Supporting Information

Inverse-spinel Mg_2MnO_4 cathode for high-performance and flexible aqueous zinc-ion battery

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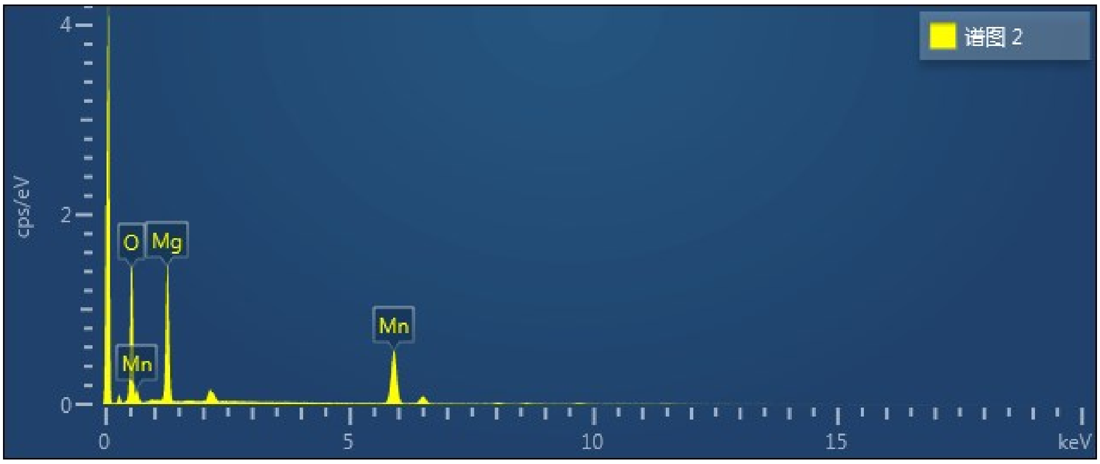

Figure S1. The SEM-EDS of as-synthesized Mg_2MnO_4 sample.

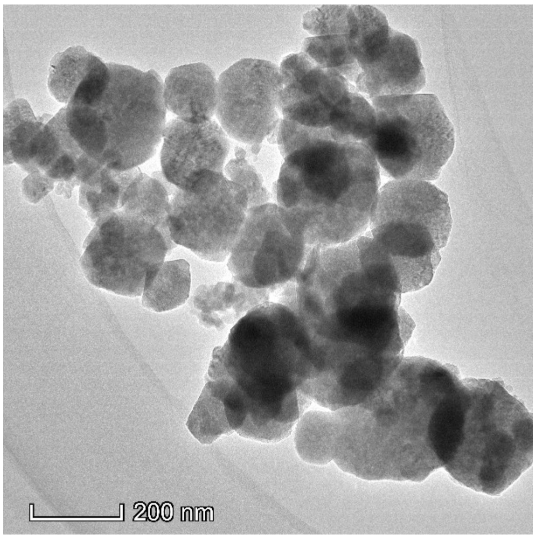

Figure S2. HRTEM image of the as-obtained Mg_2MnO_4 sample.

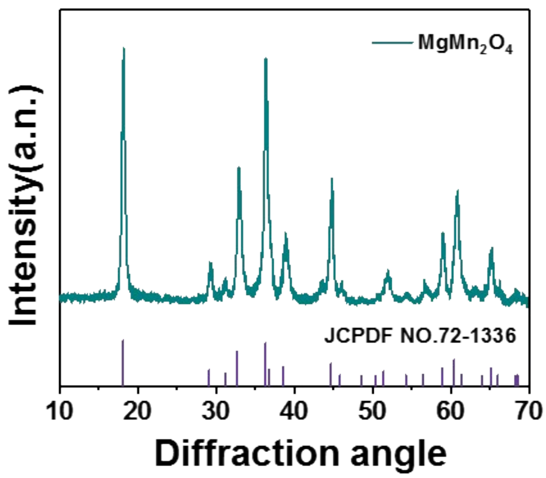

Figure S3. XRD pattern of the as-obtained $MgMn_2O_4$ sample.

