Electronic Supplementary Information

Highly Compressible Zinc-Ion Batteries with Stable Performance

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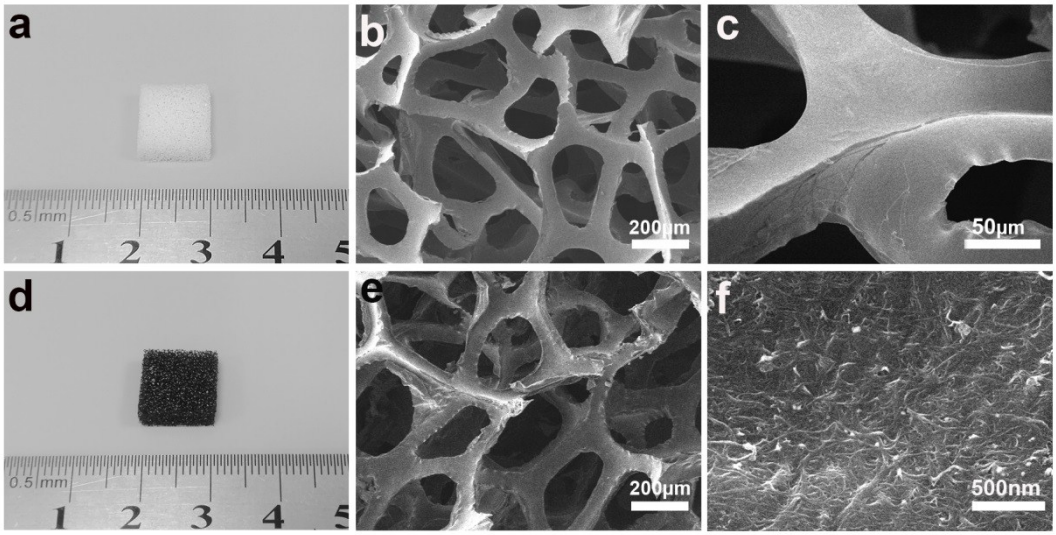

Fig. S1 (a) Optical image, (b) SEM image and (c) high magnification SEM image of sponge. (d) Optical image, (e) SEM image and (f) high magnification SEM image of SWCNT-sponge.

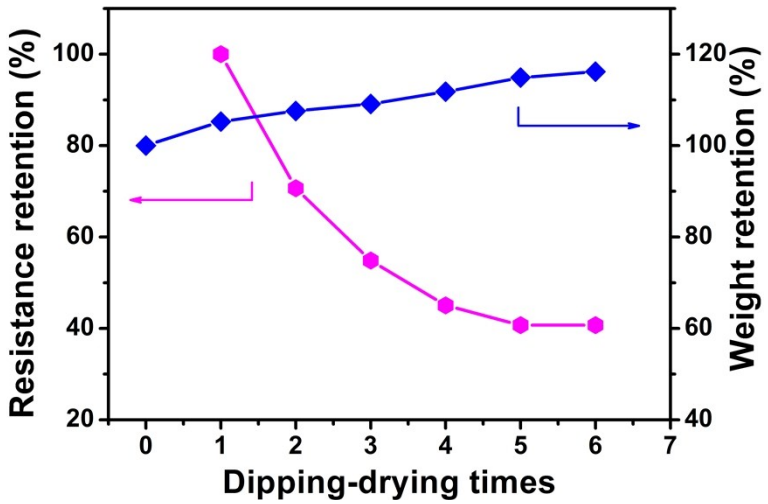

Fig. S2 The relationship between the times of dipping and drying process and the mass loading of SWCNTs and resistance of SWCNT-sponge, respectively.

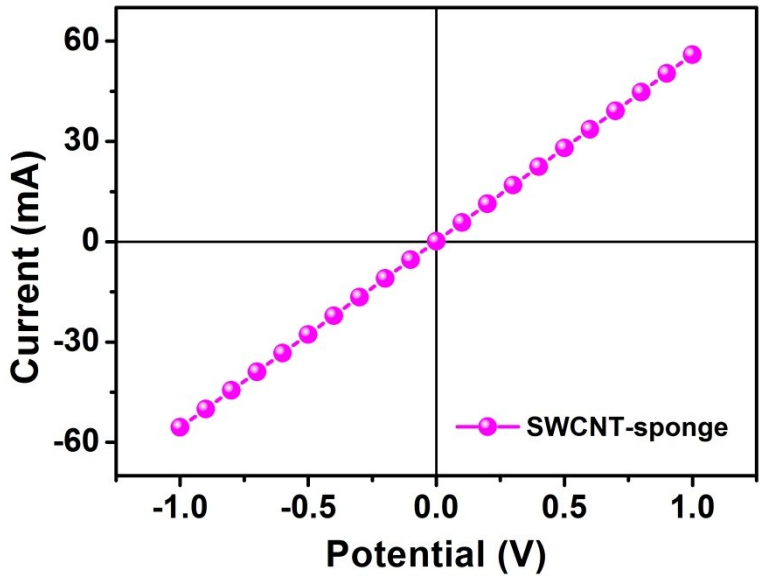

Fig. S3 I-V curve of SWCNT-sponge.

