Supplementary Information

One-step preparation of anti-freezing and flame- retardant eutectic gel electrolyte for assembling flexible and high-performance zinc-ion battery

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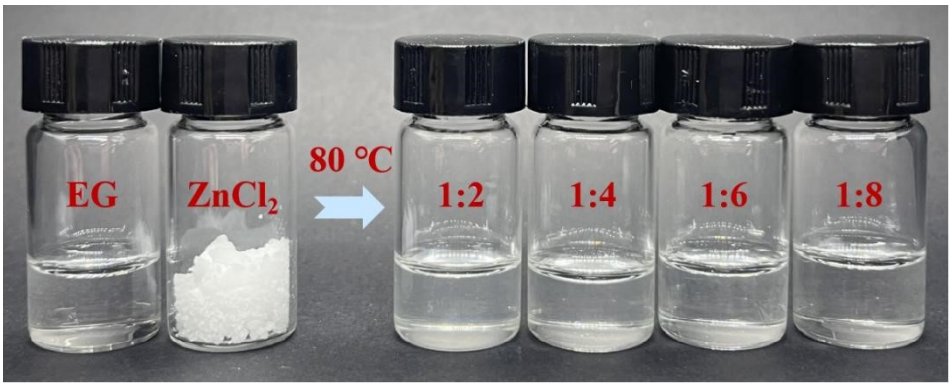

Figure S1. The pictures of DES under various ratios of ZDES (ZE2, ZE4, ZE6, ZE8).

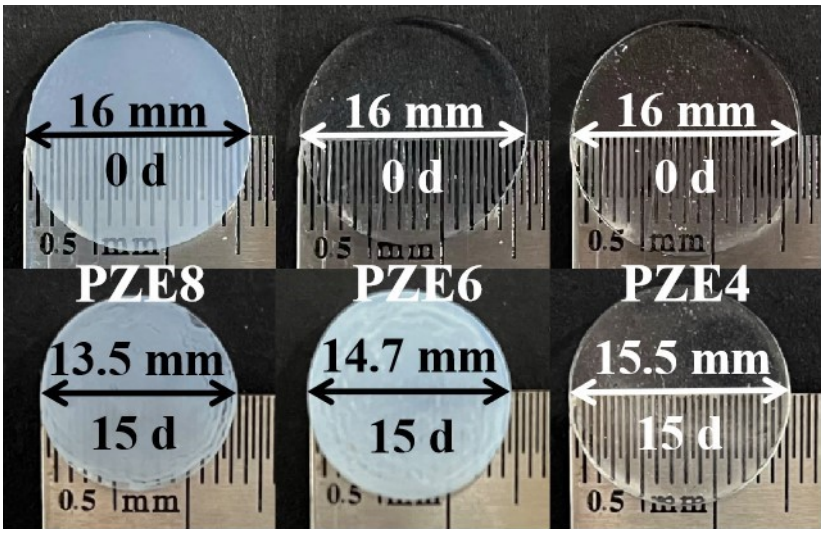

Figure S2. The pictures of volume changes for PVA-ZDES (PZE4, PZE6, PZE8) before and after a 15-day period.