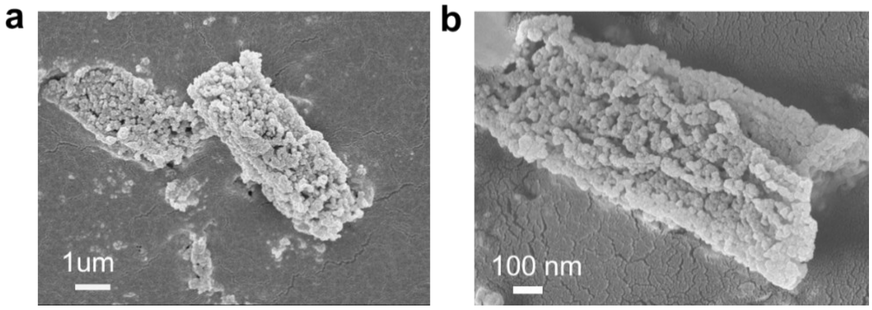

Figure S4. SEM images of the as-obtained $MgMn_2O_4$.

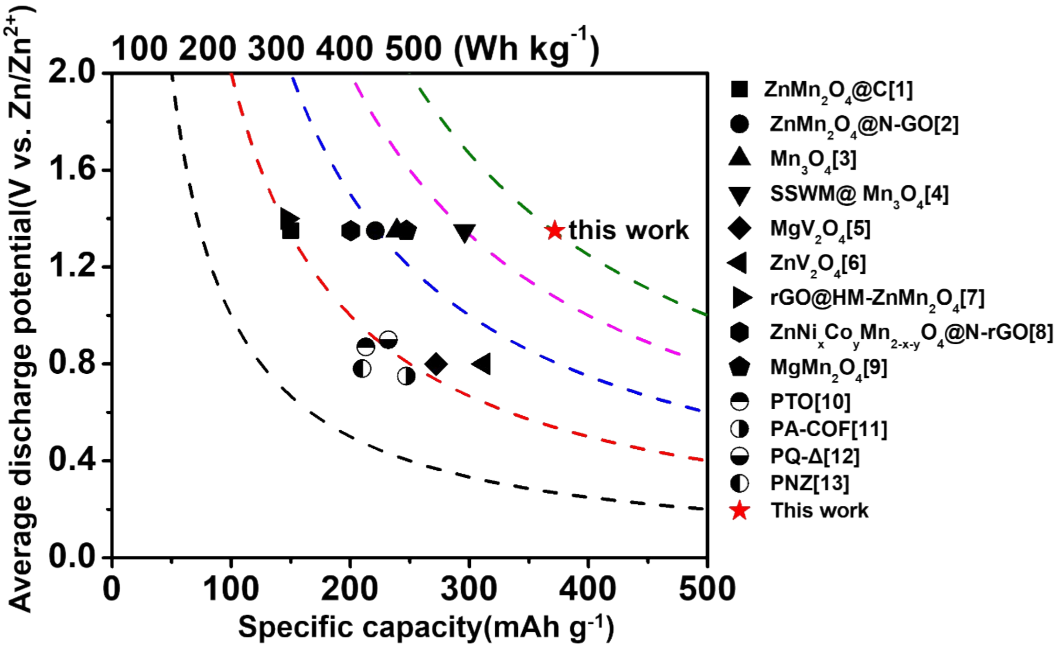

Figure S5. A comparison of average discharge potential, specific capacity and energy density between this work and reported materials.

