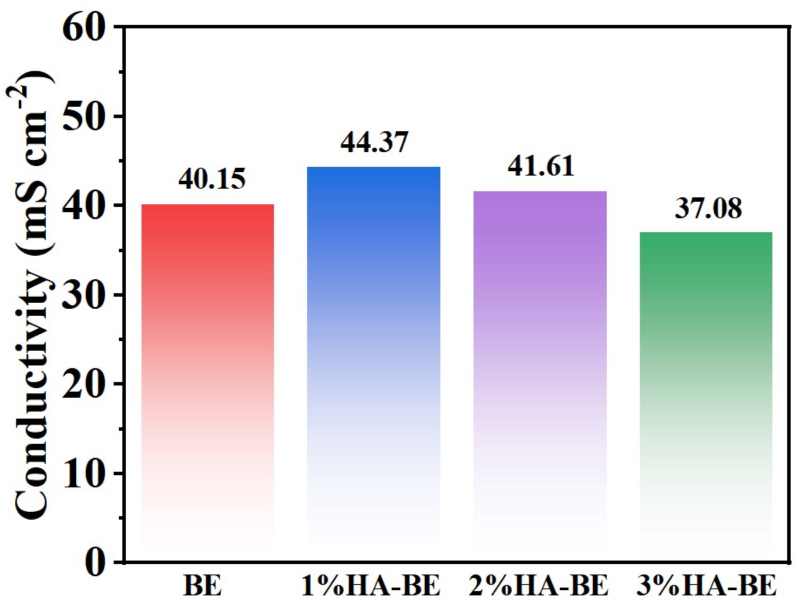

Fig. S4. Ionic conductivity of different electrolytes.

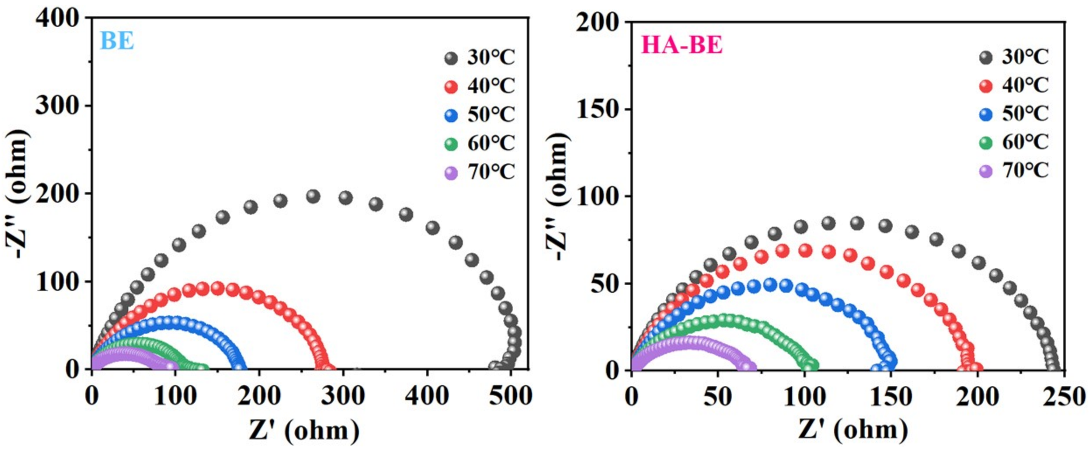

Fig. S5. Impedance of Zn||Zn symmetric cells with the two different electrolytes at different temperatures.

