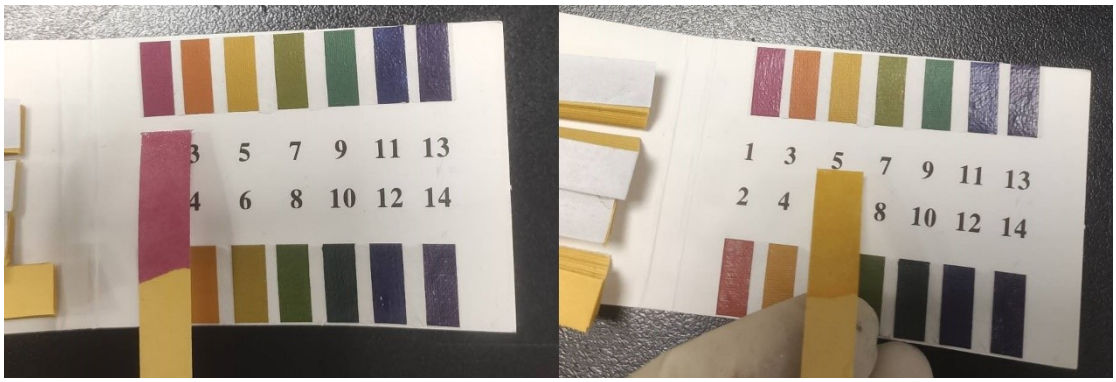


Figure S1: a)2M AMPS solution pH; b)AMPS-Zn solution pH after adding ZnO

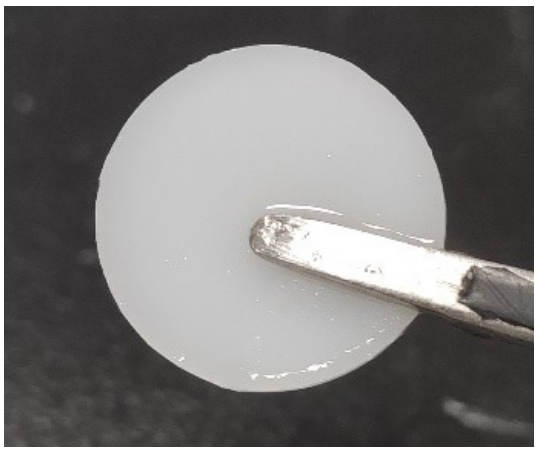


Figure S2: Optical photograph of PMZA hydrogel electrolyte

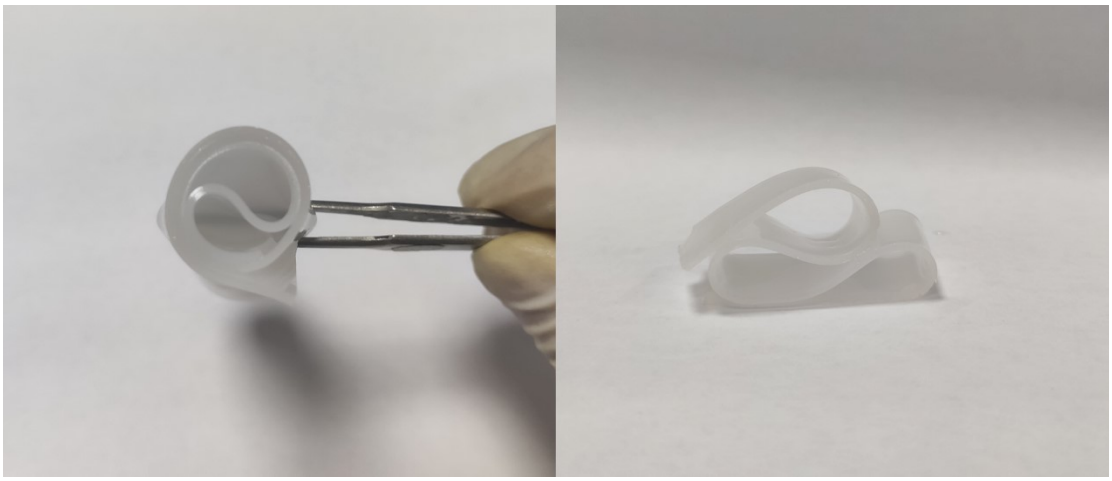


Figure S3: Mechanical properties test of PMZA hydrogel electrolyte a) curling; b) bending