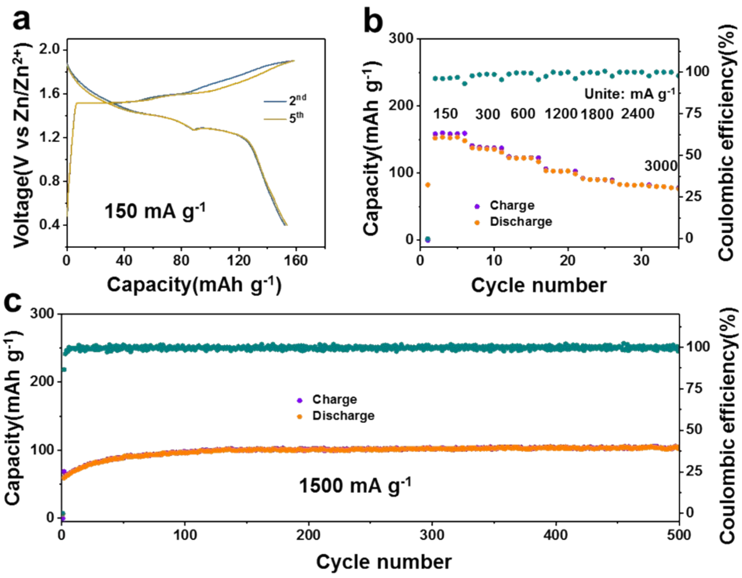

Figure S6. a) The charge-discharge curves of Zn//$MgMn_2O_4$ battery. b) Rate capacity of Zn//$MgMn_2O_4$ battery. c) Cycling stability of Zn//$MgMn_2O_4$ battery.

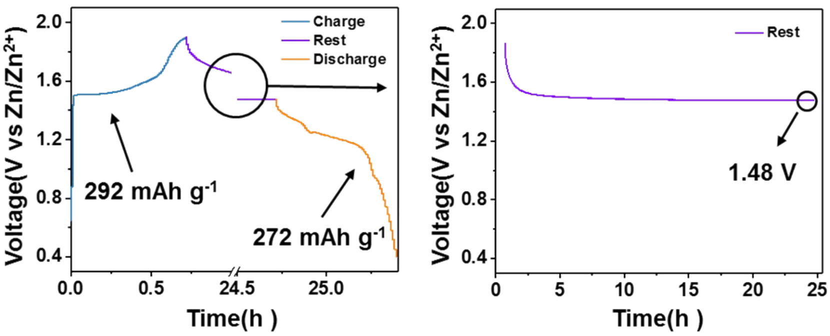

Figure S7. Electrochemical stability of the full battery surveyed by self-discharge experiments. Specifically, the full battery was fully charged to 1.9 V, then fully discharged to 0.4 V after rest for 24 h.

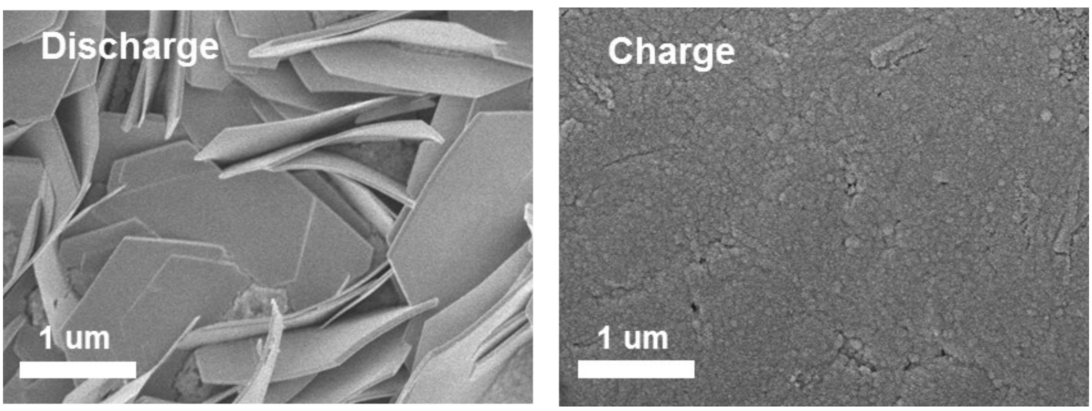

Figure S8. a~b) The ex-situ SEM patterns of Mg_2MnO_4 electrodes. a) Discharge to 0.4 V; b) Charge to 1.9 V.