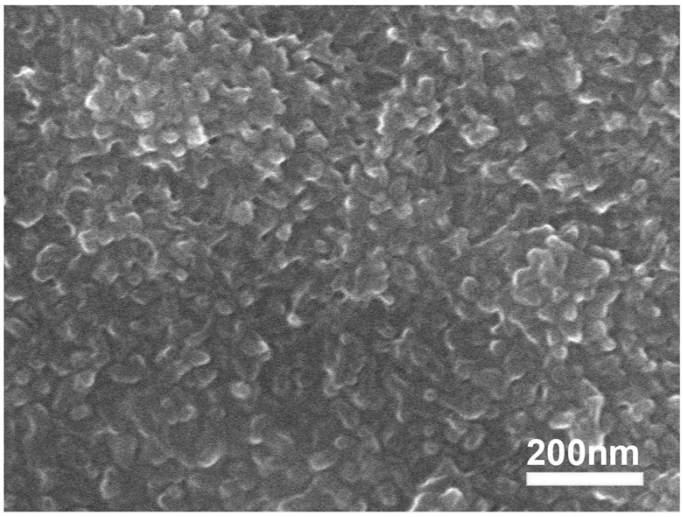

Fig. S4 The SEM image of PANI being deposited on the surface of SWCNT-sponge by polymarization for 30 min.

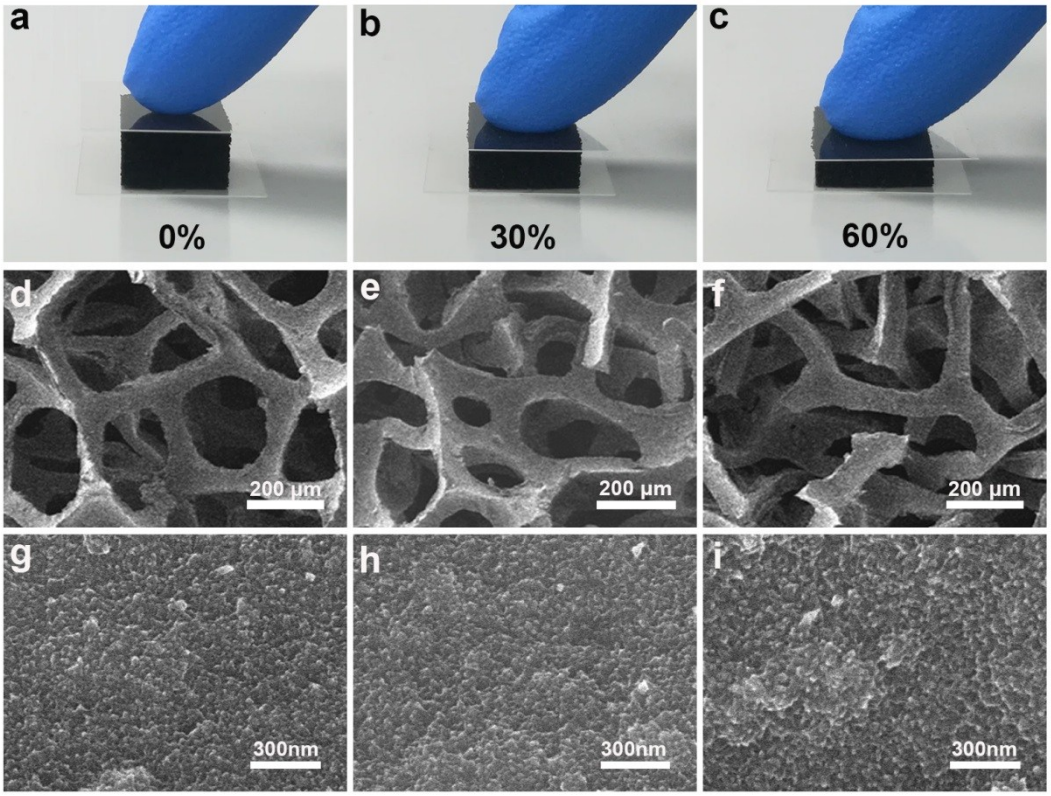

Fig. S5 (a-c) Optical images, (d-f) the corresponding SEM images and (g-i) high magnification SEM images of PANI-SWCNT-sponge (obtained by polymarization for 30 min) at different strains of 0%, 30%, and 60%.

