Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supplementary Information

Simultaneous tailoring of hydrogen evolution and dendrite growth via fertilizer-derived additive enables zinc anode interface stabilization

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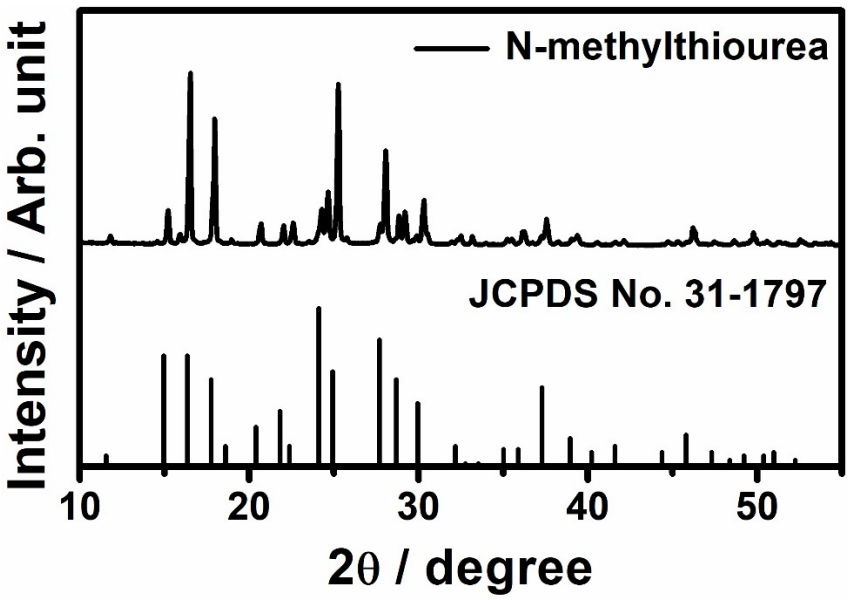

Figure S1. X-ray diffraction (XRD) pattern of N-methylthiourea (MTU).

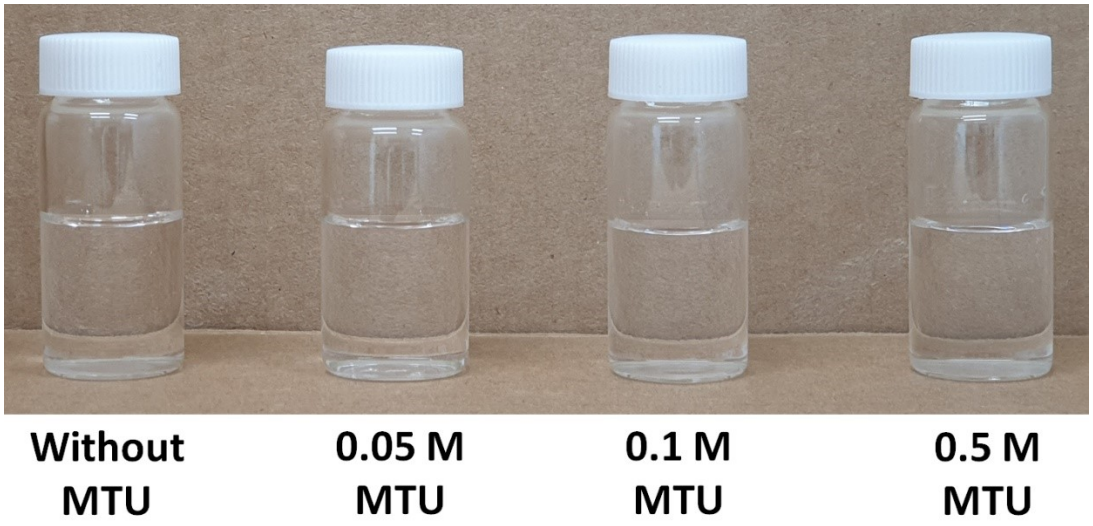

Figure S2. Photographs after addition of various concentrations of MTU in 1 M $ZnSO_4$ electrolyte.

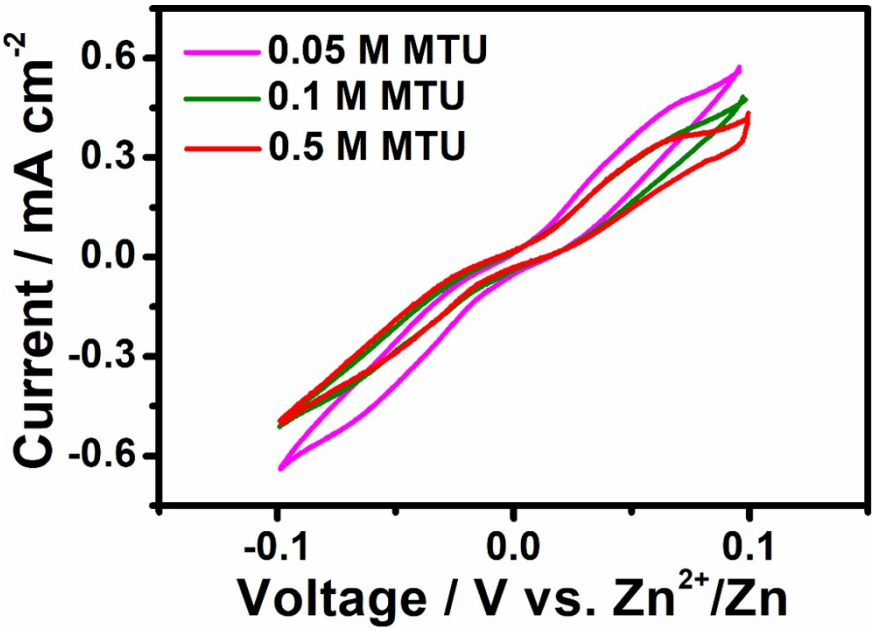

Figure S3. Cyclic voltammetry curves for Zn symmetric cells in 1 M $ZnSO_4$ electrolyte with various MTU concentrations.