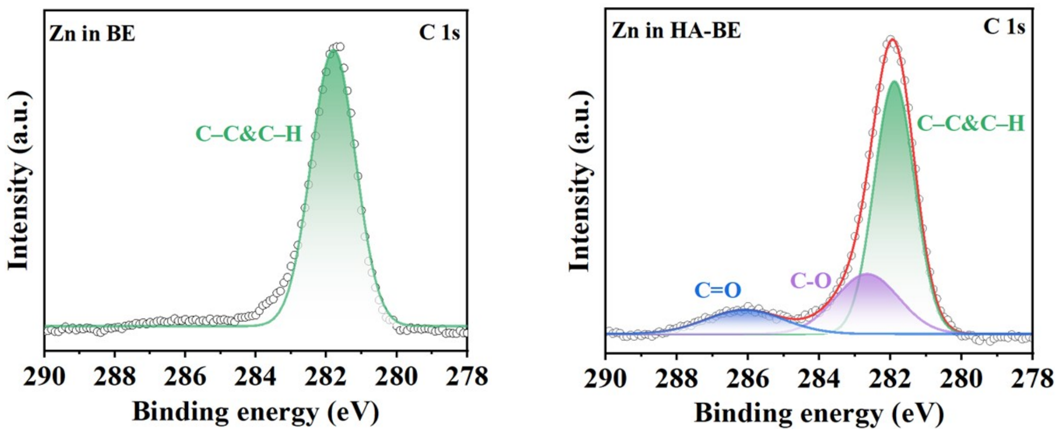

Fig. S6. XPS images of Zn foils immersed in different electrolytes for 5 days.

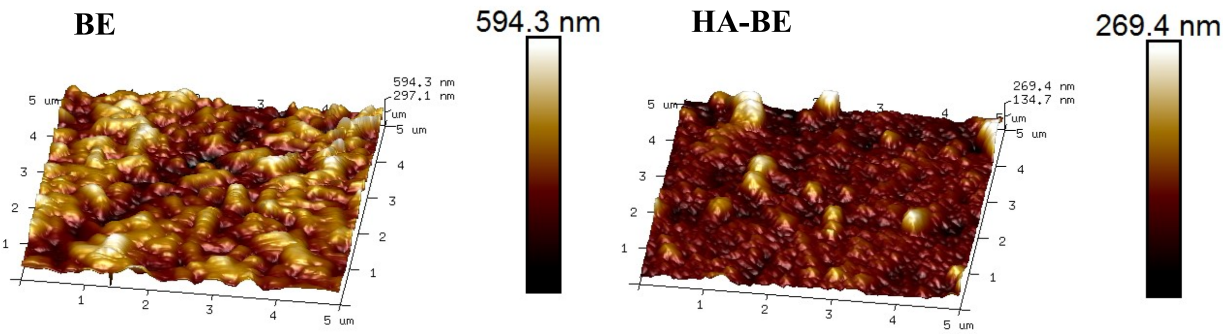

Fig. S7. AFM images of Zn foils immersed in different electrolytes for 5 days.

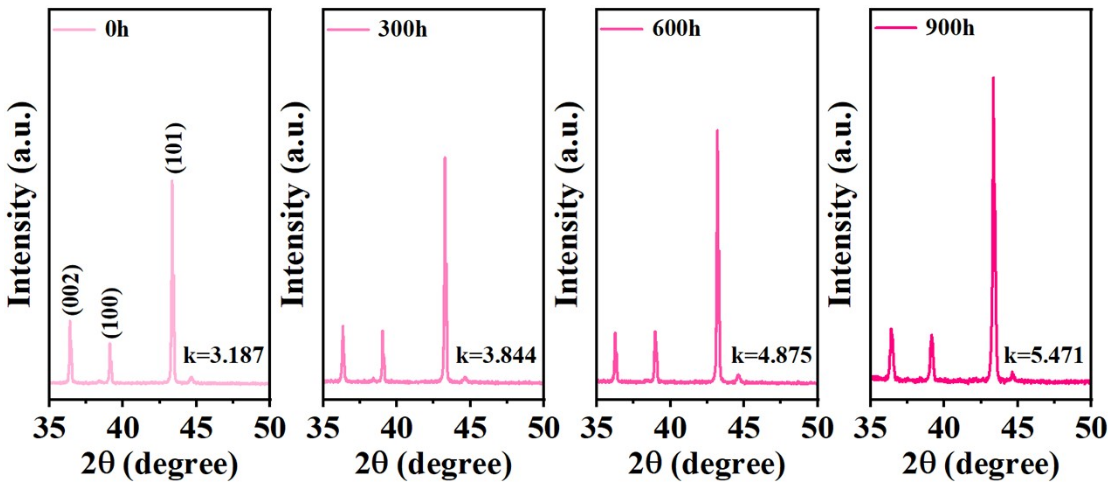

Fig. S8. XRD patterns of the Zn anode harvested at the charged state after cycling in HA-BE at different times.