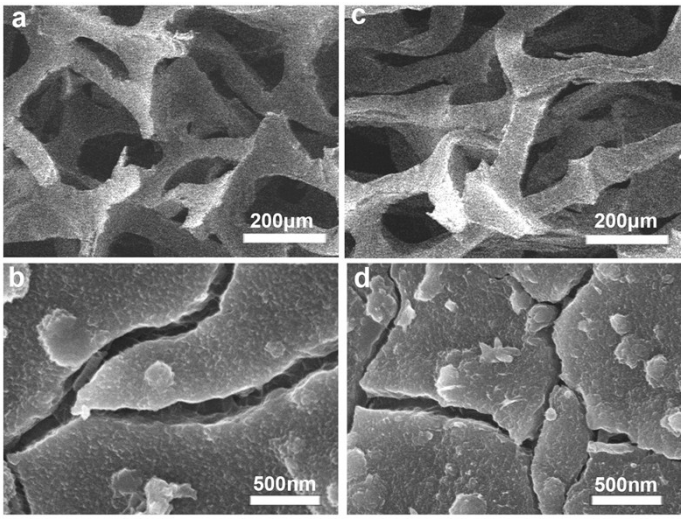

Fig. S6 (a) SEM image and (b) high magnification SEM image of PANI-SWCNT-sponge (obtained by polymarization for 45 min) at a compressive strain of 60%. (c) SEM image and (d) high magnification SEM image of PANI-SWCNT-sponge (obtained by polymarization for 60 min) at a compressive strain of 60%.

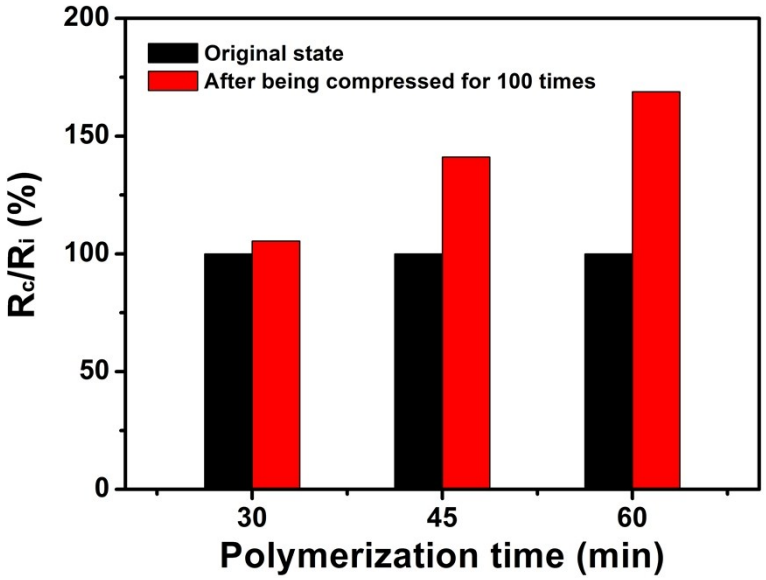

Fig. S7 The changes of electrical resistance of the PANI-SWCNT-sponge after being compressed (R_i: resistance before being compressed; R_c: resistance after being compressed).

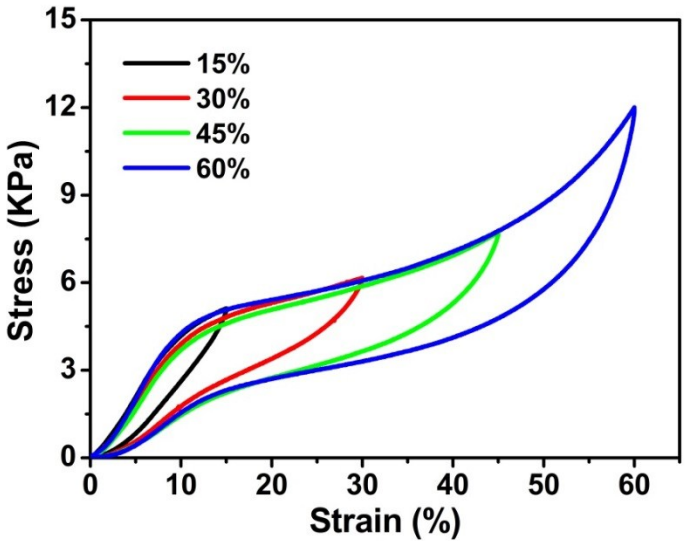

Fig. S8 Stress–strain curves of PANI-SWCNT-sponge at different strains of 15%, 30%, 45%, and 60%.