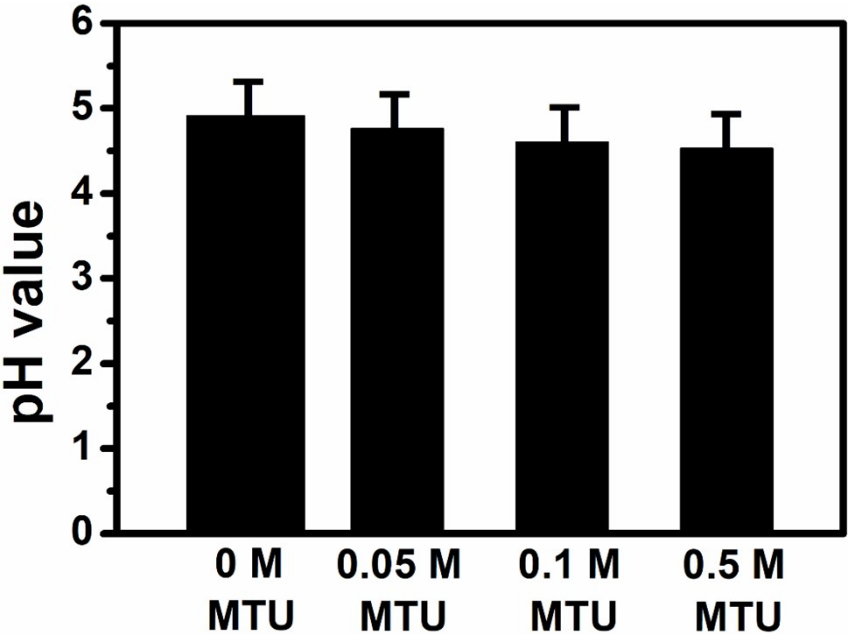

Figure S4. pH value of 1 M $ZnSO_4$ electrolyte with various MTU concentrations.

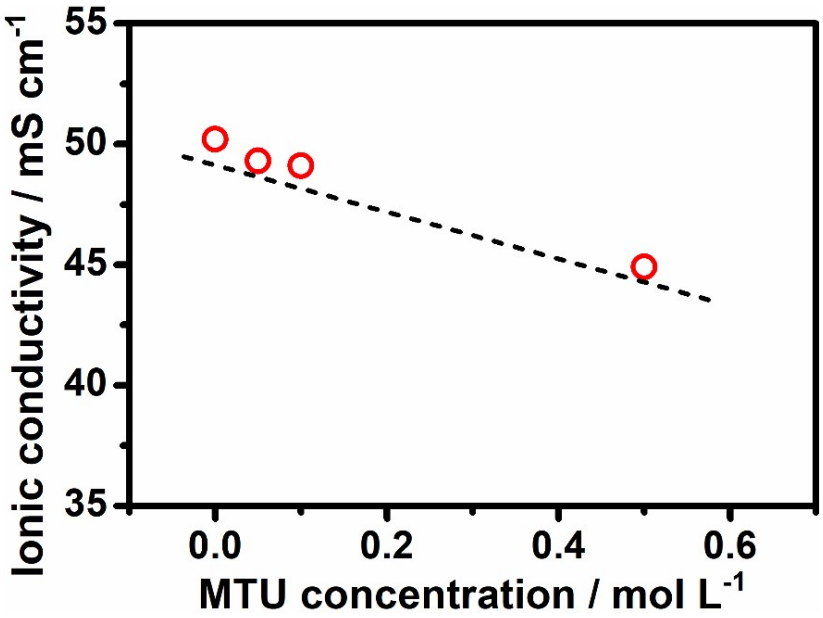

Figure S5. Ionic conductivities in 1 M $ZnSO_4$ electrolyte containing various MTU concentrations.