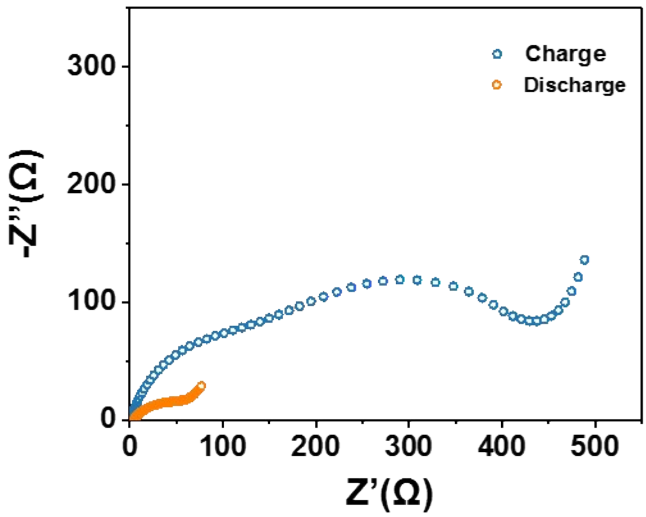

Figure S9. Typical Nyquist plots for Zn//Mg_2MnO_4 battery at different state.

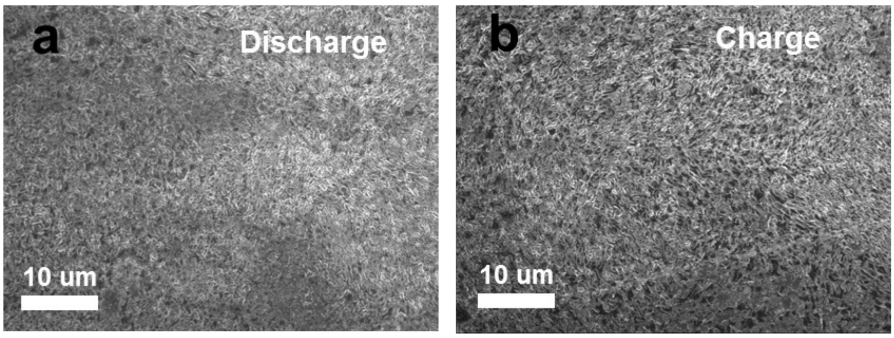

Figure S10. a~b) The ex-situ SEM patterns of Zn anode. a) Discharge to 0.4 V; b) Charge to 1.9 V.

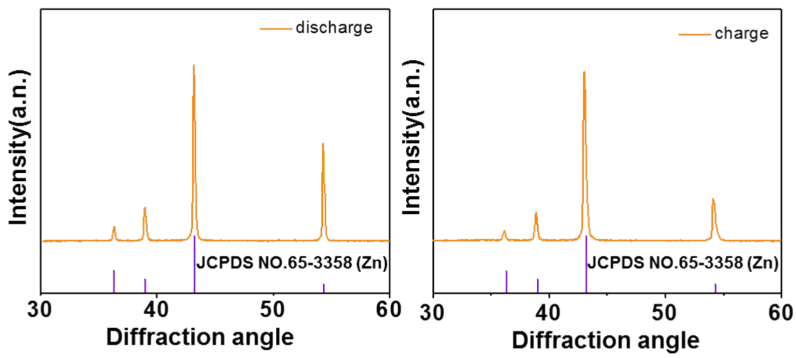

Figure S11. a~b) The ex-situ XRD patterns of Zn anode. a) Discharge to 0.4 V; b) Charge to 1.9 V.

