Electronic Supplementary Material (ESI) for Soft Matter.

A zinc-ion battery-type self-powered strain sensing system by using a high-performance ionic hydrogel

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Figure S1. The morphology of the PAAM/CMC/TA hydrogel at different tensile forces.

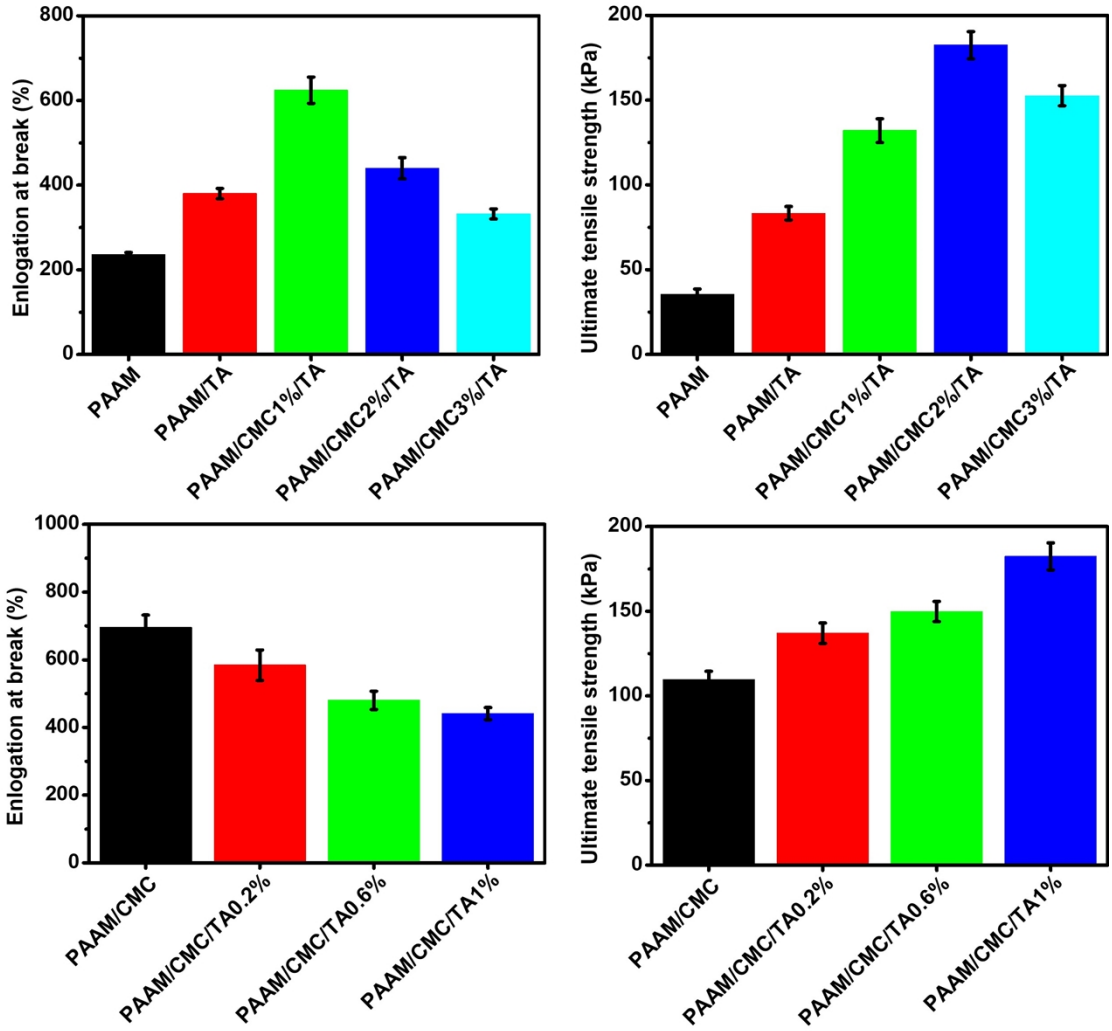
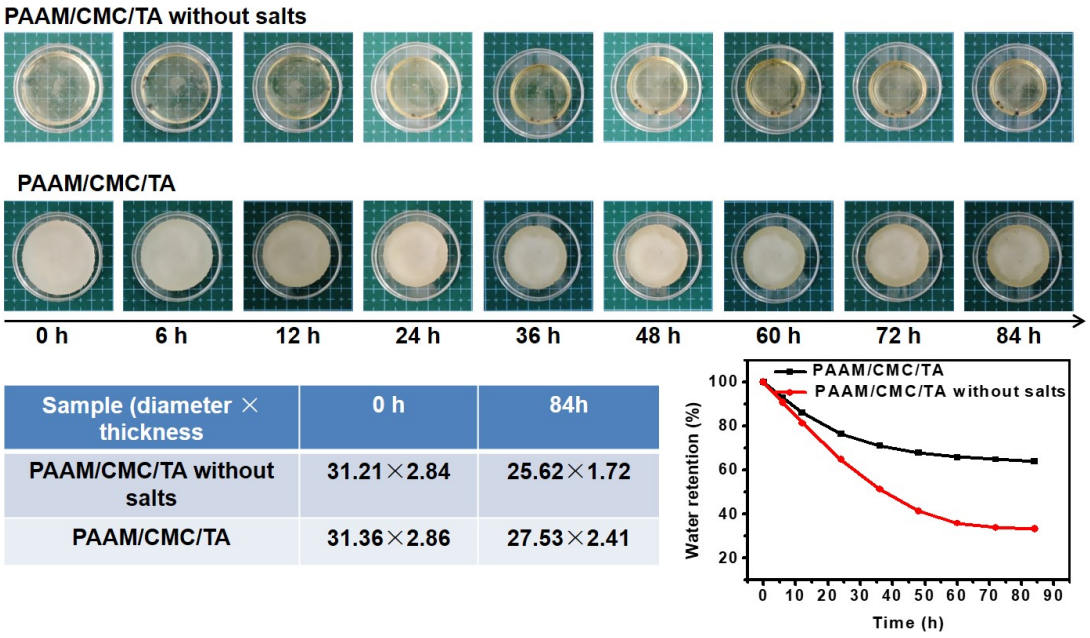