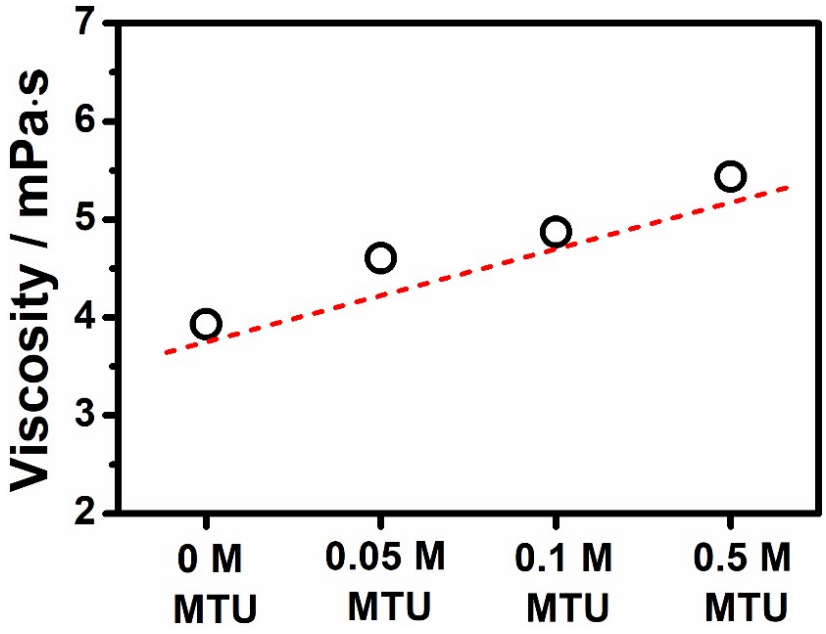

Figure S6. viscosities in 1 M $ZnSO_4$ electrolyte containing various MTU concentrations.

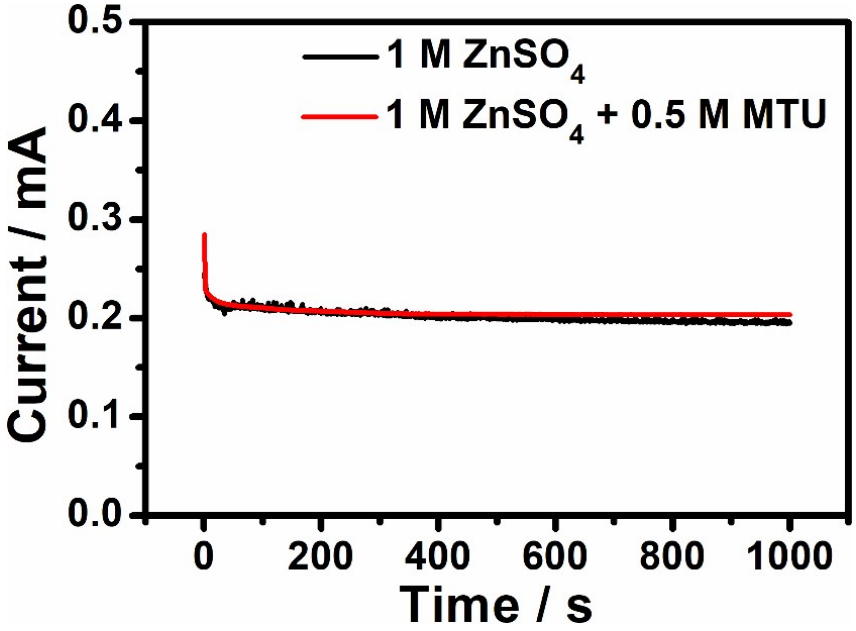

Figure S7. Chronoamperometry results in 1 M $ZnSO_4$ electrolyte and 1 M $ZnSO_4$ + 0.5 M MTU electrolyte.

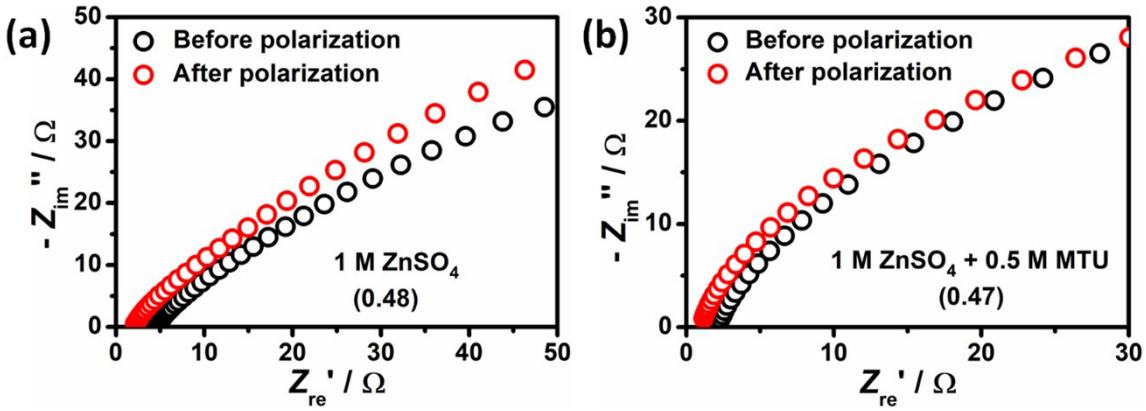

Figure S8. Electrochemical impedance spectra before and after polarization in (a) 1 M $ZnSO_4$ electrolyte and (b) 1 M $ZnSO_4$ + 0.5 M MTU electrolyte.

