Supporting Information

A Superlattice-Stabilized Layered CuS Anode for High-Performance Aqueous Zinc-Ion Batteries

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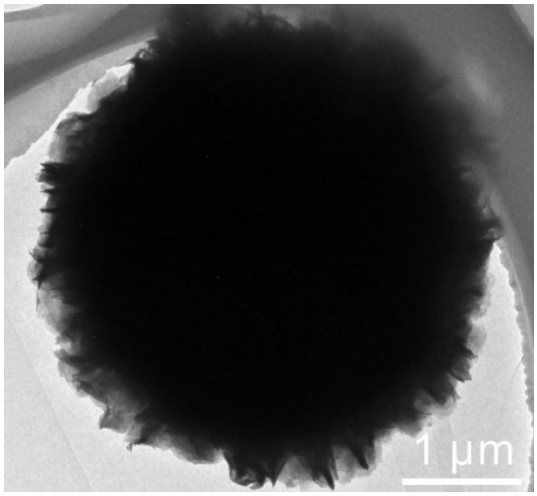

Figure S1. TEM images of CuS-CTAB microspheres. The monodispersed CuS–CTAB superlattice shows micro flower morphology with a diameter of ≈ 2–3 µm.

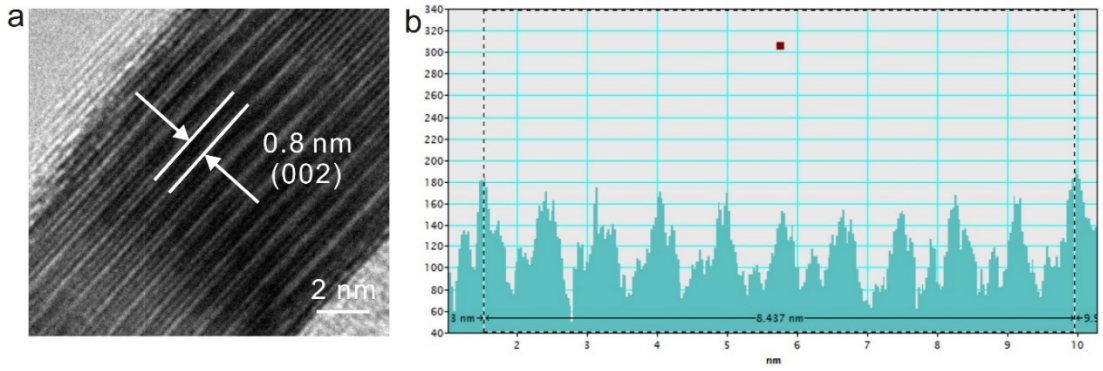

Figure S2. (a) TEM images and (b) line intensity profiles of pure CuS. It suggests that the (002) interlayer spacing of pure CuS is 0.84 nm.

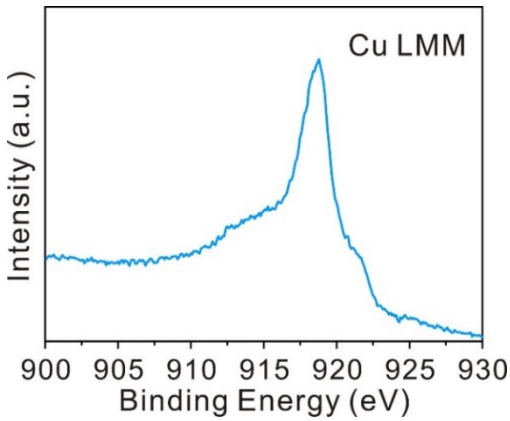

Figure S3. High-resolution Cu XPS spectrum of the as-prepared CuS-CTAB.