Figure S2. Elongation at break and ultimate tensile strength of the PAAM/CMC/TA hydrogel with different CMC content (a, b, TA fixed at 1%) and different TA content (c, d, CMC fixed at 2%).



Sample (diameter × thickness	0 h	84h
PAAM/CMC/TA without salts	31.21×2.84	25.62×1.72
PAAM/CMC/TA	31.36×2.86	27.53×2.41

Figure S3. The water retention during the hydrogels placed at room temperature at 50% relative humidity. The water retention was calculated by the real-time mass divided by the original mass at the beginning.

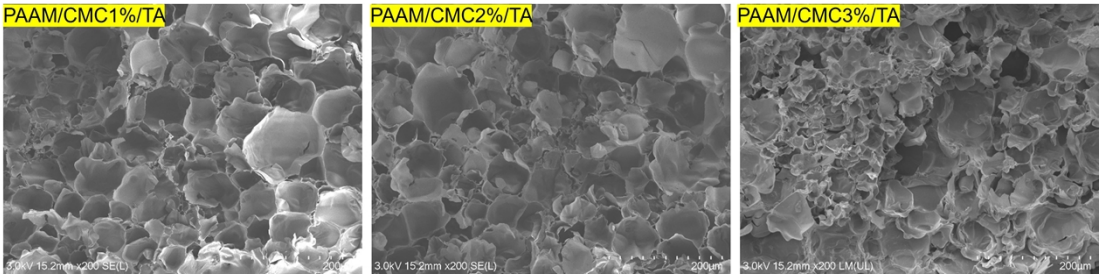


Figure S4. SEM image of PAAM/CMC/TA hydrogel with different contents of CMC (1%, 2% and 3%).