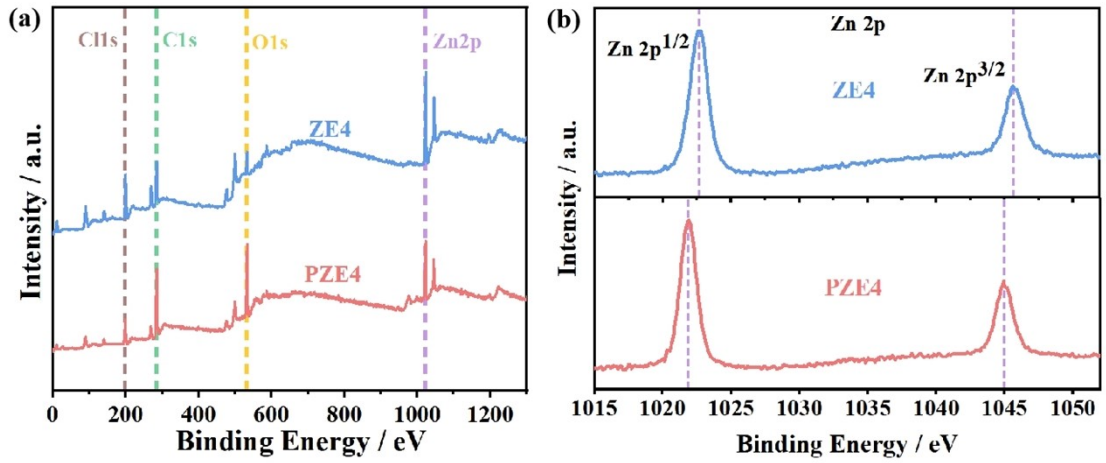

Figure S3. (a) The survey XPS spectra of ZE4 and PZE4-W, (b) The high resolution Zn 2p spectra of ZE4 and PZE4-W.

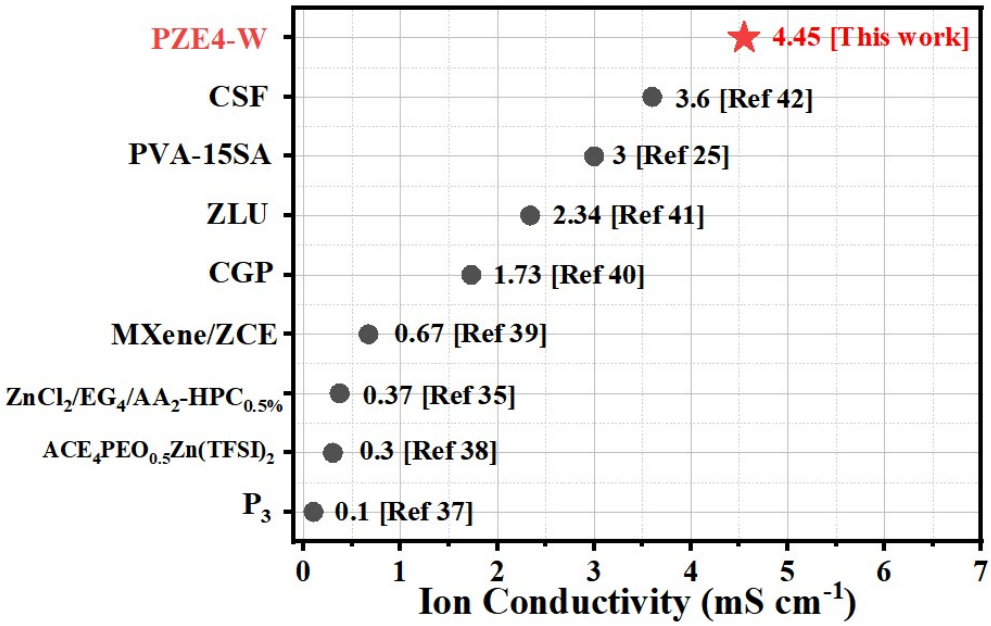

Figure S4. The ionic conductivity of PZE4-W was compared with that of zinc-based eutectic gel reported in recent years.[25, 35, 37-42]

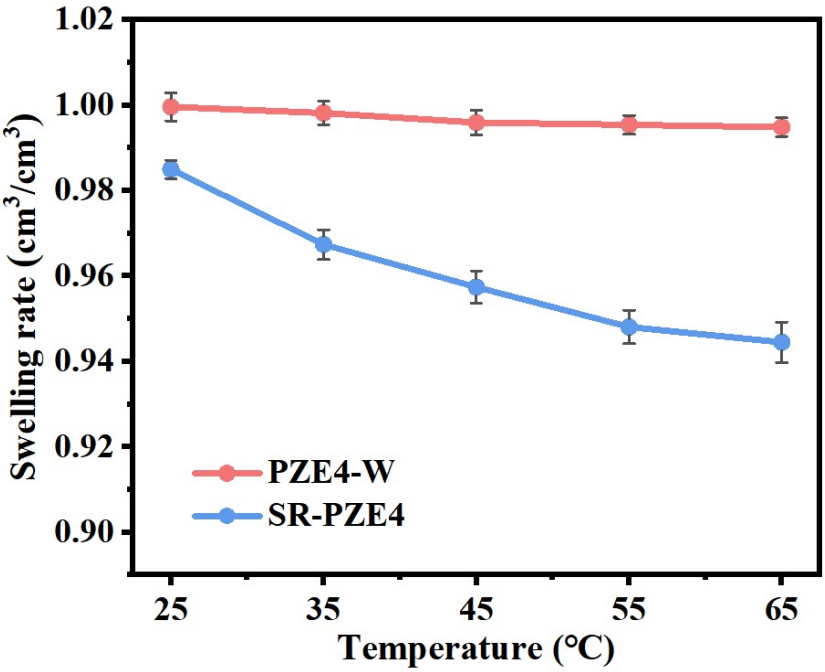

Figure S5. The swelling rate of PZE4-W and SR-PZE4 gel at different temperatures.