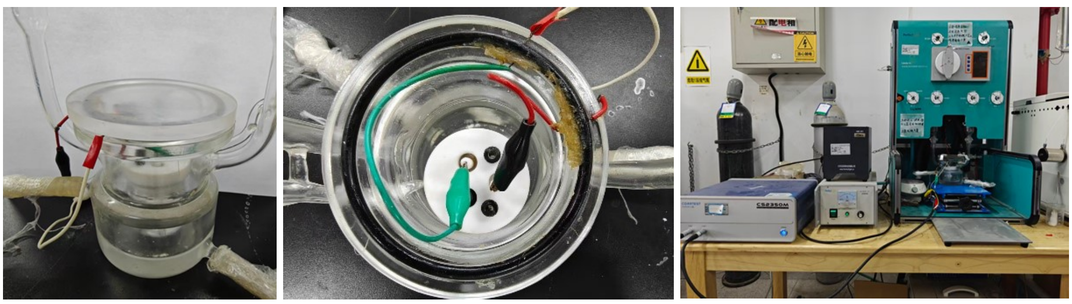

Fig. S9. In situ electrochemical gas chromatography.

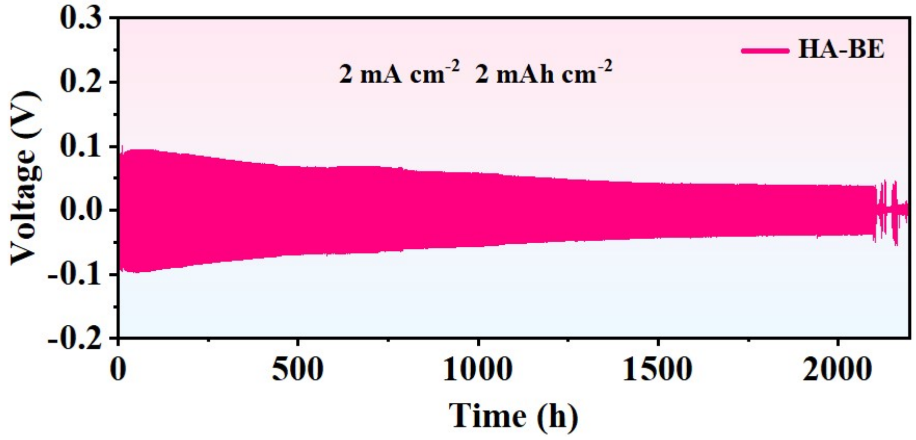

Fig. S10. Cycling performance of Zn||Zn symmetric cells at 2 mA cm^{-2} and 2 mAh cm^{-2}.

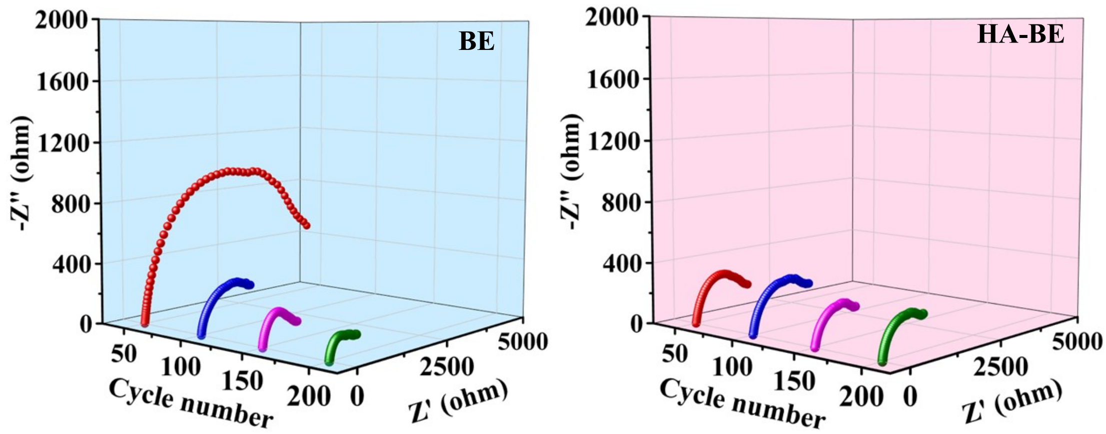

Fig. S11. EIS of Zn||Zn symmetric cells with the two different electrolytes after different cycles.