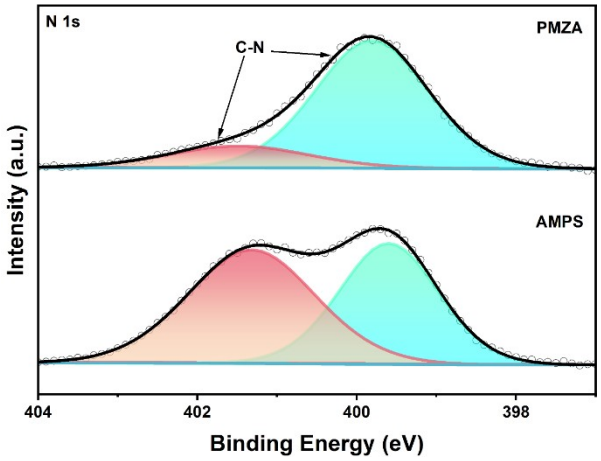


Figure S4: N 1s XPS curve of PMZA gel electrolyte

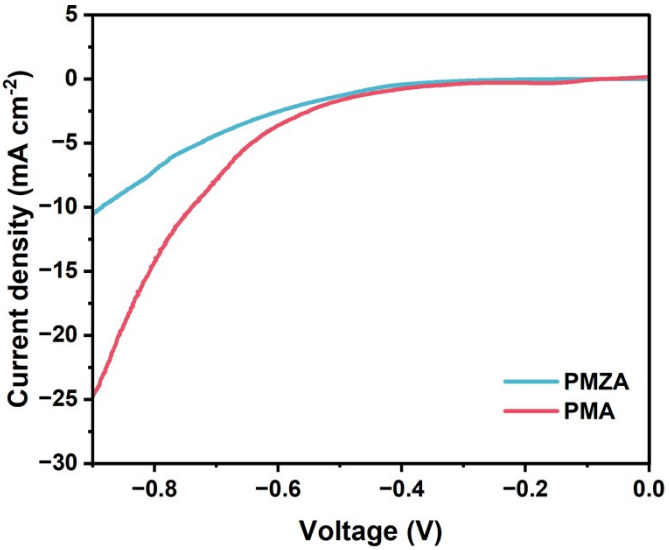
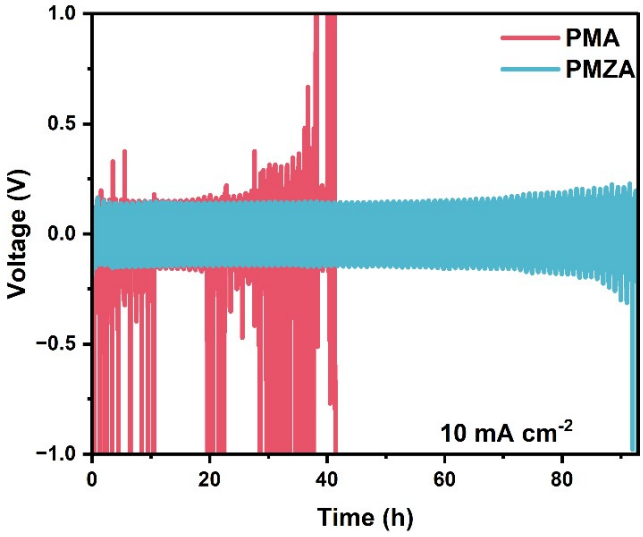
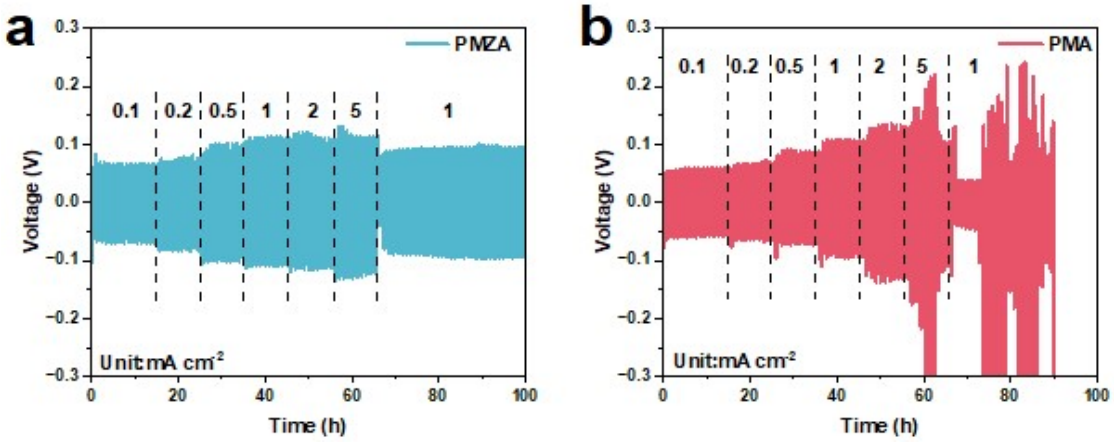