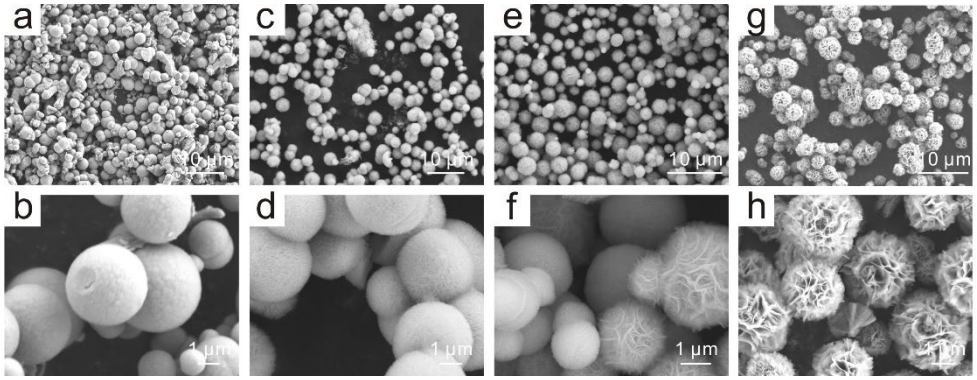

Figure S4. SEM images of CuS-CTAB with different amounts of CTAB for (a) 0 g, (c) 0.1 g, (e) 0.2 g, (g) 0.4 g and the corresponding enlarged images for (b), (d), (f), and (h). It indicates that CUS-CTAB-0 shows a sphere shape with smooth surface. On increasing the amount of CTAB, the smooth surface gradually evoluted and transformed into the sheet-like structure and ultimately formed into a typical flower-like microsphere morphology at the added amount of 0.4 g.

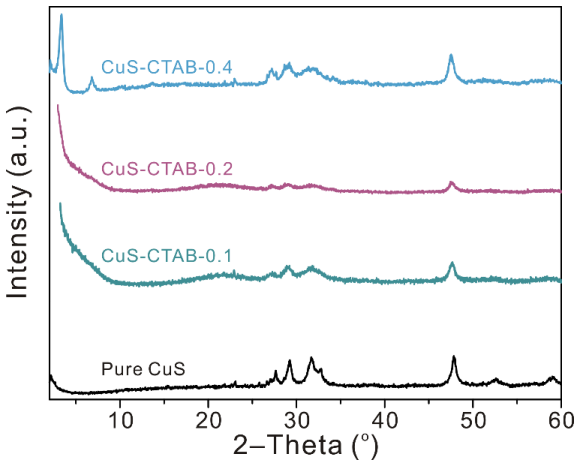

Figure S5. XRD patterns of CuS-CTAB with different amounts of CTAB. When the added amounts of CTAB reach to 0.4 g, CTAB molecules will successfully intercalate into the interlayer of CuS and form superlattice structure.

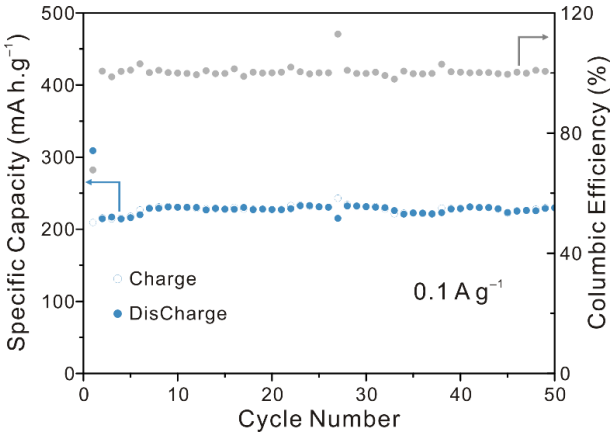

Figure S6. Cycling performances and the corresponding Coulombic efficiency of CuS-CTAB electrode at the current density of 0.1 A g^{-1}. The cell exhibits high discharge capacity of 230.1 mAh g^{-1} and high Coulombic efficiency close to 100%.

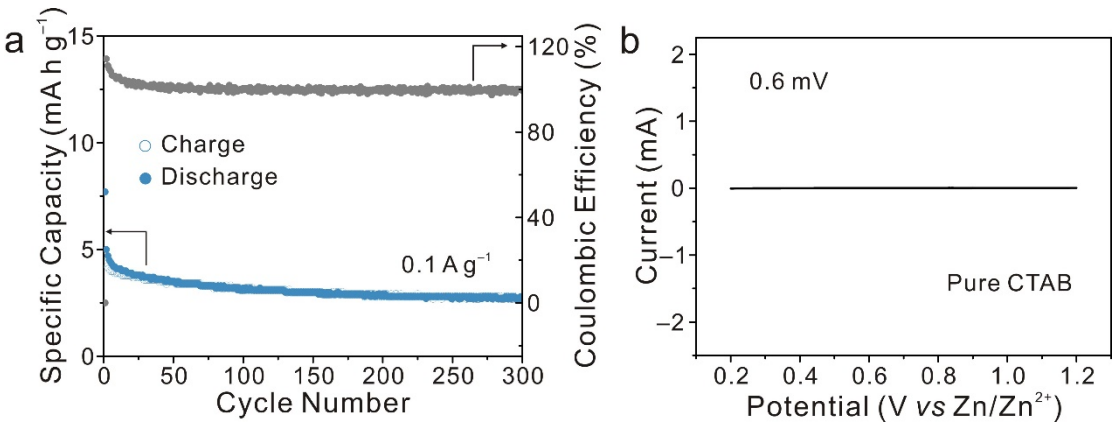

Figure S7. (a) Cycling performance of CTAB at 0.1 A g^{-1}. (b) CV scanning of CTAB electrode at 0.6 mV s^{-1} between 0.2 and 1.2 V (*vs* Zn^{2+}/Zn).

