

## Supplementary Information

# Enabling the uniform zinc deposition by zwitterion additive in aqueous zinc metal anode

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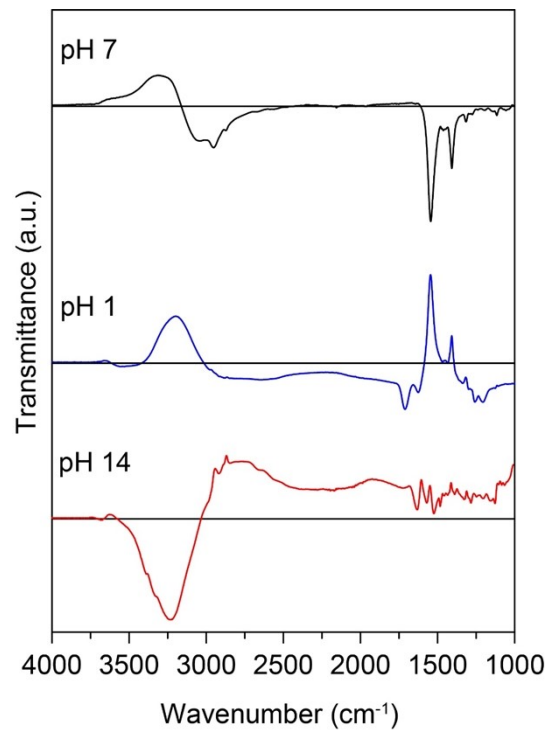
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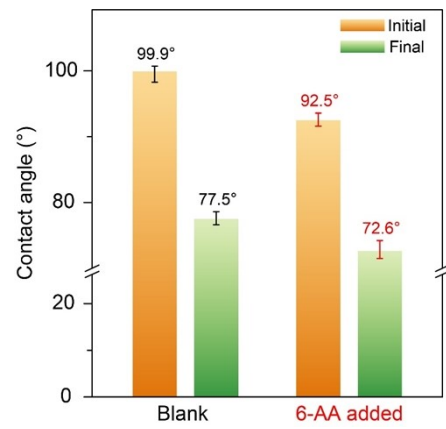
<sup>‡</sup>S.-H. H. and Y. J. C contributed equally to this work.

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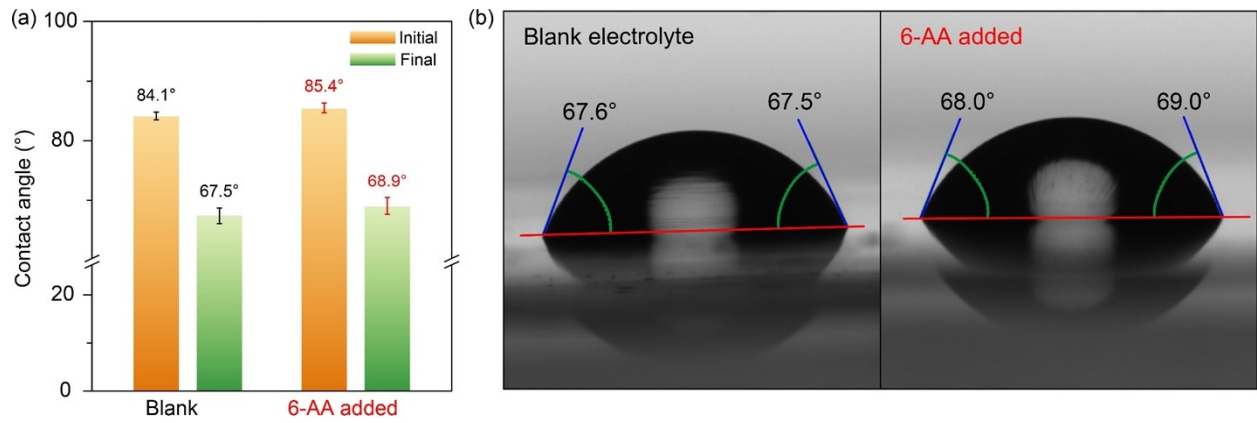
E-mail: seunghoyu@korea.ac.kr