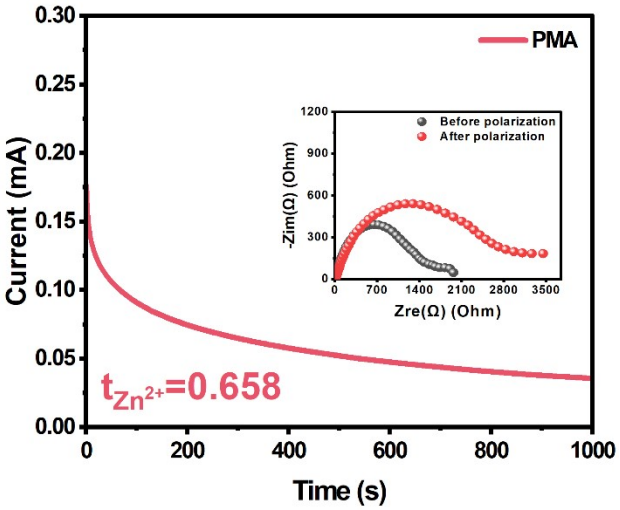
Figure S5: HER curve of PMZA hydrogel electrolyte



FigureS6:Cycling performance of PMZA and PMA hydrogel electrolytes at 10 mA cm^{-2}



FigureS7:Rate performance of a) PMZA and b) PMA hydrogel electrolytes at different current densities



FigureS8:Characterization of Zn^{2+} transfer Number in PMA Hydrogel Electrolyte

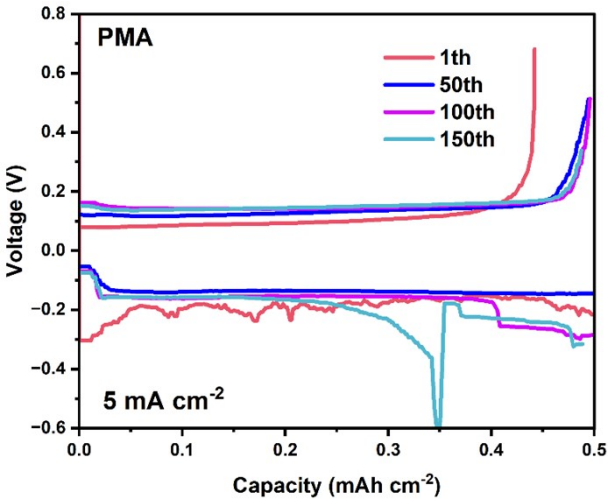


Figure S9: Galvanostatic charge-discharge (GCD) curves of Zn//Cu half-cell with PMA hydrogel electrolyte