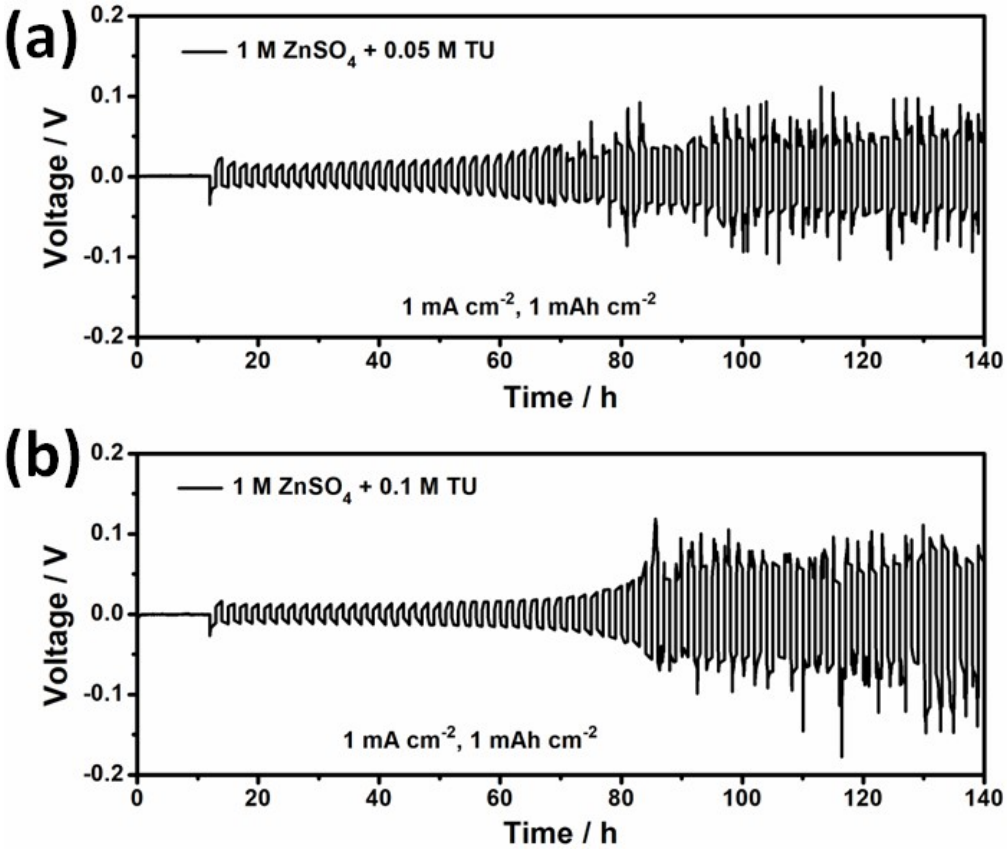

Figure S9. Chronopotentiometry results for Zn symmetric cells in (a) 1 M $ZnSO_4$ +0.05 M TU electrolyte, and (b) 1 M $ZnSO_4$ + 0.1 M TU electrolyte at a constant current density (1 mA cm^{-2}) and capacity (1 mAh cm^{-2}).

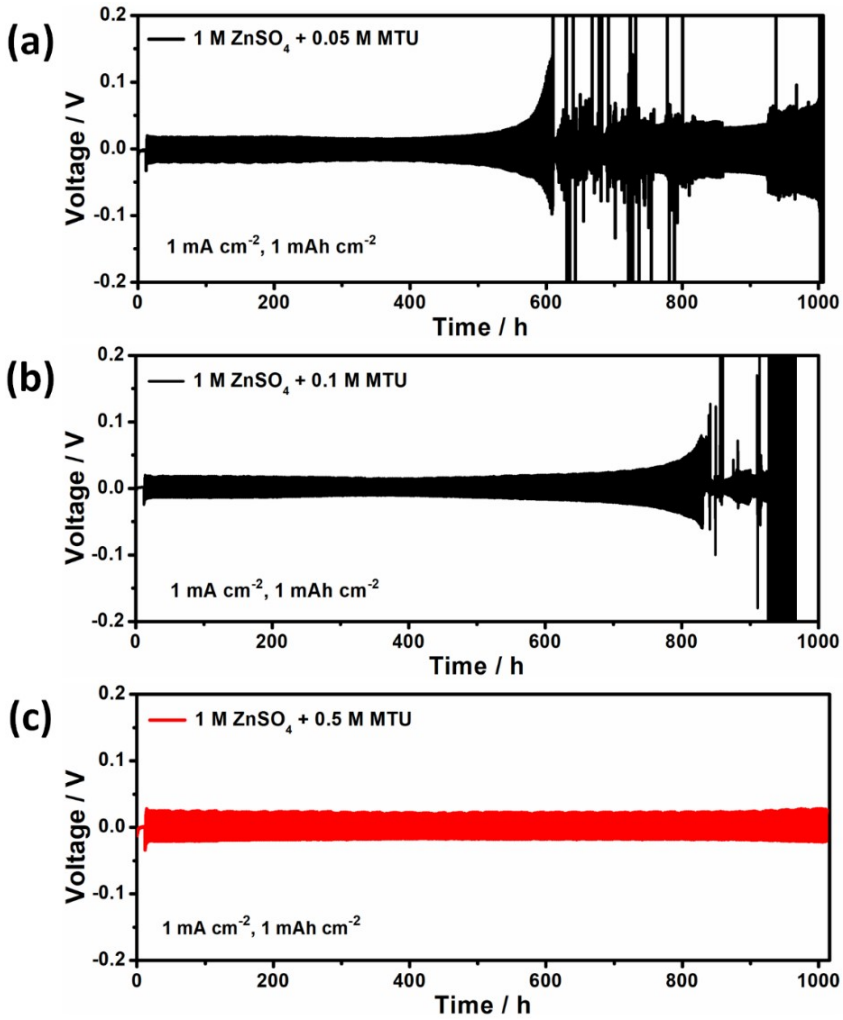

Figure S10. Chronopotentiometry results for Zn symmetric cells in (a) 1 M $ZnSO_4$ +0.05 M MTU electrolyte, (b) 1 M $ZnSO_4$ + 0.1 M MTU electrolyte, and (c) 1 M $ZnSO_4$ + 0.5 M MTU electrolyte at a constant current density (1 mA cm^{-2}) and capacity (1 mAh cm^{-2}).