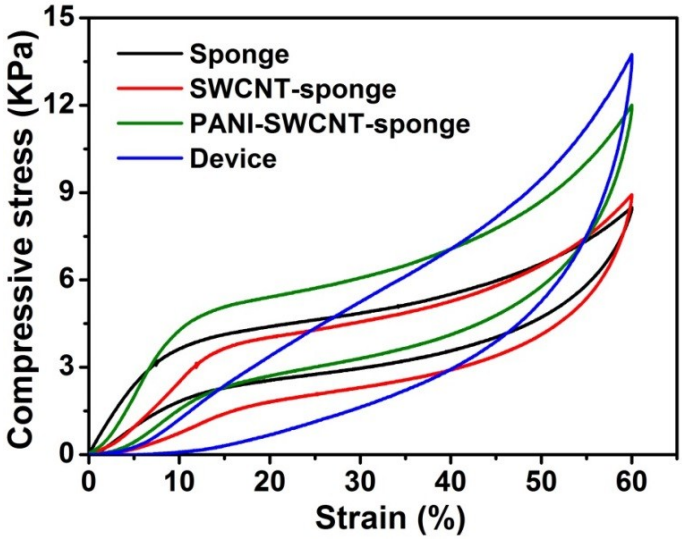

Fig. S9 Stress-strain curves of sponge, SWCNT-sponge, PANI-SWCNT-sponge, and compressible ZIBs with a maximum strain of 60%.

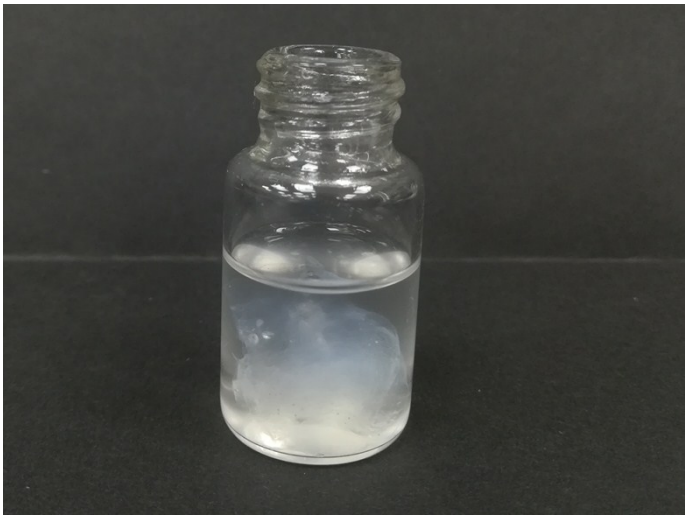

Fig. S10 The optical images of the mixture of PVA and 1 M $ZnSO_4$ aqueous solution.

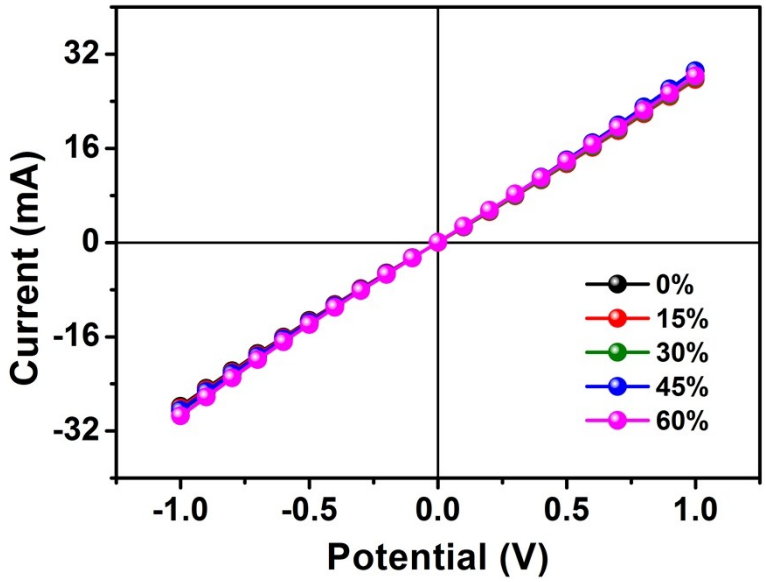

Fig. S11 I-V curves of PANI-SWCNT-sponge in quasi-solid-state PVA/Zn$(CF_3SO_3)_2$ electrolyte under different strains of 15%, 30%, 45%, and 60%.