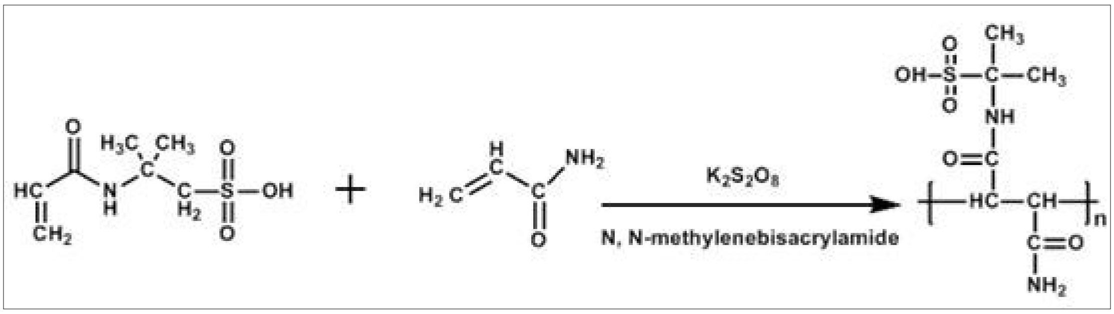

Figure S12. The structural formula for the polymerization.

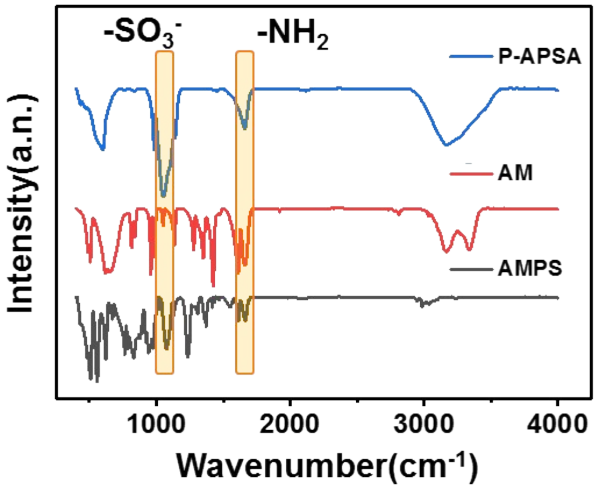

Figure S13. The ATR-FTIR spectra of AM, AMPS, and P-APSA sample.

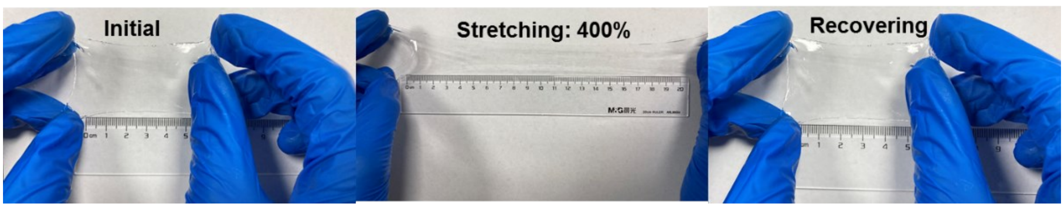

Figure S14. The stretching test of P-APSA sample.