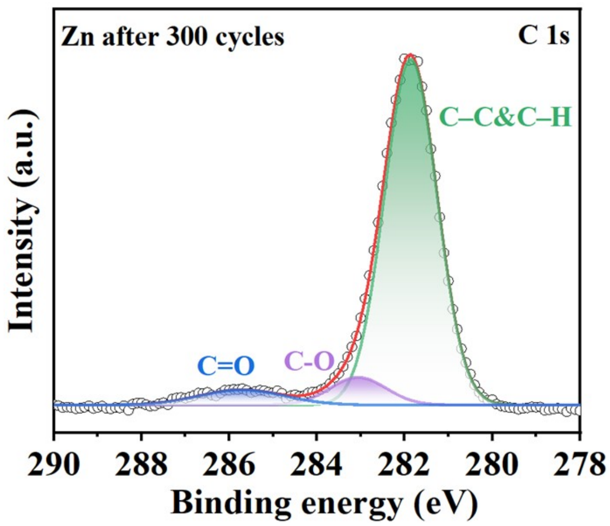

Fig. S12. XPS image of Zn anode after 300 cycles in HA-BE.

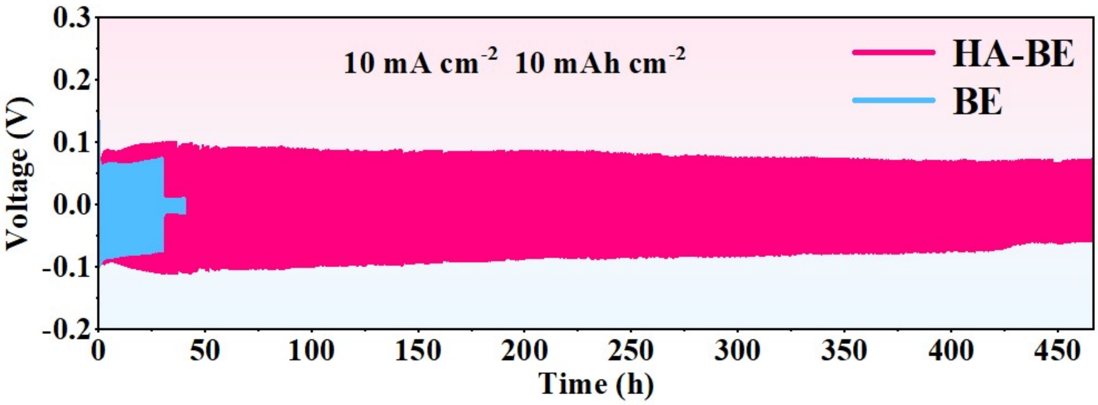

Fig. S13. Cycling performance of Zn||Zn symmetric cells at 10 mA cm^{-2} and 10 mAh cm^{-2}.