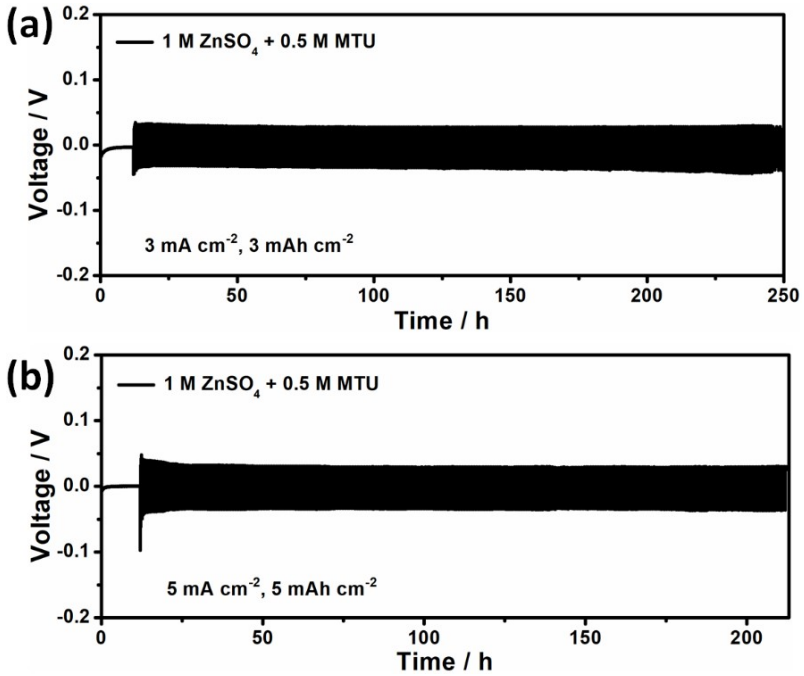

Figure S11. Chronopotentiometry results for Zn symmetric cells in 1 M $ZnSO_4$ + 0.5 M MTU electrolyte at (a) 3 mA cm^{-2} and (b) 5 mA cm^{-2} with a constant capacity of 3 mAh cm^{-2} and 5 mAh cm^{-2}, respectively.

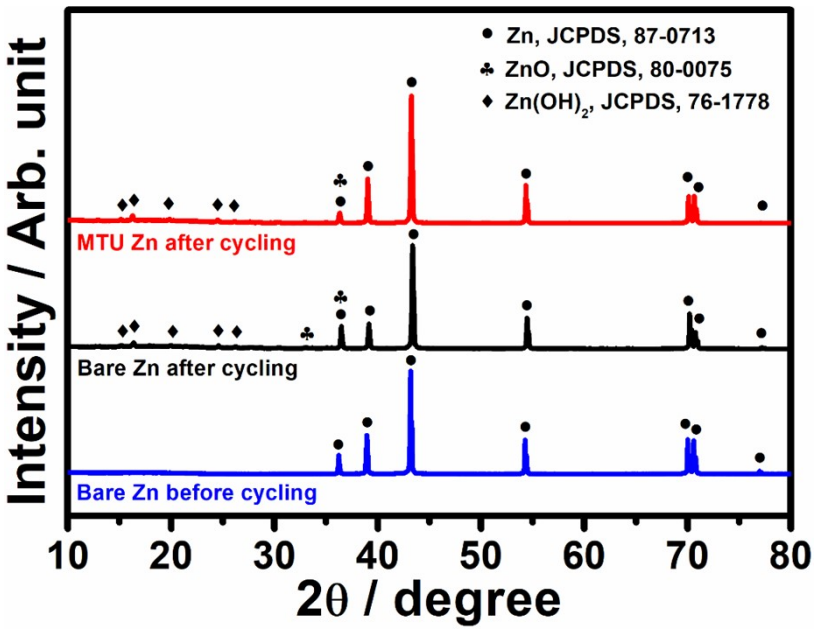

Figure S12. X-ray diffraction patterns of Zn-metal in 1 M $ZnSO_4$ electrolyte and 1 M $ZnSO_4$ + 0.5 M MTU electrolyte symmetric cells after 10 cycles.