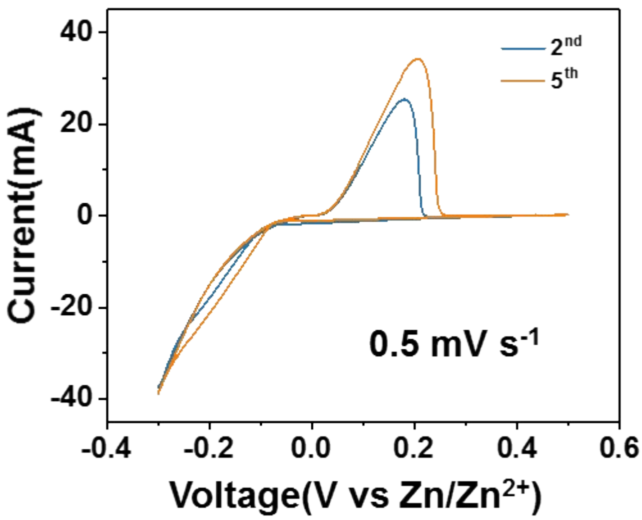

Figure S15. Reversible Zn^{2+} plating/stripping behaviour on SS

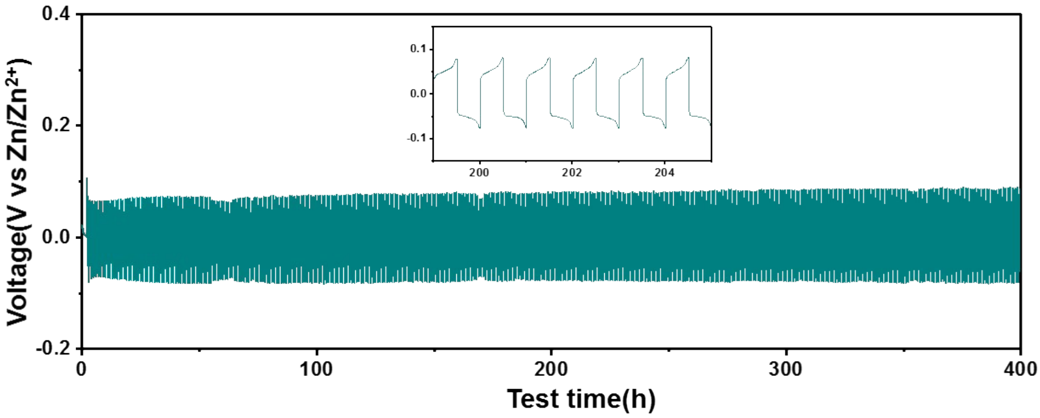

Figure S16. Cycling stability of Zn//P-APSA//Zn symmetric cell.

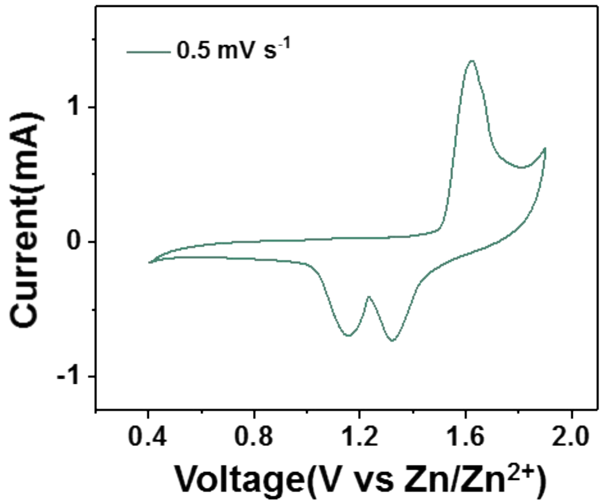

Figure S17. The CV curves of Zn//P-APSA//Mg_2MnO_4 battery.

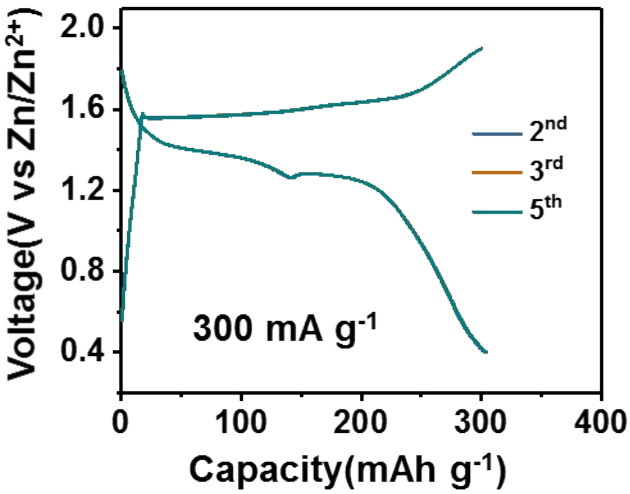

Figure S18. The charge-discharge curves of Zn//P-APSA//Mg_2MnO_4 battery.