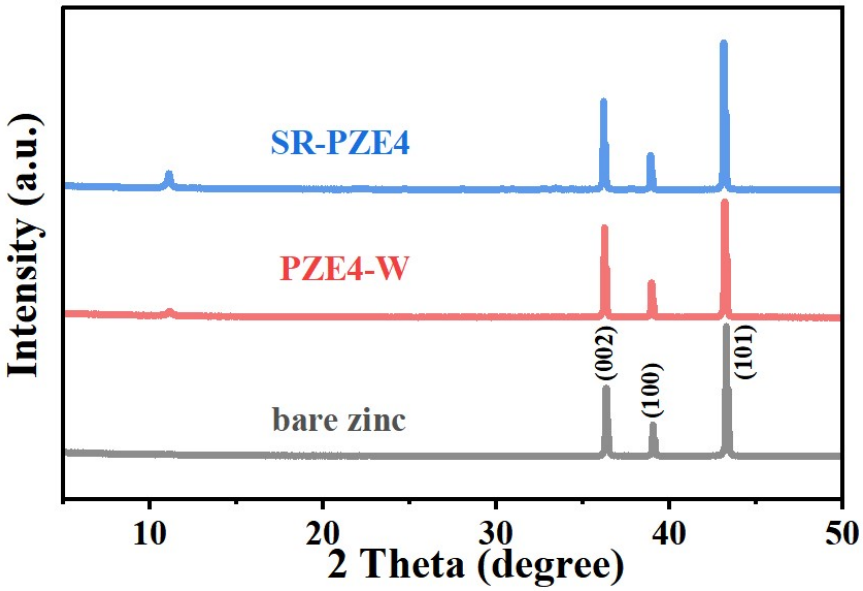

Figure S6. XRD analysis of bare zinc and the zinc surface with SR-PZE4 and PZE4-W electrolytes following 10 deposition-stripping cycles of Zn‖Zn symmetric cells, respectively.

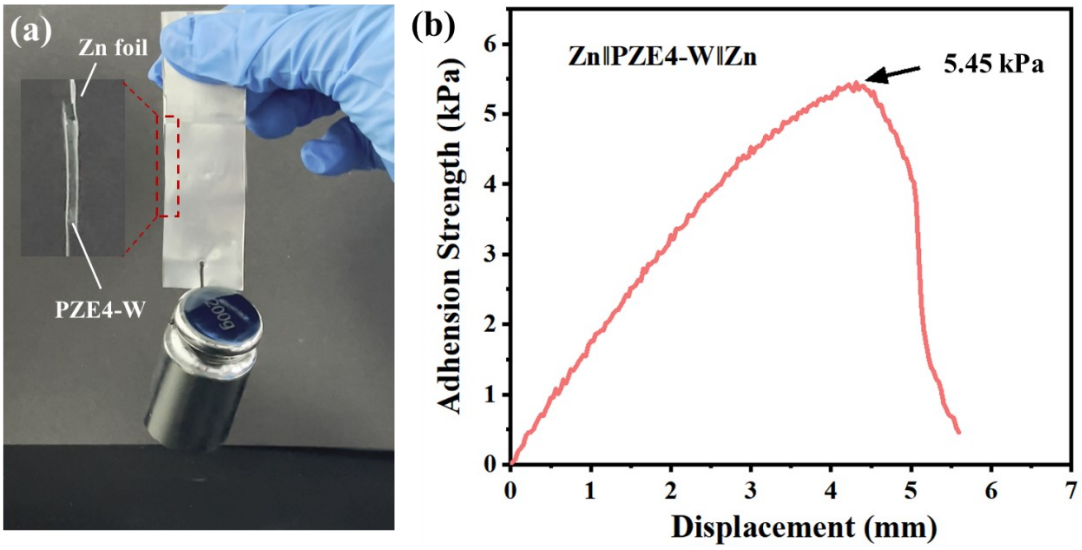

Figure S7. (a) Optical photos of the adhesion behavior of PZE4-W cocrystal gel to zinc electrode. (b) Tensile shear curves of PZE4-W eutecticgels with Zn foil