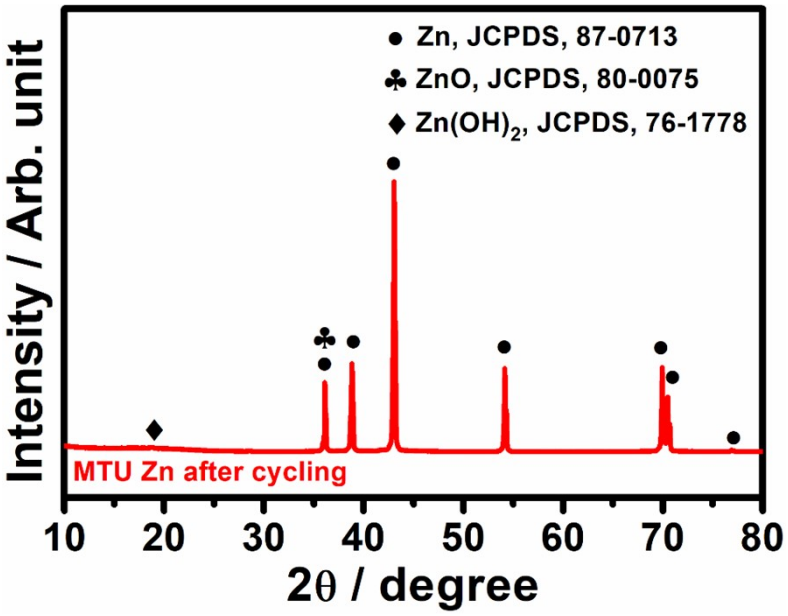

Figure S13. X-ray diffraction patterns of Zn-metal in 1 M $ZnSO_4$ + 0.5 M MTU electrolyte symmetric cell after 50 cycles.

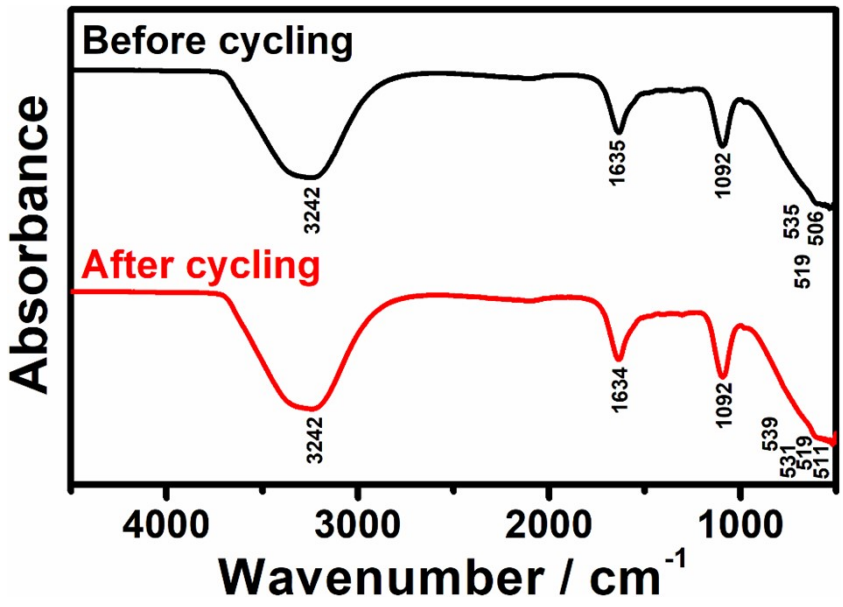

Figure S14. FTIR spectra of 1 M $ZnSO_4$ + 0.5 M MTU electrolyte before and after 50 cycles.

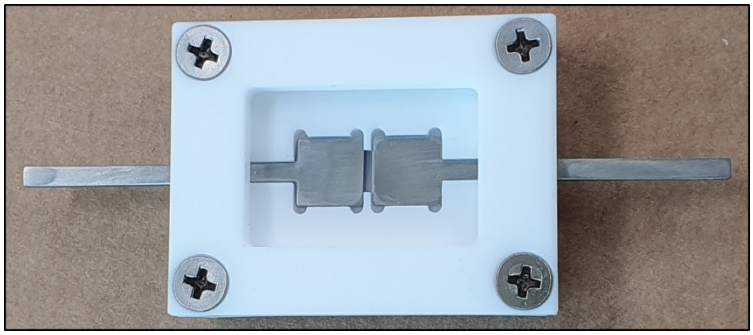

Figure S15. Photo of a symmetric cell made in the lab for in-situ optical visualization.

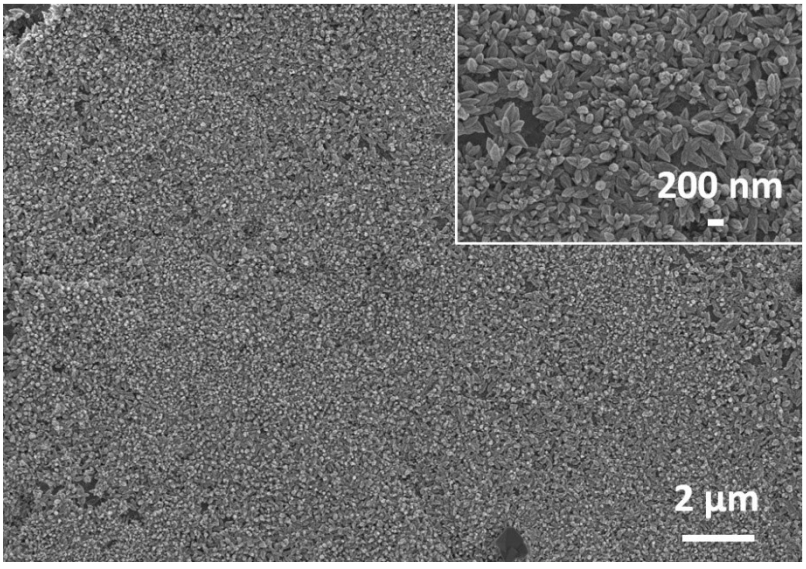

Figure S16. SEM image of Zn-metal electrode surface behavior with MTU in 1 M $ZnSO_4$ + 0.5 M MTU electrolyte at a current density of 3 mA cm^{-2} with a constant capacity of 3 mAh cm^{-2}.