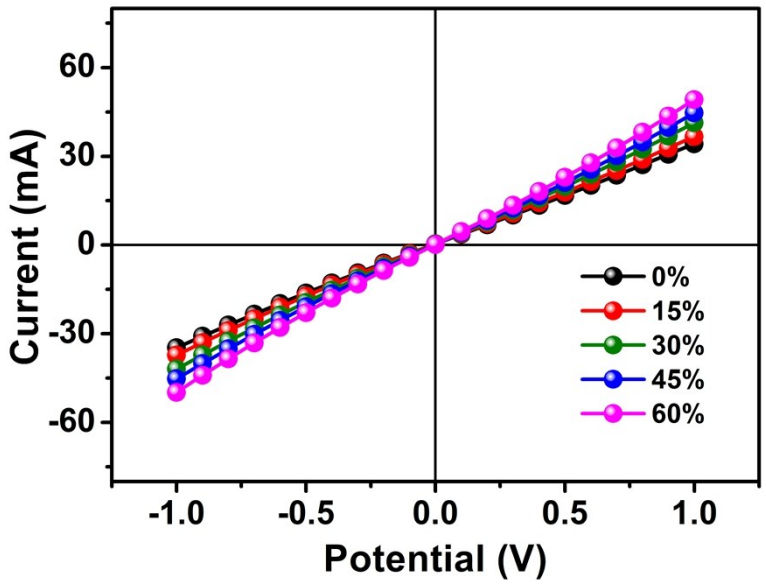

Fig. S12 I-V curves of PANI-SWCNT-sponge in liquid $Zn(CF_3SO_3)_2$ electrolyte under different strains of 15%, 30%, 45%, and 60%.

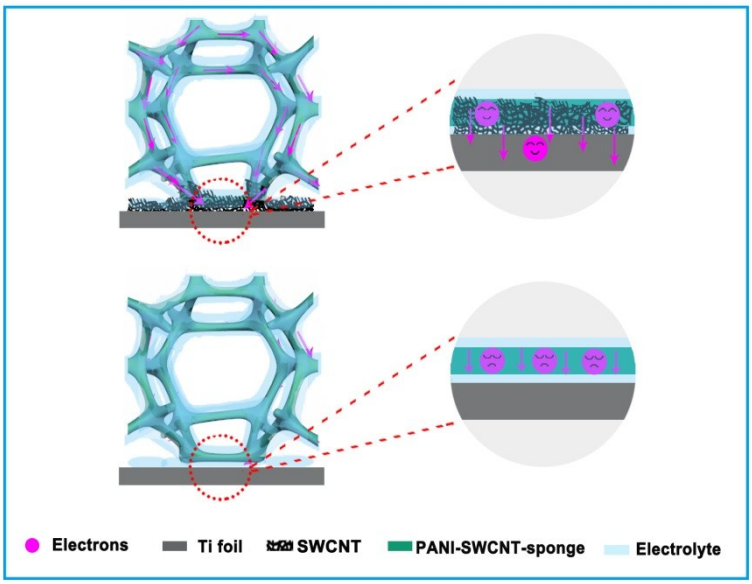

Fig. S13 The schematic illustration of electron transport between the PANI-SWCNT-sponge and Ti foil.

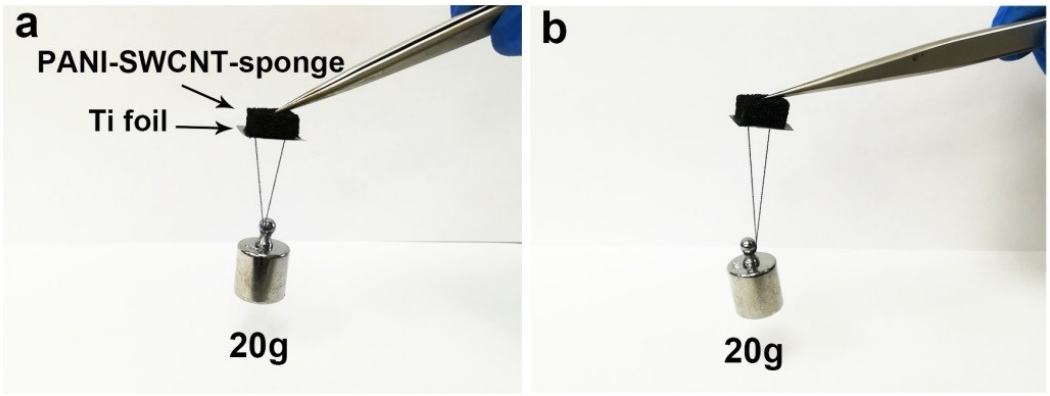

Fig. S14 Optical images of the load-bearing of PANI-SWCNT-sponge electrode: (a) without electrolyte; (b) with PVA/$Zn(CF_3SO_3)_2$ electrolyte.