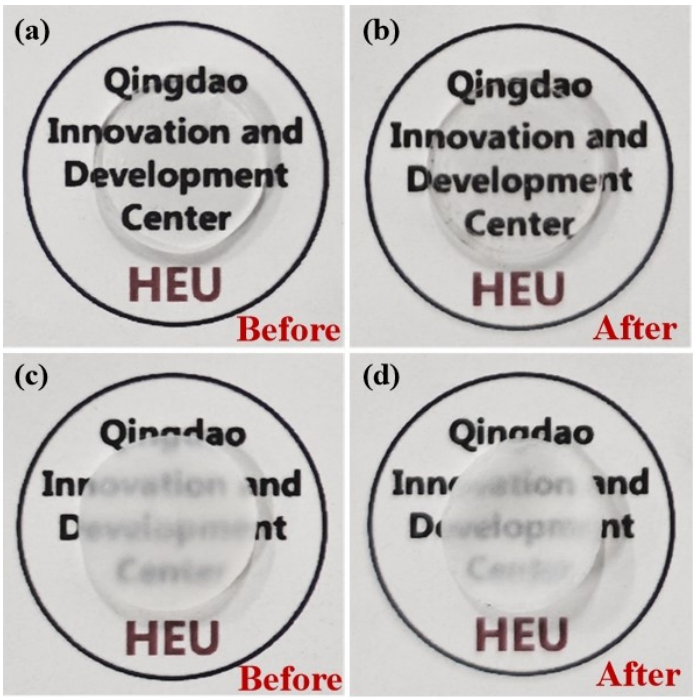

Figure S8. Optical images of (a, b) PZE4-W electrolyte and (c, d) SR-PZE4 electrolyte before and after 50 cycles of deposition and stripping at a current density of 1 mA cm^{-2}.

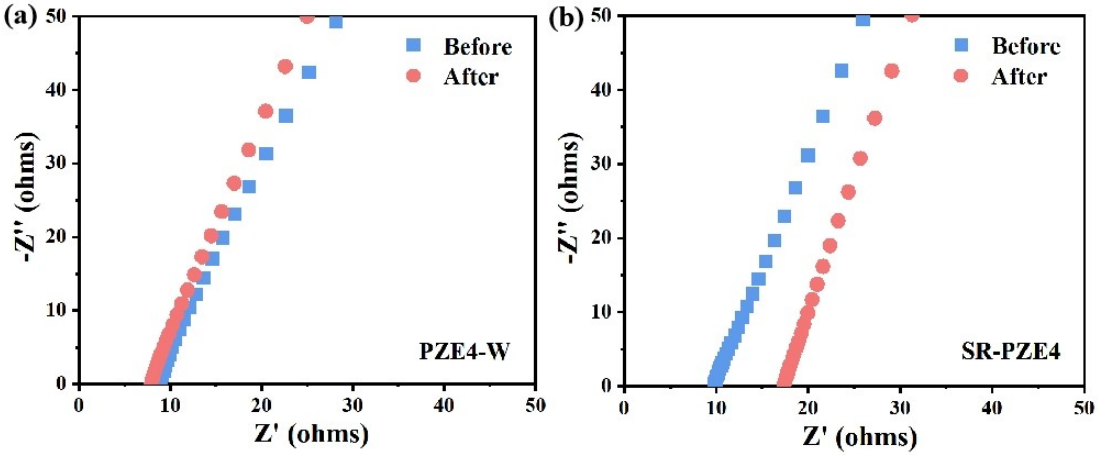

Figure S9. The EIS of (a, b) PZE4-W electrolyte and (c, d) SR-PZE4 electrolyte before and after 50 cycles of deposition and stripping at a current density of 1 mA cm^{-2}.