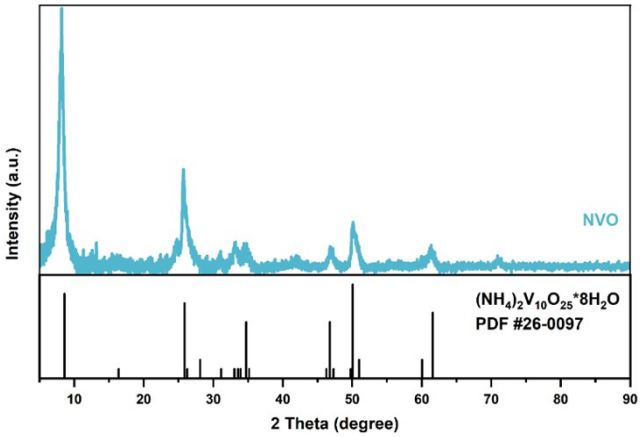


Figure S10: XRD pattern of NVO cathode material

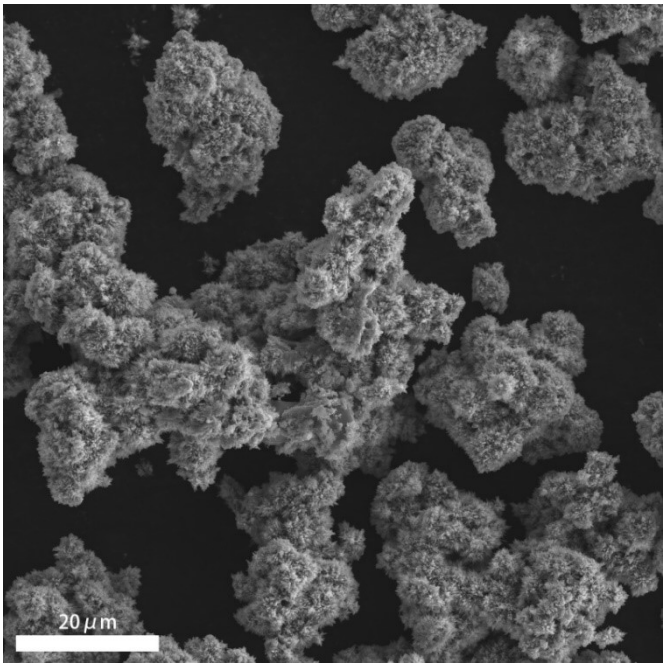


Figure S11: SEM image of NVO cathode material

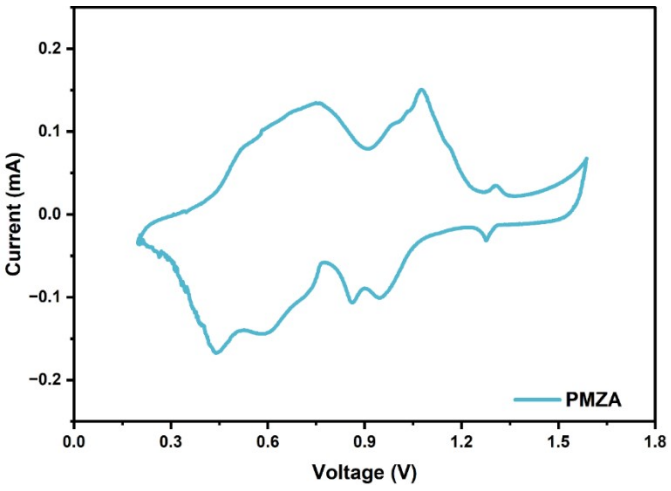


Figure S12: CV curve of PMZA hydrogel electrolyte at a scan rate of 0.1 mV s^{-1}

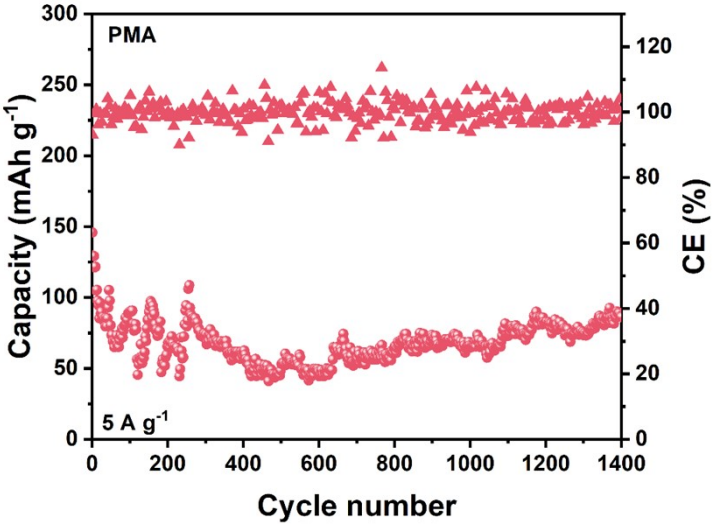


Figure S13: PMZA cycling performance at a current density of 5 A g−1

Table S1 Comparison of ion transference number and ion conductivity between PMZA gel electrolyte and reported gel electrolytes

Hydrogel electrolyte	**Zn^{2+} transference number**	**Ionic conductivity (mS cm^{-1})**	**Ref**
PMZA	71.17	0.916	This work
DCZ-gel	38.6	0.73	1
6P-PAM	17.6	0.79	2
CP/EGZn/betaine	48	0.86	3
s-PPMHE	82.65	0.82	4
PAM/SA	5.4	0.86	5
PAD@SC	43.2	0.87	6
PCZ-gel	24.6	0.72	7
CCH	9.7	0.81	8
OR-PUU	26.9	0.78	9
PM-HE	60.6	0.88	10
KevlarH	35.6	0.69	11

Table S2 Performance Comparison Between This Work and Reported Vanadium-Based Full Cells

Cathode	Current density ($A\ g^{-1}$)	Capacity retencity (%)	Cycle number	Ref
$(NH_4)_2V_{10}O_{25}•8H_2O$	5	100	7000	This Work
V_2O_5	5	61.7	4000	12
$Na_2V_6O_{16}•1.63H_2O$	5	83.6	2400	13
V_2O_5	2	75.2	1000	14
$Na_2V_6O_{16}•xH_2O$	3	96.3	500	15
$NH_4V_4O_{10}$	5	82.8	2000	16
$(NH_4)_2V_{10}O_{25}•8H_2O$	5	92.1	4000	17
$NH_4V_4O_{10}$	3	80	1000	18
$NH_4V_4O_{10}$	2	89.8	1200	19
V_2O_5	3	90.9	2000	20
V_2O_5	1	92	3000	21
$NH_4V_4O_{10}$	1	84.6	600	22

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