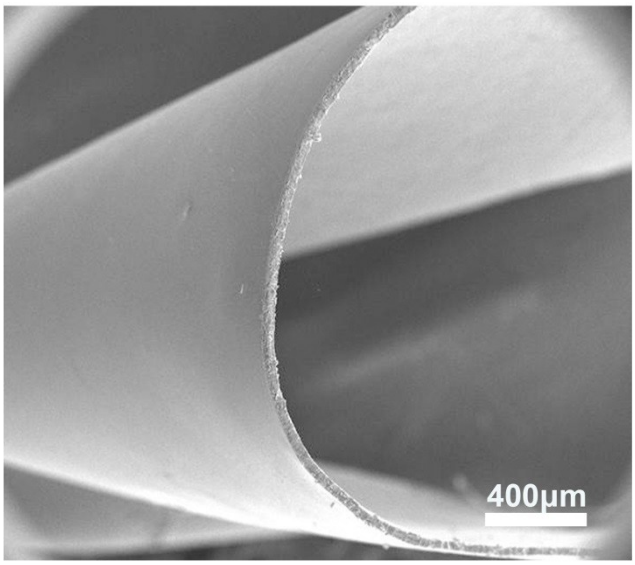

Fig. S15 Cross-sectional SEM image of PVA/Zn(CF_3SO_3)$_2$ electrolyte film.

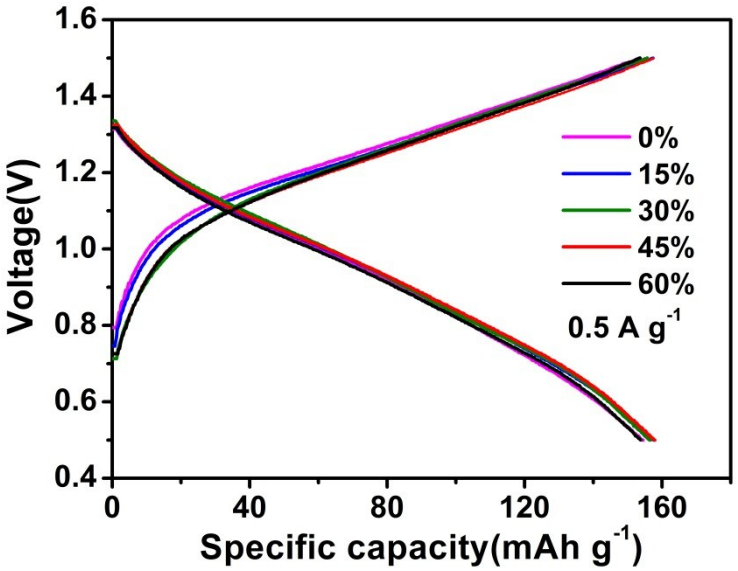

Fig. S16 The charge/discharge curves of the compressible ZIBs at different compressive strains of 0%, 15%, 30%, 45%, and 60%.

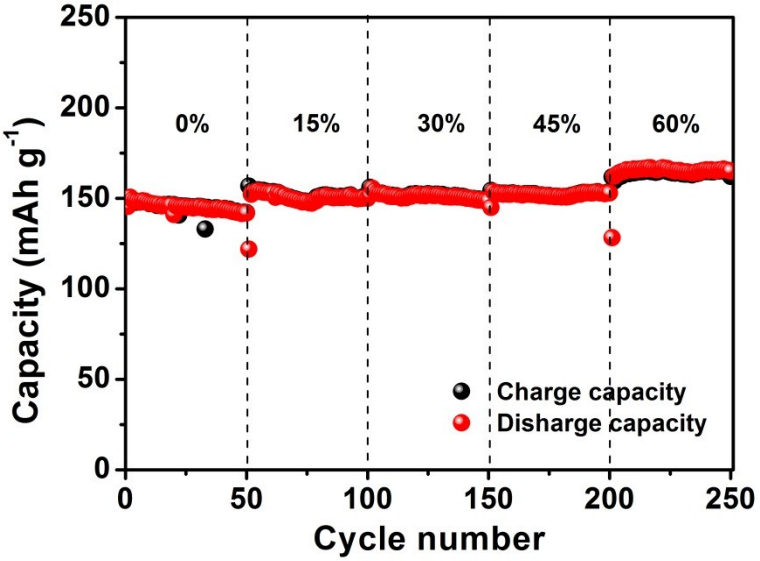

Fig. S17 Cycling performance of the compressible ZIBs based on liquid electrolyte at different compressive strains of 0%, 15%, 30%, 45%, and 60%; current density: 0.5 A g^{-1}.