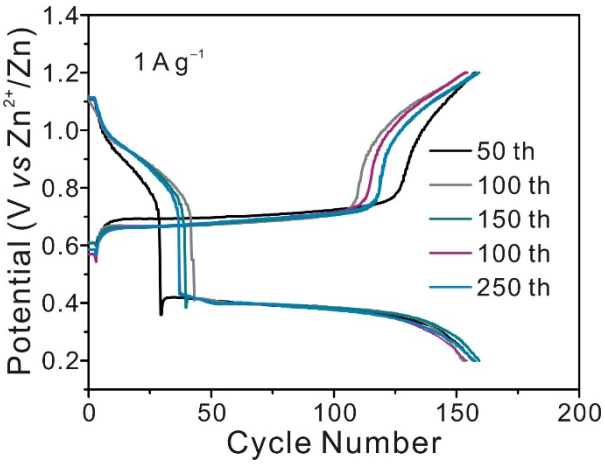

Figure S8. Representative galvanostatic charge/discharge curves of the CuS-CTAB at 1 A g^{-1}.

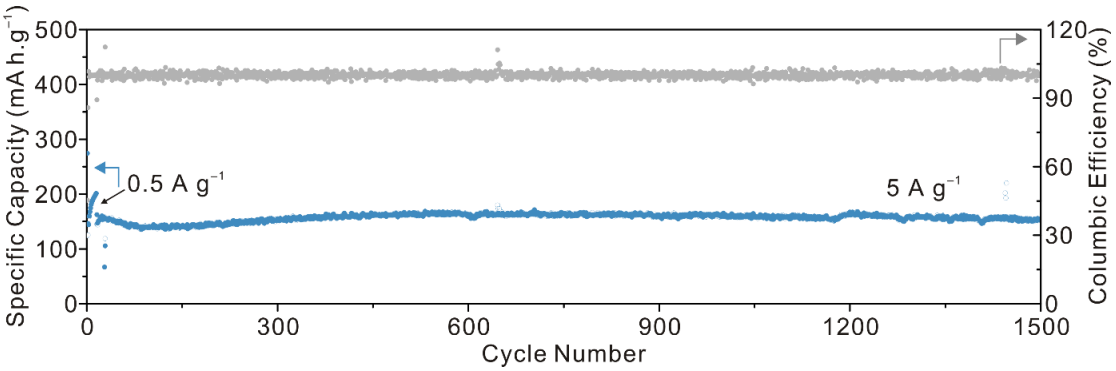

Figure S9. Cycling performance and the corresponding Coulombic efficiency of CuS-CTAB at 5 A g^{-1}. The cell shows initial discharge capacity of 155.3 mA h g^{-1} at 5 A g^{-1} and then increases to 163.9 mA h g^{-1} because of the activation process. Its capacity fades slightly and the capacity retention can reach to 94.3% over the whole 1500 cycles.