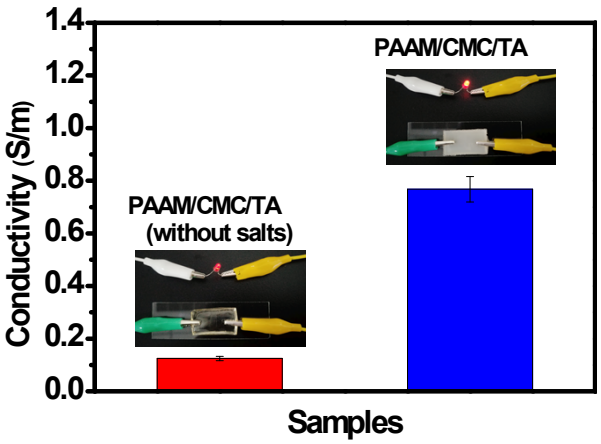


Figure S5. Conductivity of the PAAM/CMC/TA sample compared with that without salts.

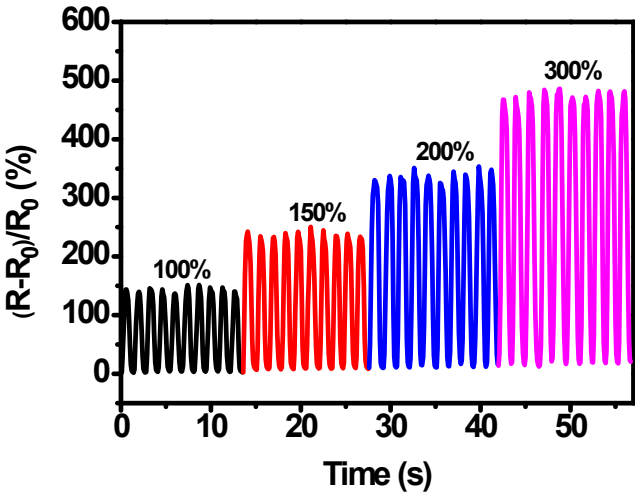


Figure S6. The $\Delta R/R_0$ of the strain sensor at 100%, 150%, 200% and 300% strains.