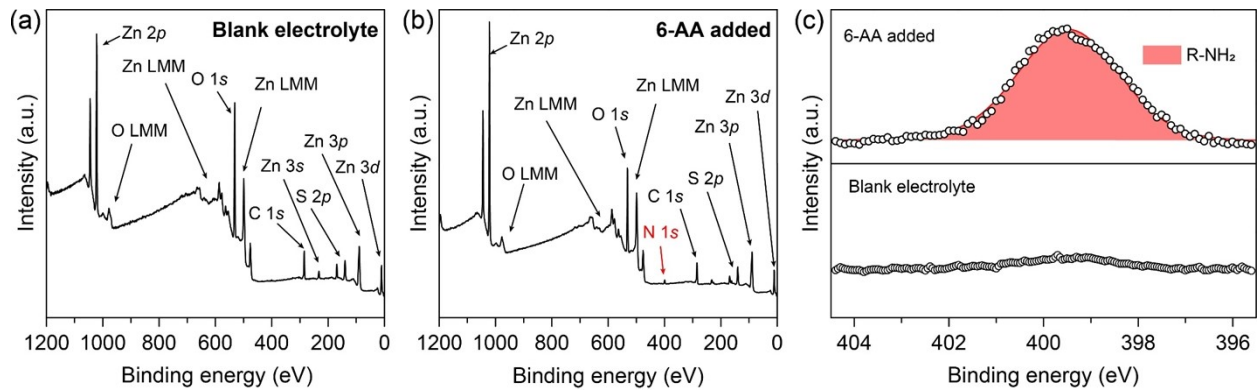
**Figure S1.** FTIR spectra of the 6-AA added electrolyte in various pH conditions (black: pH 7, blue: pH 1, red: pH 14).



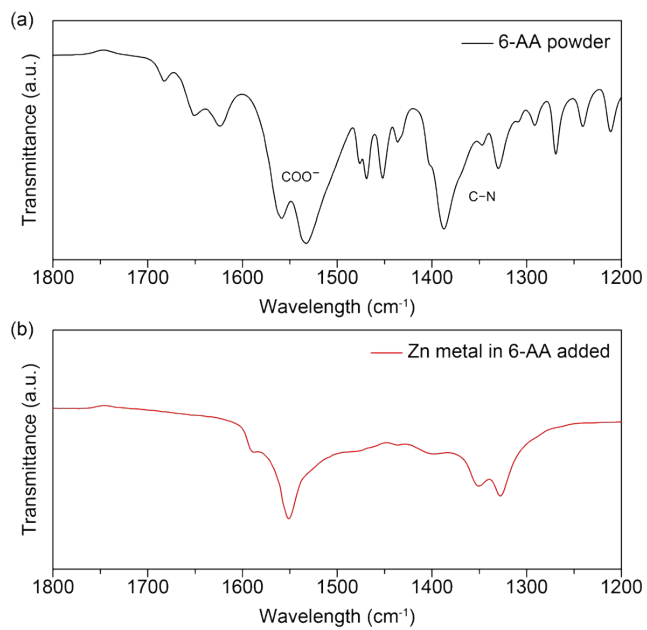
**Figure S2.** Average initial and final contact angles on Zn foil for the blank electrolyte and the 6-AA added electrolyte.