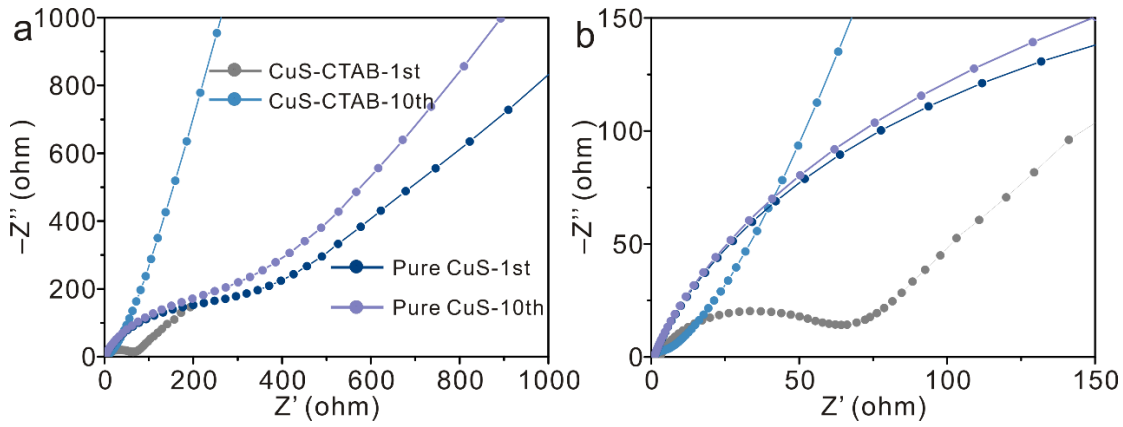

Figure S10. (a) EIS spectra and (b) enlarged spectra of CuS-CTAB and pure CuS at selected cycles (1st, 10th). The R_{ct} values of CuS-CTAB obvious decrease after ten cycles, which are probably attributed to the activation of materials. But the R_{ct} values of pure CuS have not obvious change.

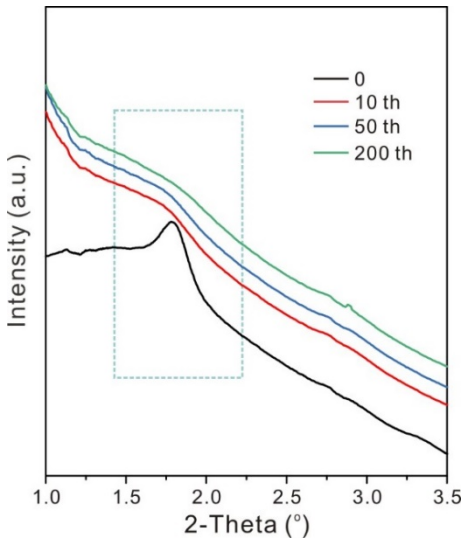

Figure S11. XRD patterns of CuS-CTAB electrode under the different cycles at 1 A g^{-1} (the wavelength of X-rays was calibrated to 0.8265 Å (15 KeV) by using the LaB6 standard from NIST (660b)).

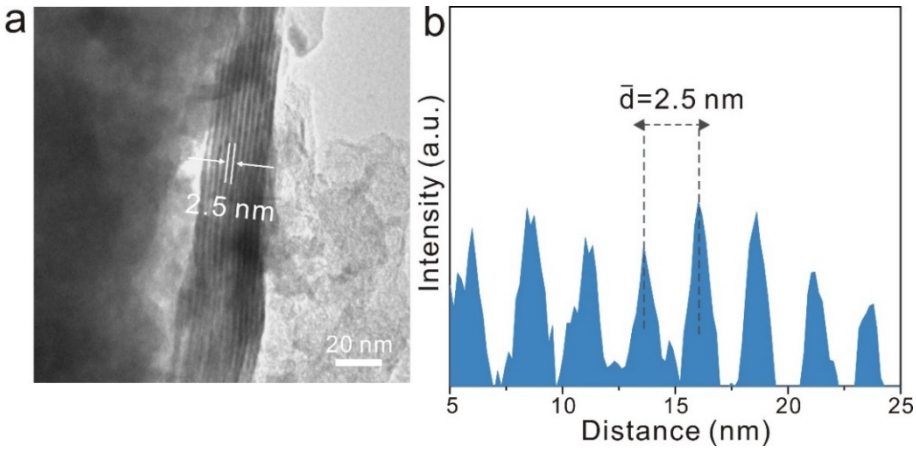

Figure S12. (a) HR-TEM image and (b) line intensity profiles of CuS-CTAB superlattice after 50 cycles (at the full discharge state at 1A g^{-1}).

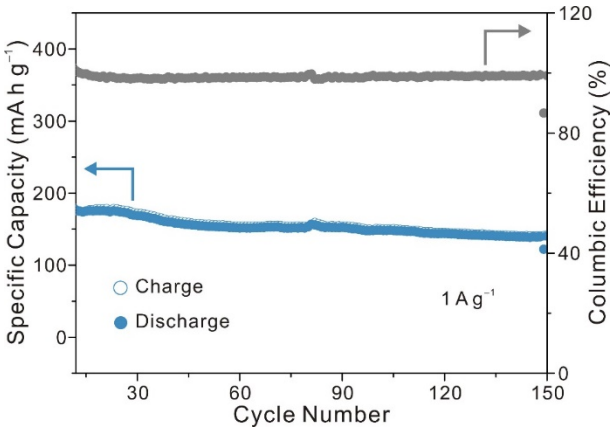

Figure S13. Cycling performance and the corresponding Coulombic efficiency of CTAB||Zn_xMnO_2 full battery at a current of 1 A g^{-1}. The cell demonstrates ~175.2 mAh g^{-1} with the coulombic efficiency close to 100% at 1 A g^{-1}.