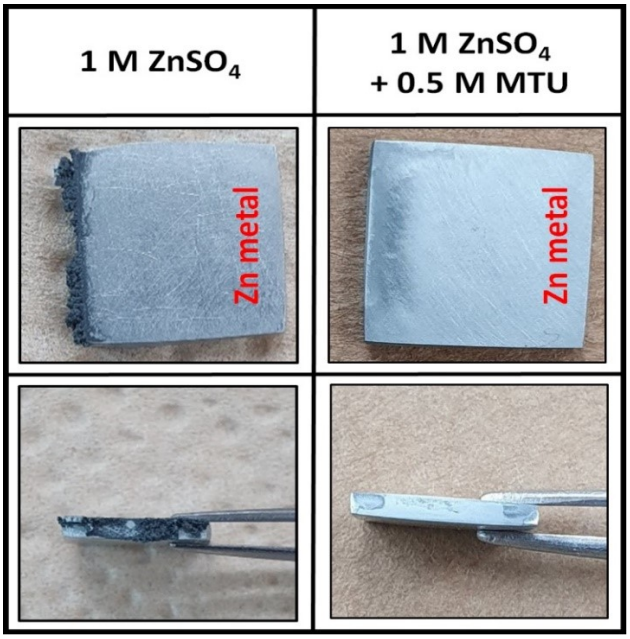

Figure S17. Photos of side and surface of Zn-metal electrode from a lab-made symmetric cell.

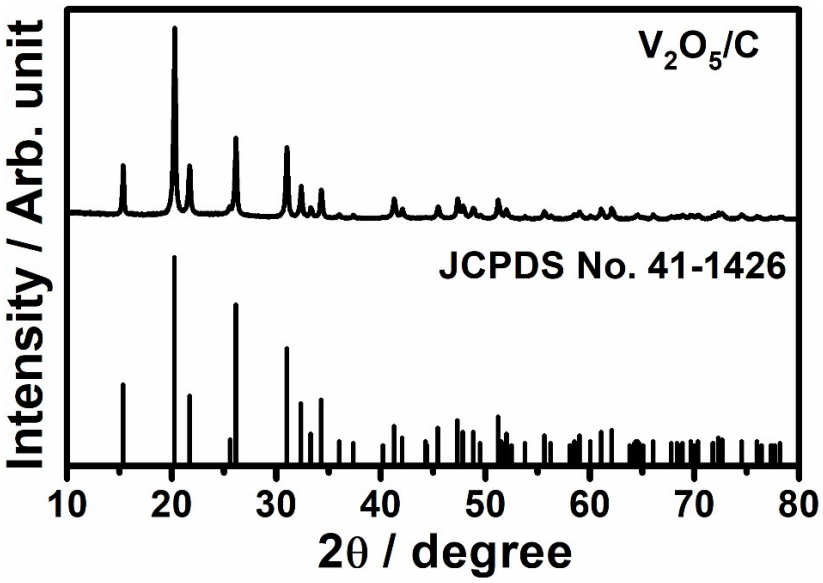

Figure S18. X-ray diffraction pattern of V_2O_5-C composite. The lines represent the reference pattern from the crystal structure database.

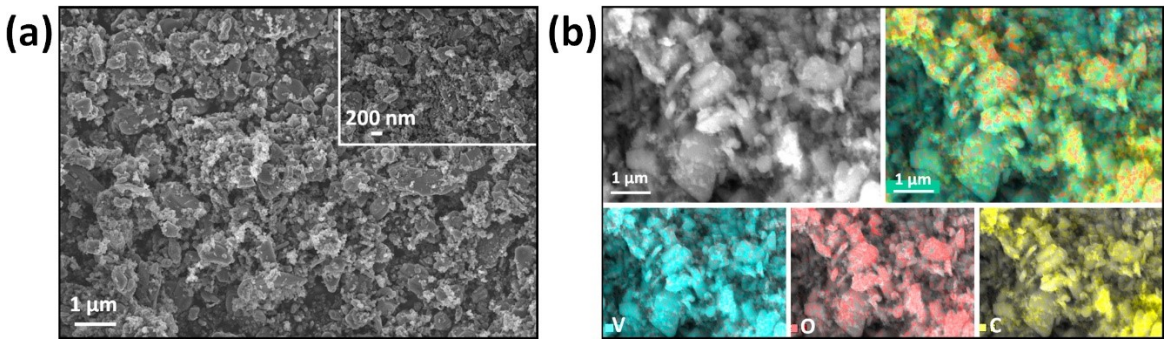

Figure S19. V_2O_5-C composite (a) SEM image and (b) elemental distributions.