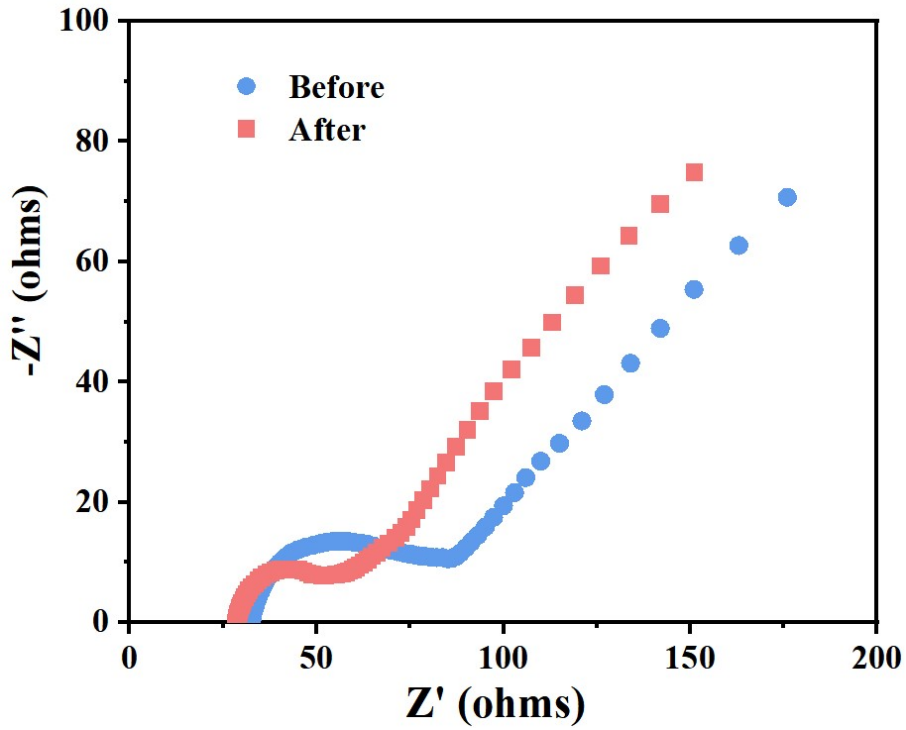

Figure S10. EIS of Zn‖PZE4-W‖PANI-CC button cell before and after rate cycling.

Figure S11. Pictures of voltage changes in Zn‖PANI solid-state soft-pack batteries under bending, piercing, and cutting.

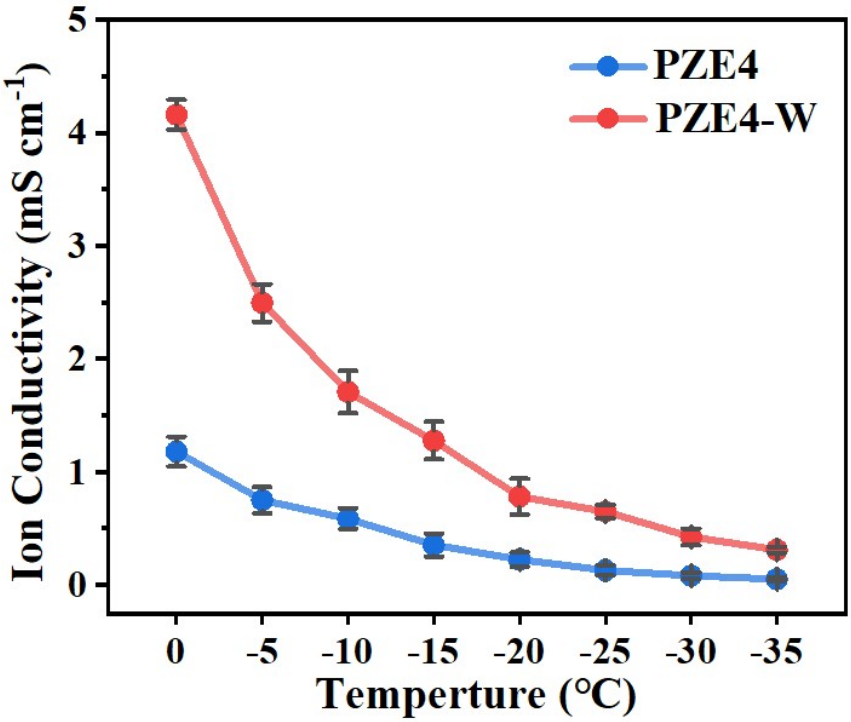

Figure S12. The ionic conductivity of the PZE4 and PZE4-W electrolytes from -35°C to 0°C.