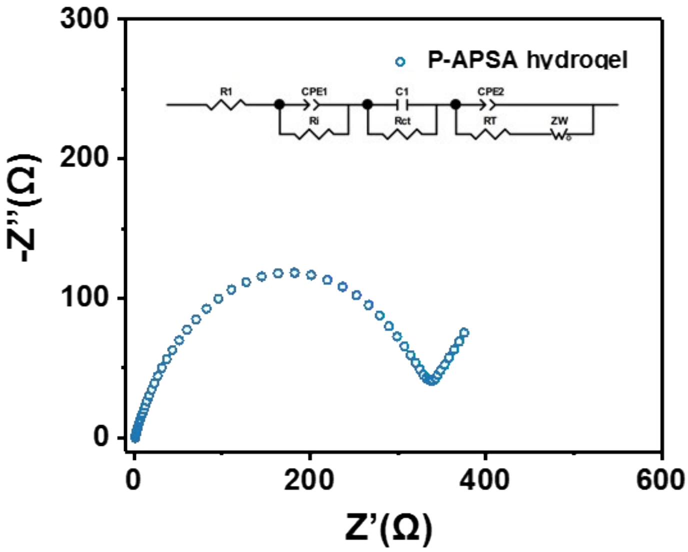

Figure S19. Typical Nyquist plots for Zn//P-APSA//Mg_2MnO_4 battery.

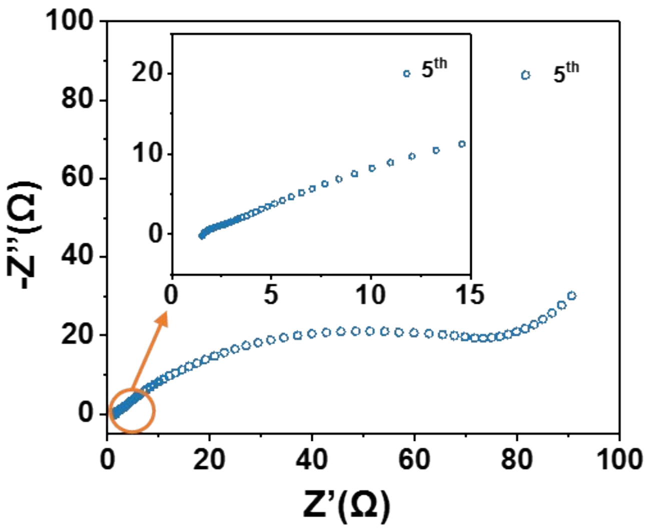

Figure S20. Typical Nyquist plots for Zn//P-APSA//Mg_2MnO_4 battery after five cycles.

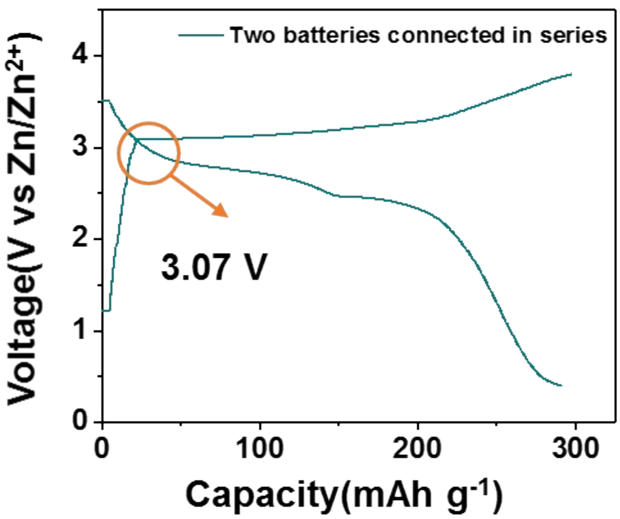

Figure S21. The charge-discharge curve of two batteries connected in series.