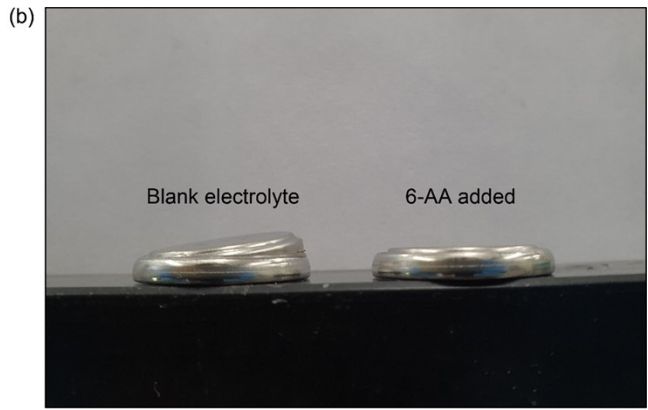
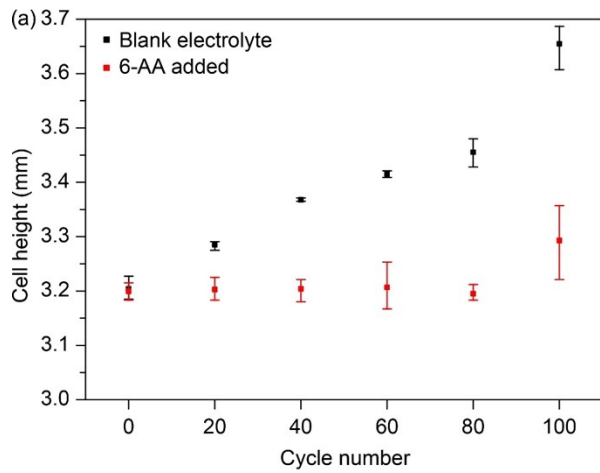
**Figure S3.** (a) Average initial and final contact angles on Cu foil for the blank electrolyte and the 6-AA added electrolyte and (b) photograph of two electrolytes dropped on Cu foil measured at the final equilibrium state. The final state was measured 5 minutes after the initial state.



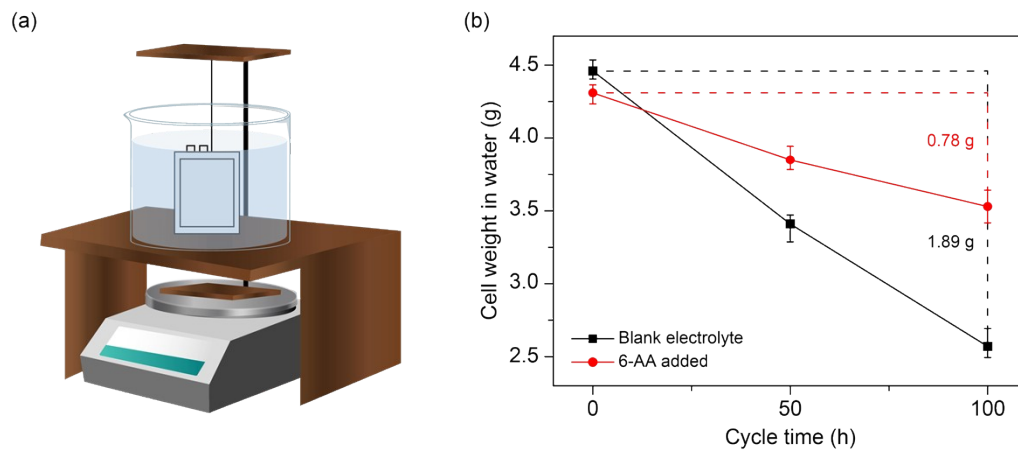
**Figure S4.** X-ray photoelectron spectroscopy survey scan spectra of (a) blank electrolyte and (b) 6-AA added electrolyte, and (c) high-resolution N 1s spectra of blank electrolyte and 6-AA added electrolyte.