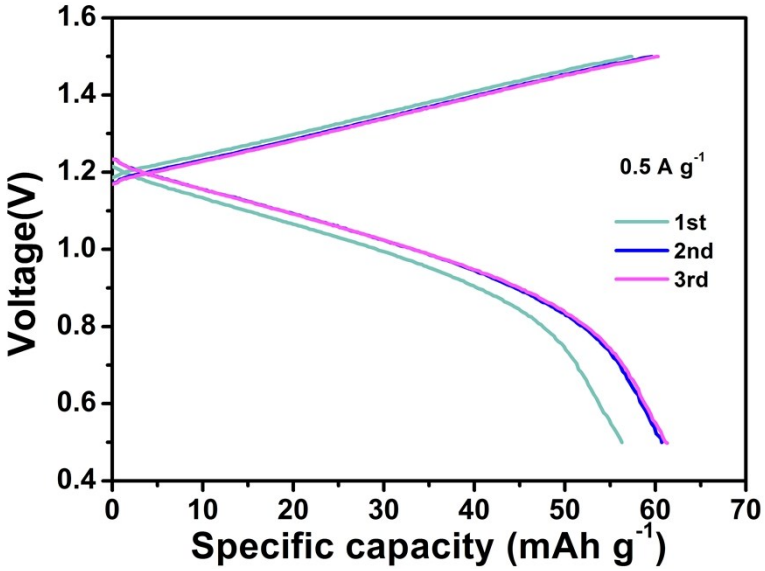

Fig. S18 The charge/discharge curves of the compressible ZIBs at the original state without additional SWCNTs between PANI-SWCNT-sponge and Ti foil.

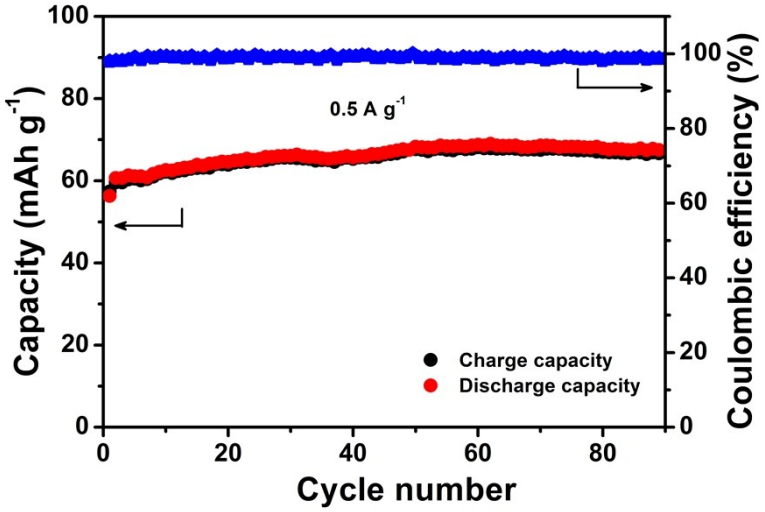

Fig. S19 Cycling performance of the compressible ZIBs at the original state without additional SWCNTs between PANI-SWCNT-sponge and Ti foil.

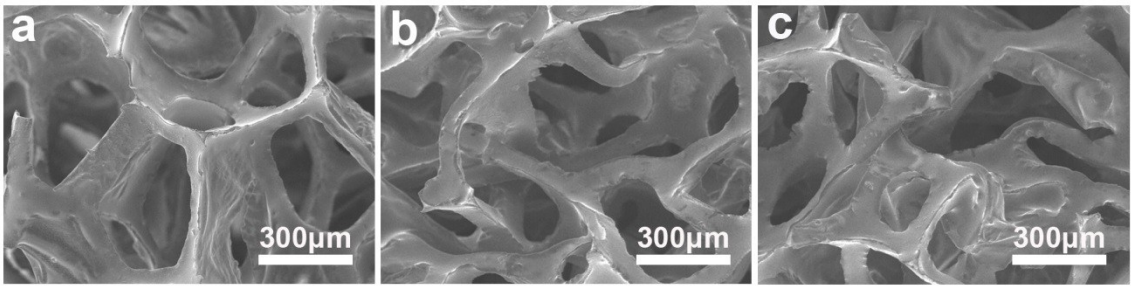

Fig. S20 SEM images of PANI-SWCNT-sponge with PVA/Zn$(CF_3SO_3)_2$ electrolyte at different strains of a) 0%, b) 30%, and c) 60%.