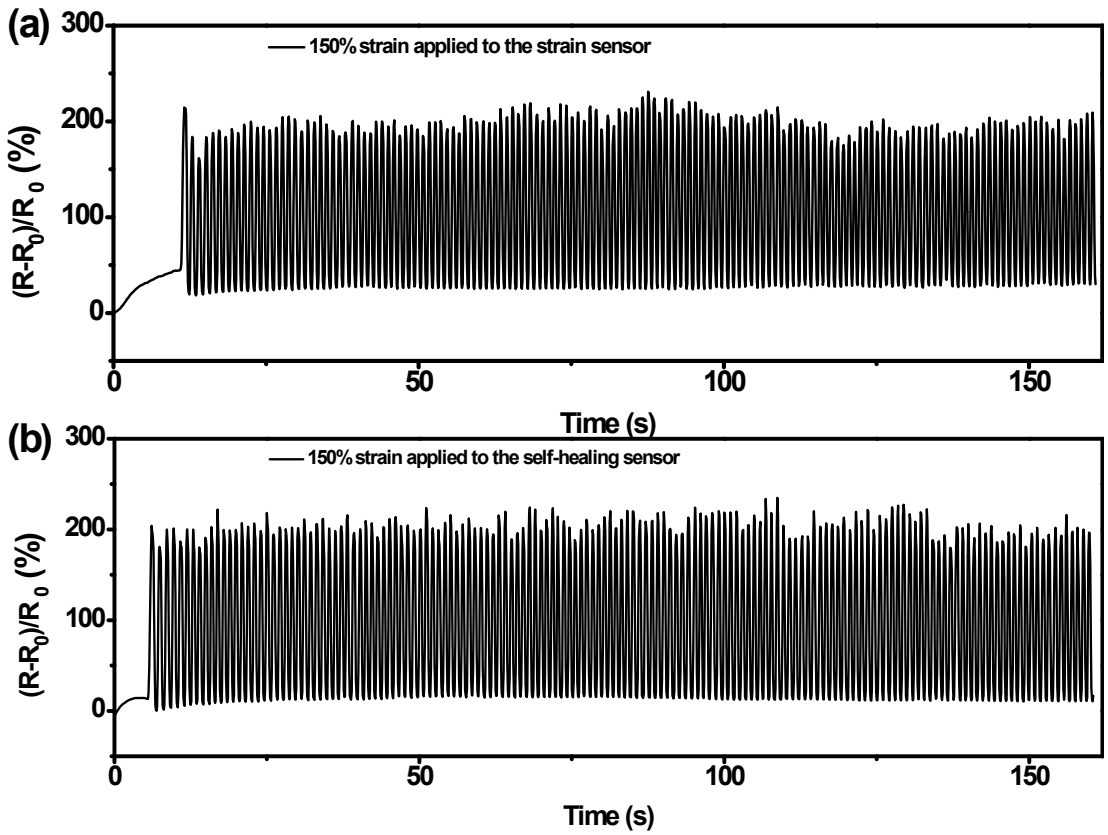


Figure S7. The detection of 150% strain by the strain sensor before and after self-healing process.

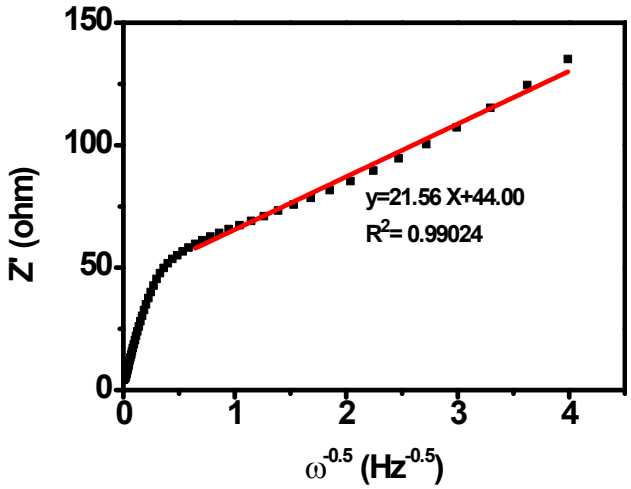


Figure S8. The calculated Warburg coefficient for the hydrogel battery.

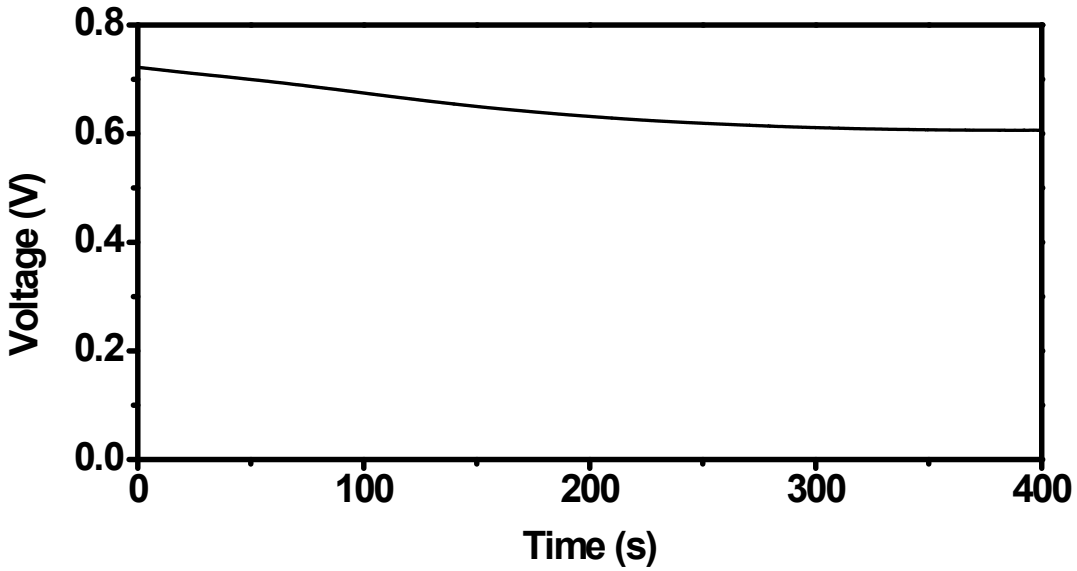


Figure S9. The output voltage signal of the self-powered sensing system when at original state.

Figure S9 shows voltage drop profile of the self-powered sensing system. After 400 seconds, the devices retained a 0.60 V output voltage for 400 seconds. When the external force was applied to the ZIB battery in this interval, the signal peaks appered on this curve, allowing for reliable practical utilization as a self-powered sensory system.