**Figure S5.** FTIR spectra of the (a) 6-AA powder and (b) Zn metal immersed in 6-AA added electrolyte for 1 day.

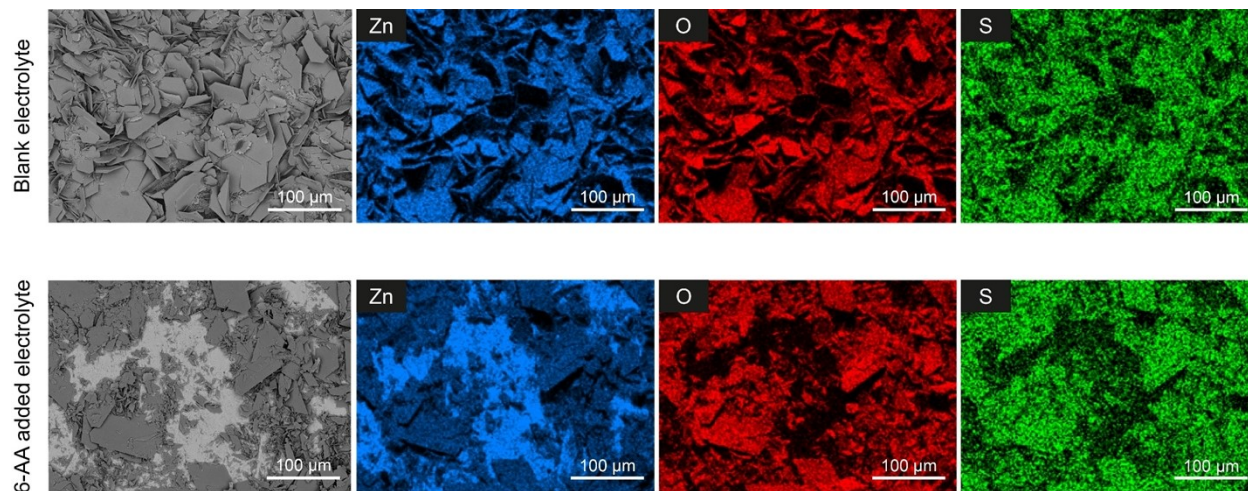


**Figure S6.** (a) The Zn||Zn coin cell heights at each cycle number (black: blank electrolyte, red: 6-AA added electrolyte) and (b) photograph of each cell after 150th cycle at  $1 \text{ mA cm}^{-2}$ ,  $1 \text{ mAh cm}^{-2}$ .

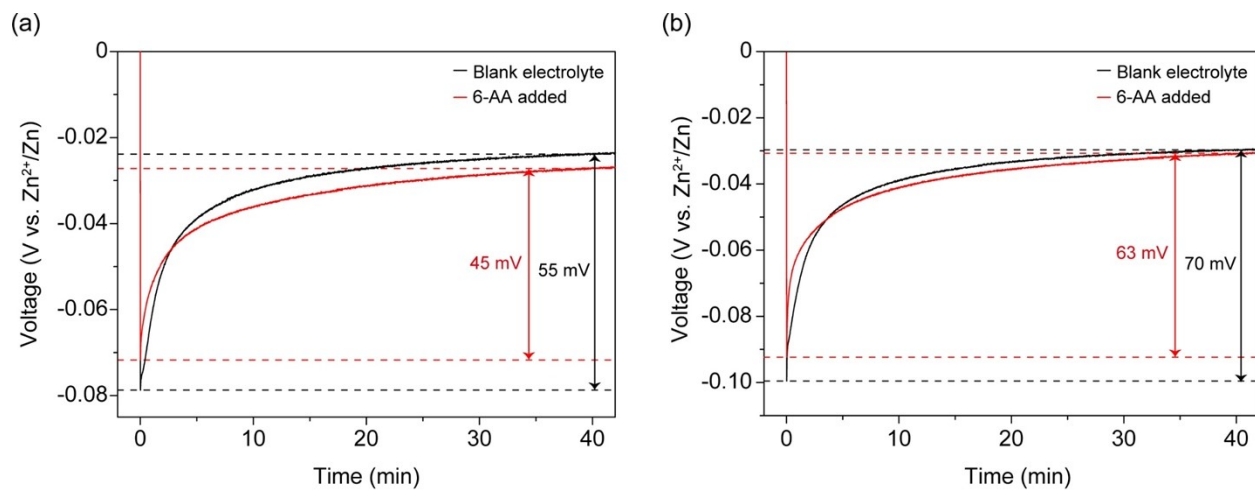


**Figure S7.** (a) Scheme of Archimedes method and (b) the cell weight change of pouch cell as a function of cycle time (black: blank electrolyte, red: 6-AA added electrolyte). The pouch cells were cycled at a current density of  $4 \text{ mA cm}^{-2}$  with a capacity of  $1 \text{ mAh cm}^{-2}$ .