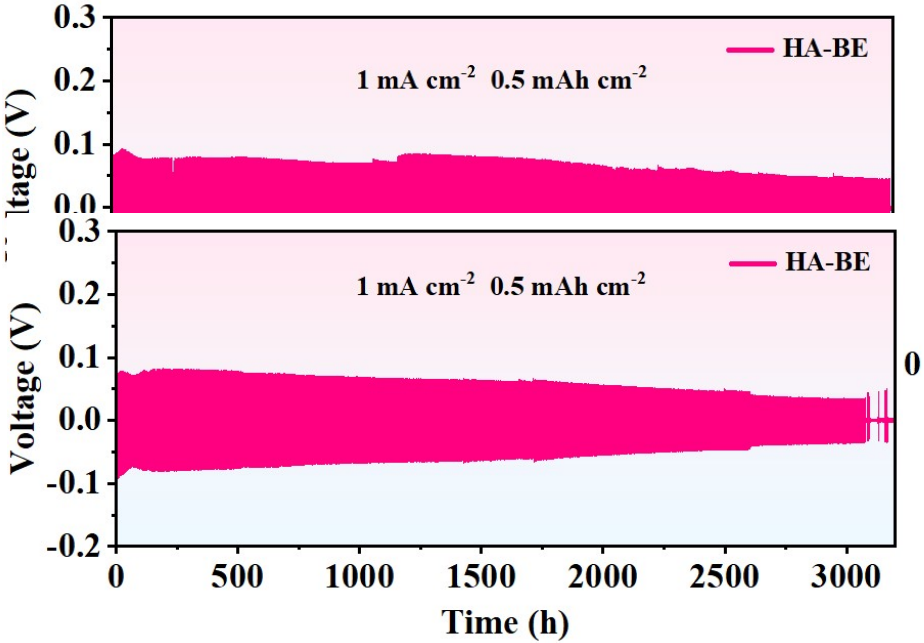

Fig. S14. Parallel tests of Zn||Zn symmetric cells at 1 mA cm^{-2} and 0.5 mAh cm^{-2}.

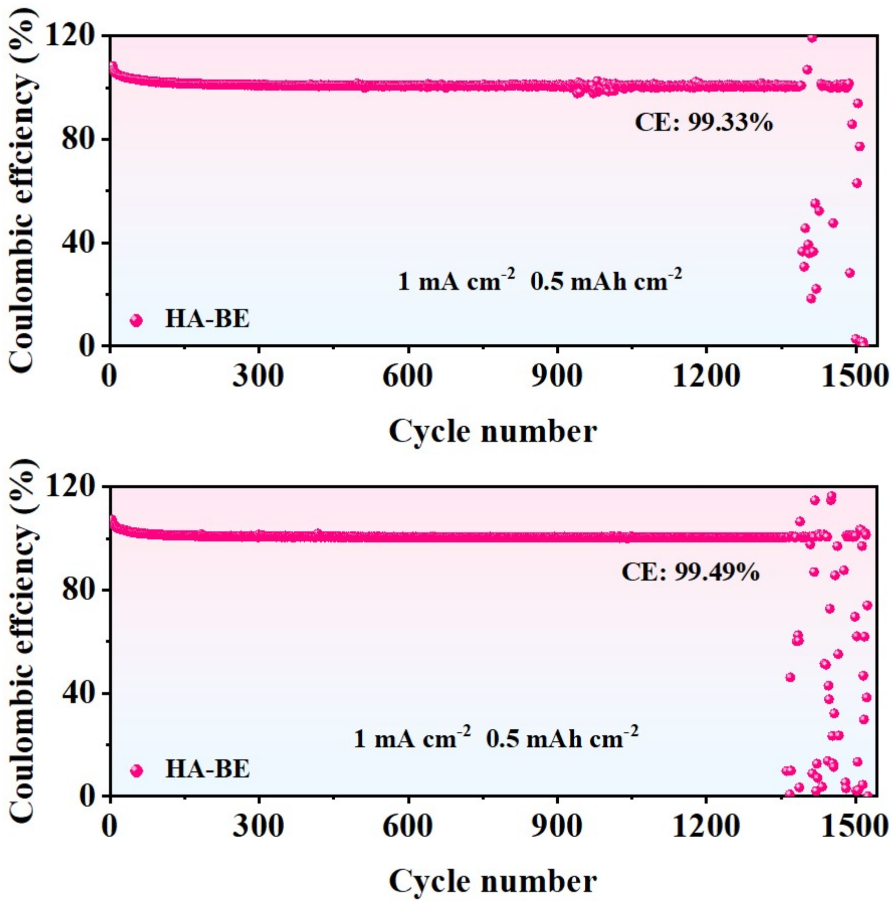

Fig. S15. Parallel tests of Zn||Cu half cells at 1 mA cm^{-2} and 0.5 mAh cm^{-2}.

Fig. S16. YH-80R environmental test chamber.