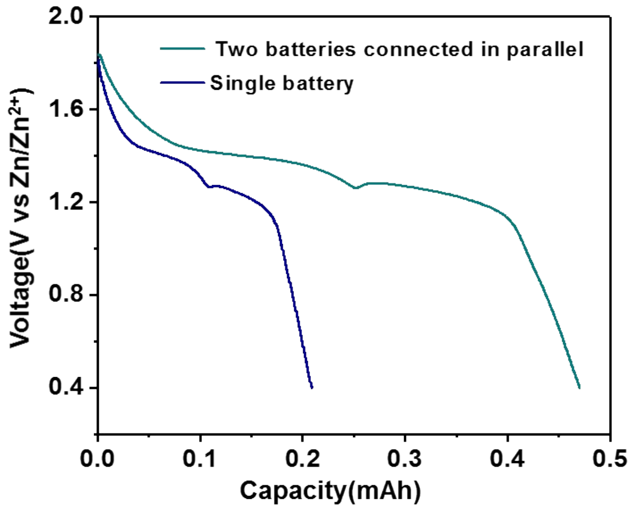

Figure S22. The discharge curves of single battery and two batteries connected in parallel.

Table S1 The SEM-EDS of as-synthesis Mg_2MnO_4 sample.

Technology		SEM-EDS		ICP-OES
Element	wt%	wt% sigma	Atom%	wt%
O	36.77	0.29	55.06	
Mg	31.62	0.25	31.16	35.907%
Mn	31.61	0.27	13.78	36.105%
Mole ration of Mn:Mg		0.442:1		0.445:1

Table S2 A comparison of electrochemical performance between this work and reported materials.

Electrode	Electrolyte	Specific capacity	Cycling stability	Ref
$ZnMn_2O_4$@C	3 M $Zn(CF_3SO_3)_2$	150 mAh g^{-1} at 50 mA g^{-1}	94% after 500 at 500 cycles mA g^{-1}	1
$ZnMn_2O_4$@ N-GO	1M $ZnSO_4$+ 0.05M $MnSO_4$	221 mAh g^{-1} at 100 mA g^{-1}	97.4% after 2500 cycles at 1000 mA g^{-1}	2
Mn_3O_4	2 M $ZnSO_4$	239.2 mAh g^{-1} at 100 mA g^{-1}	72.2% after 300 cycles at 500 mA g^{-1}	3
SSWM@ Mn_3O_4	2 M $ZnSO_4$+ 0.1 M $MnSO_4$	296 mAh g^{-1} at 100 mA g^{-1}	60% after 500 cycles at 500 mA g^{-1}	4
MgV_2O_4	2 M $Zn(TFSI)_2$	272 mAh g^{-1} at 200 mA g^{-1}	74% after 500 cycles at 4000 mA g^{-1}	5
ZnV_2O_4	2 M $Zn(ClO_4)_2$	312 mAh g^{-1} at 0.5 C	82% after 1000 cycles at 10C	6
rGO@HM-$ZnMn_2O_4$	1M $ZnSO_4$+0.05M $MnSO_4$	146.9 mAh g^{-1} at 300 mA g^{-1}	88% after 650 cycles at 1000 mA g^{-1}	7
$ZnNi_xCo_yMn_{2-x-y}O_4$@N-rGO	2M $ZnSO_4$+ 0.2M $MnSO_4$	200.5 mAh g^{-1} at 10 mA g^{-1}	79% after 900 cycles at 1000 mA g^{-1}	8
$MgMn_2O_4$	1M $ZnSO_4$ + 1M $MgSO_4$ + 0.1 M $MnSO_4$	247 mAh g^{-1} at 50 mA g^{-1}	80% after 500 cycles at 500 mA g^{-1}	9
Mg_2MnO_4	2M $ZnSO_4$+ 0.1M $MnSO_4$	371.7 mAh g^{-1} at 150 mA g^{-1}	85% after 2000 cycles at 3000 mA g^{-1} (compared to the discharge capacity after activation)	This work

Reference:

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