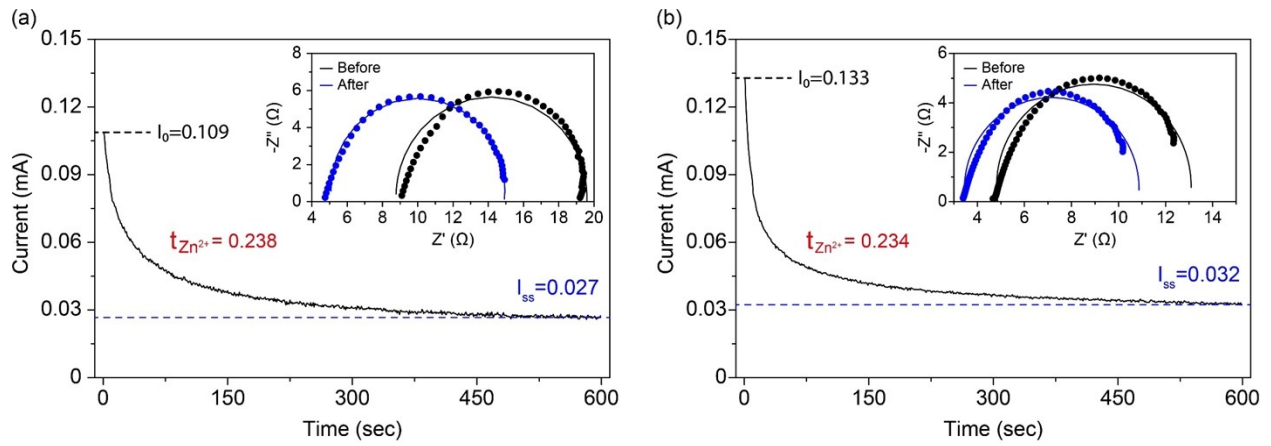




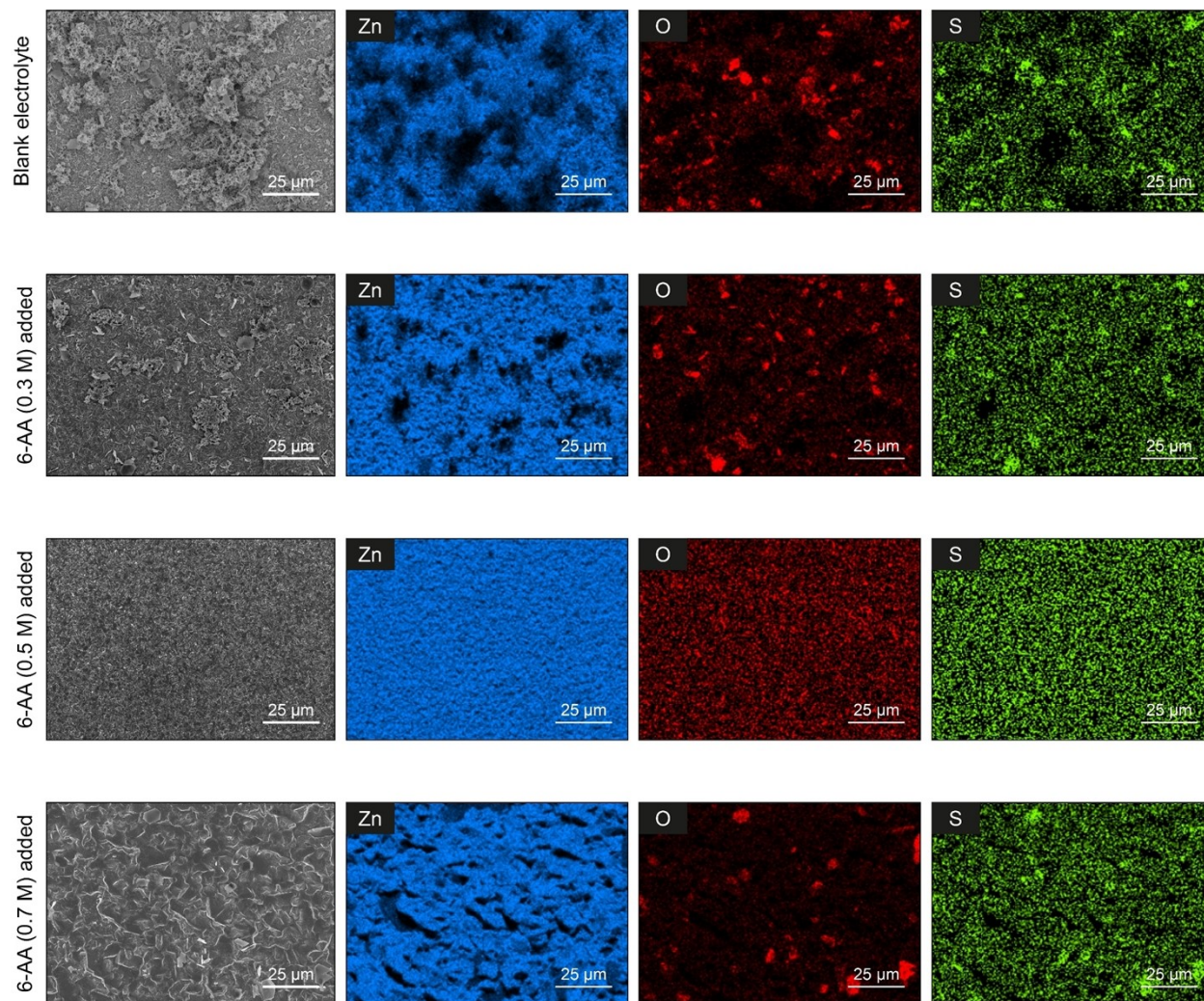
**Figure S8.** Top-view SEM images and EDS elemental maps of Zn foil immersed in 7 days in the blank electrolyte (top) and the 6-AA added electrolyte (bottom).



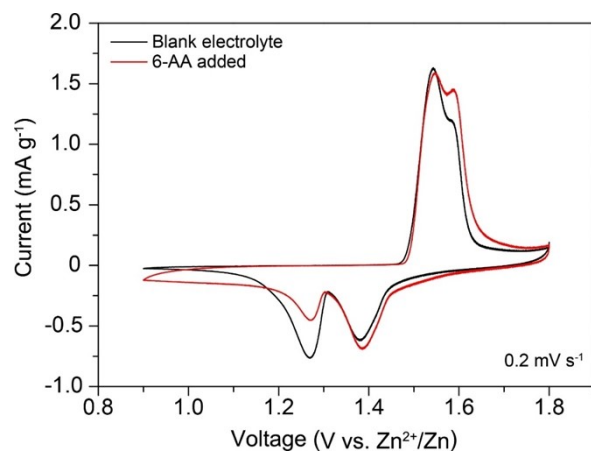
**Figure S9.** Comparisons of the Zinc deposition overpotential between the blank electrolyte (black) and the 6-AA added electrolyte (red) at (a) 1 mA cm<sup>-2</sup> and (b) 2 mA cm<sup>-2</sup>.