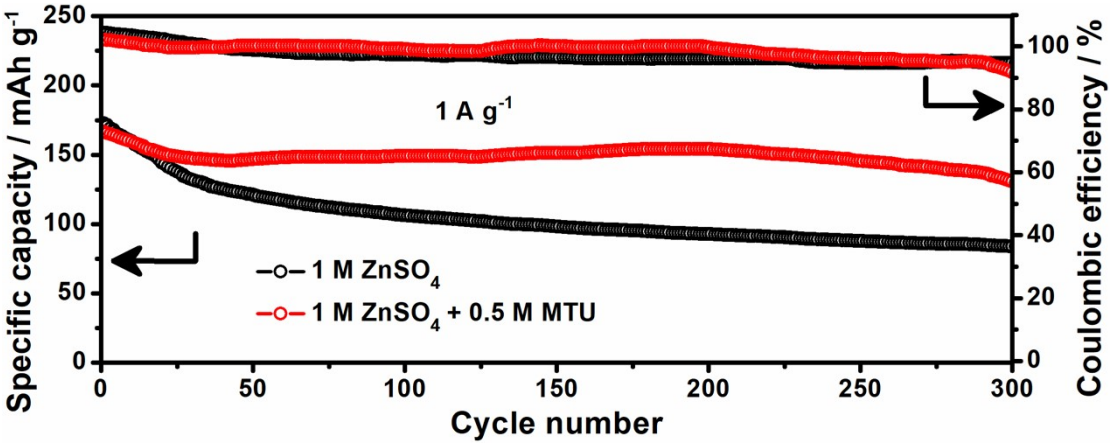

Figure S20. Cycling performance and the Coulombic efficiency of full cell using V_2O_5-C composite cathode with 1 M $ZnSO_4$ electrolyte and 1 M $ZnSO_4$ + 0.5 M MTU electrolyte at 1 A g^{-1}.

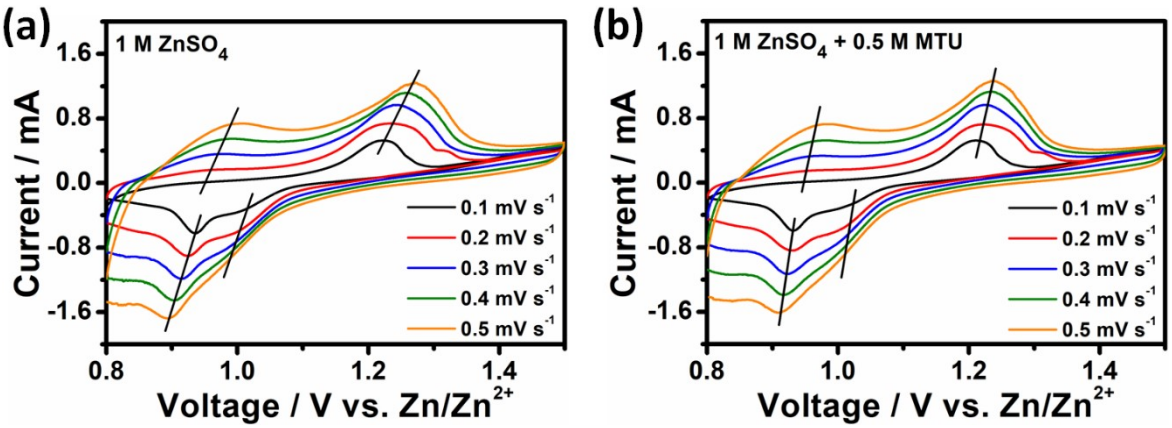

Figure S21. Cyclic voltammetry curves of full cell using V_2O_5-C composite cathode with 1 M $ZnSO_4$ electrolyte and 1 M $ZnSO_4$ + 0.5 M MTU electrolyte.

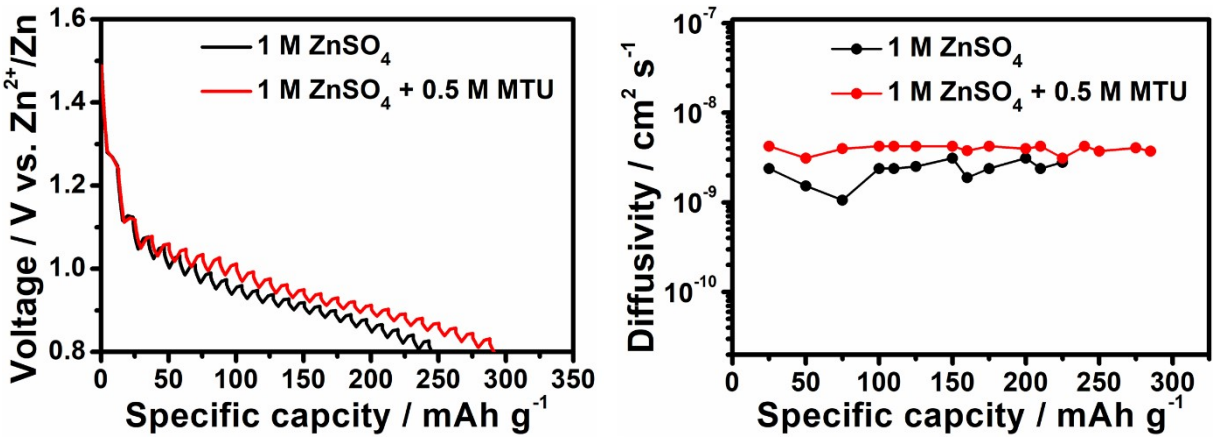

Figure S22. GITT voltage profiles and Zn diffusivities in 1 M $ZnSO_4$ electrolyte and 1 M $ZnSO_4$ + 0.5 M MTU electrolyte as a function of cell potential during 2nd cycles, which were determined by the GITT during Zn discharge process.