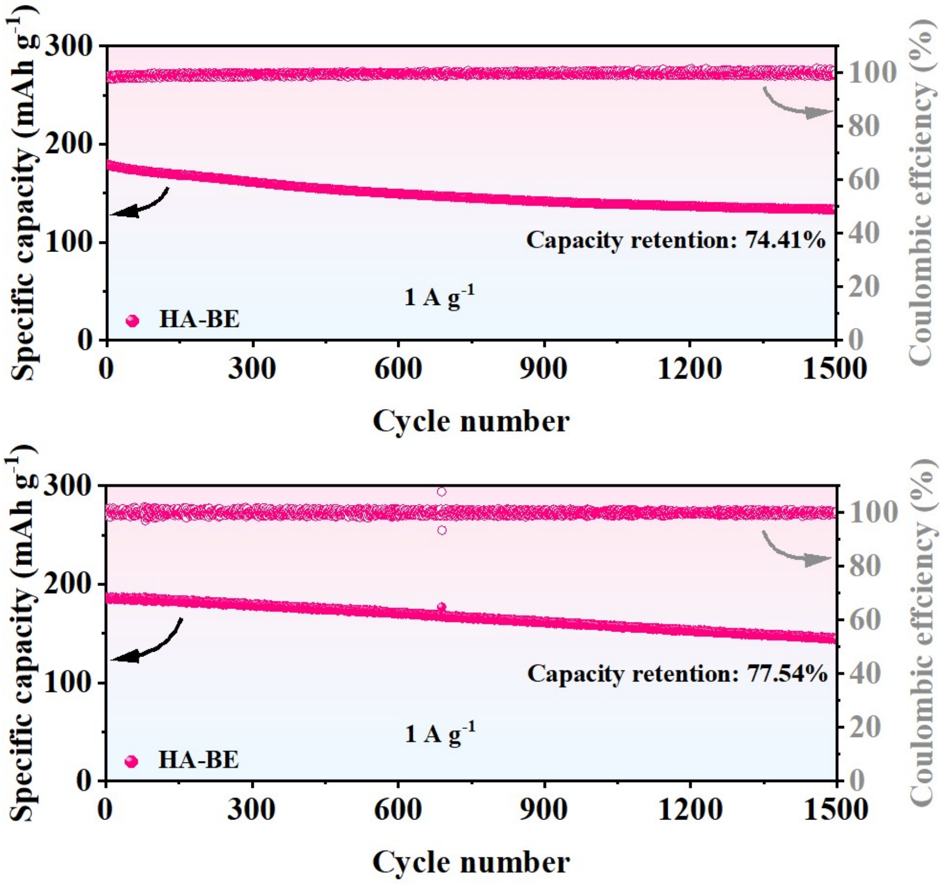

Fig. S17. Parallel tests of Zn||MnO_2 full cells at 1 A g^{-1}.

Fig. S18. The open-circuit voltage of Zn||MnO_2 pouch cell.

Table S1 Comparison of cycle life in this work with other literatures based on electrolyte additives.

Electrolyte additive	Current density and capacity	Lifespan	CE and cycle	Reference
TMB (Trifluoro borate)	1.0 mA cm^{-2}, 1.0 mAh cm^{-2}	1800 h	99.63%	**[1]**
CLE (Cellulose levulinate ester)	1.0 mA cm^{-2}, 1.0 mAh cm^{-2}	2800 h		**[2]**
THL (Trehalose)	1.0 mA cm^{-2}, 1.0 mAh cm^{-2}	1500 h	99.8%	**[3]**
MAAC (Methylammonium acetate)	1.0 mA cm^{-2}, 0.5 mAh cm^{-2}	2000 h	99.5%, 700	**[4]**
AN (Acetonitrile)	1.0 mA cm^{-2}, 1.0 mAh cm^{-2}	1300 h	99.3%, 600	**[5]**
TEG （Triethylene glycol）	1.0 mA cm^{-2}, 1.0 mAh cm^{-2}	2000 h		**[6]**
GL (Glucose)A	1.0 mA cm^{-2}, 1.0 mAh cm^{-2}	3200 h	99.8%, 400	**[7]**
SADS (Disodium Succinate)	1.0 mA cm^{-2}, 1.0 mAh cm^{-2}	2200 h	99.24%	**[8]**
TDFND (Tetradecafluorononane-1,9-diol)	1.0 mA cm^{-2}, 1.0 mAh cm^{-2}	1250 h	99.8%	**[9]**
HA (Hydroxyacetone)	1.0 mA cm^{-2}, 0.5 mAh cm^{-2}	3200 h	99.27%, 1500	**This work**

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