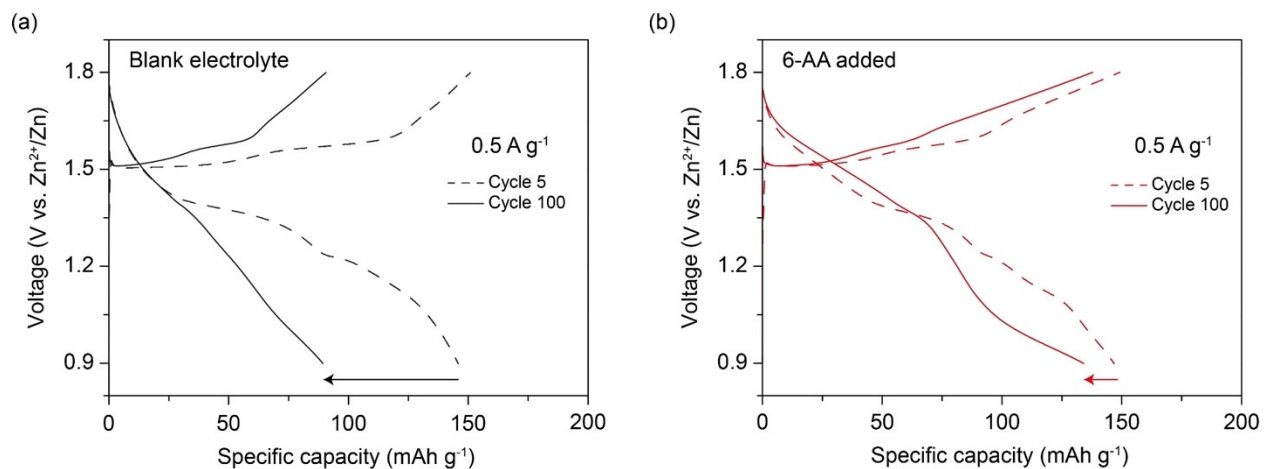
**Figure S10.** Chronoamperometry profiles and Nyquist plots of Zn||Zn symmetric cells cycled in (a) the blank electrolyte and (b) the 6-AA added electrolyte.



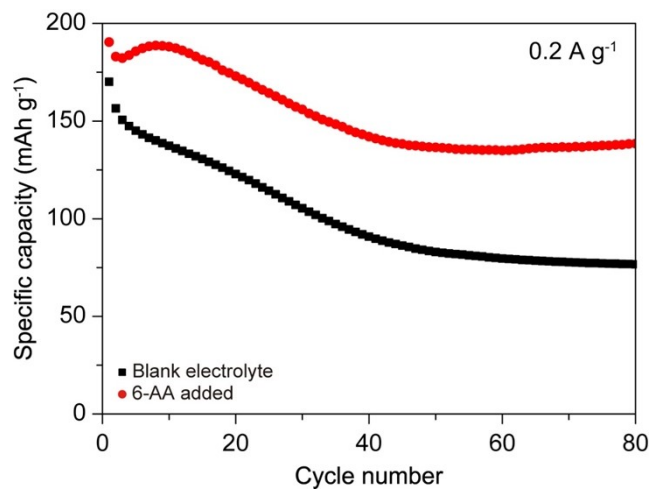
**Figure S11.** Top-view SEM images and EDS elemental maps of Cu current collector collected from Zn||Cu half cells cycled in the blank electrolyte, 0.3, 0.5, and 0.7 M of the 6-AA added electrolyte. The Zn||Cu half cells were cycled at  $1 \text{ mA cm}^{-2}$  for 29 times, followed by  $1 \text{ mA cm}^{-2}$ ,  $4 \text{ mAh cm}^{-2}$  of zinc deposition.



**Figure S12.** Cyclic voltammograms (CV) of the  $\alpha$ -MnO<sub>2</sub>||Zn full cells in the blank electrolyte and the 6-AA added electrolyte at the scan rate of 0.2 mV s<sup>-1</sup> between 0.9 and 1.8 V (vs. Zn<sup>2+</sup>/Zn).



**Figure S13.** Voltage profiles of  $\alpha$ -MnO<sub>2</sub>||Zn full cells at 5th and 100th cycle at 0.5 A g<sup>-1</sup> between 0.9 and 1.8 V (vs. Zn<sup>2+</sup>/Zn) (a) in the blank electrolyte and (b) in the 6-AA added electrolyte.



**Figure S14.** Cycle performance with Coulombic efficiency of the  $\alpha$ -MnO<sub>2</sub>||Zn cells, cycling at 0.2 A g<sup>-1</sup> between 0.9 and 1.8 V (vs. Zn<sup>2+</sup>/Zn).