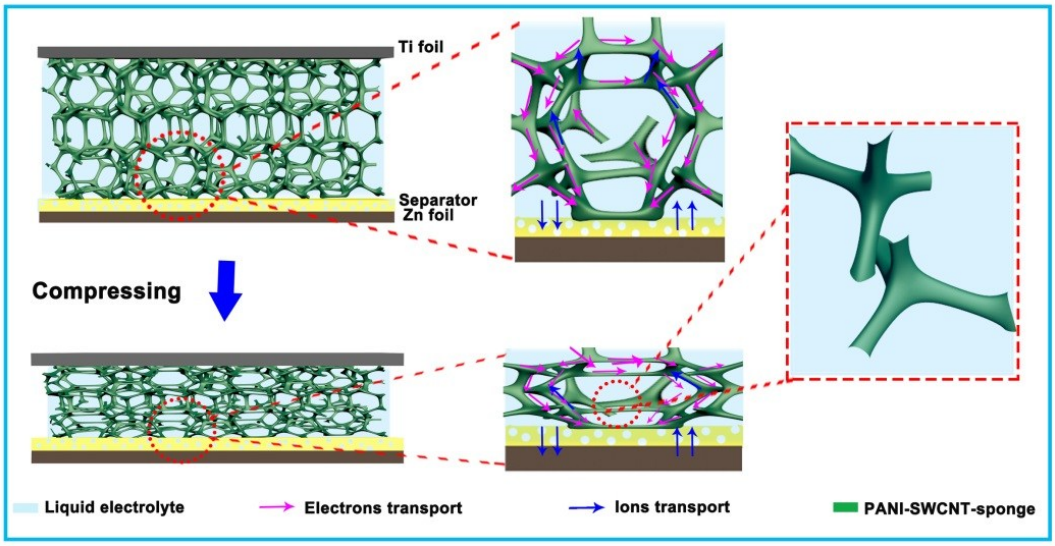

Fig. S21 The schematic illustration of the electron/ion transports in compressible ZIBs at initial and compressing states based on liquid electrolyte.

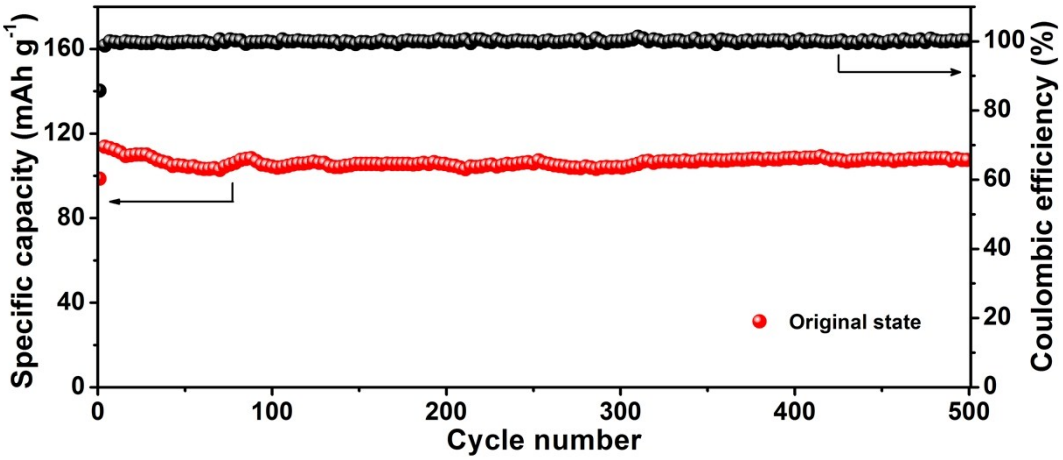

Fig. S22 Long-term cycle life of the devices at the original state at 1.0 A g^{-1}.

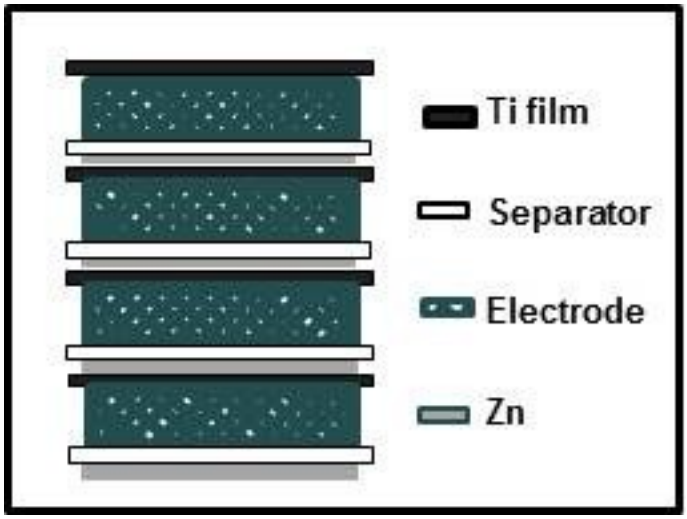

Fig. S23 Schematic diagram of the integrated compressible ZIBs.

Movie S. The compressible ZIBs powering LEDs in a real-time compressing-releasing process.