Supplementary information

Alleviated Mn^{2+} dissolution drives long-term cycling stability in ultrafine Mn_3O_4/PPy core-shell nanodots for zinc-ion battery

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Fig. S1-Fig. S13

Table S1

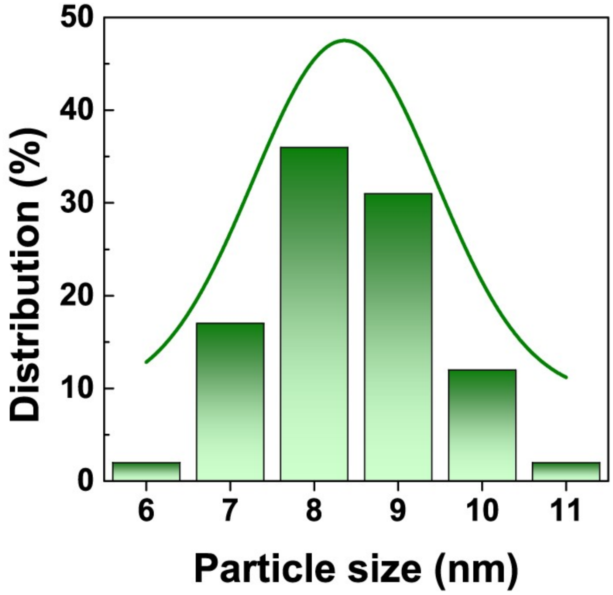


Fig. S1 Size distribution of the as-prepared Mn_3O_4/PPy nanodots.

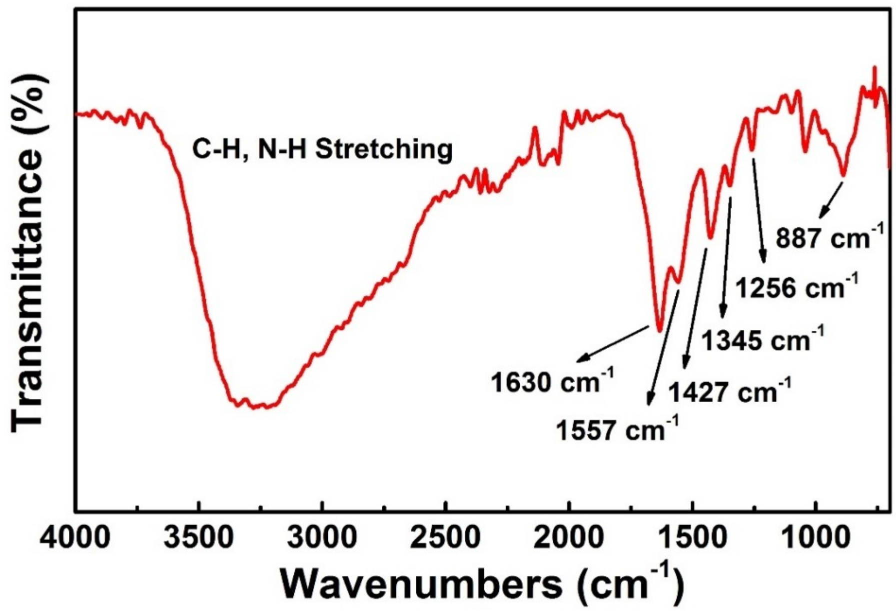


Fig. S2 High-resolution FTIR spectrum (4000 − 700 cm^{-1}) of Mn_3O_4/PPy nanodots.

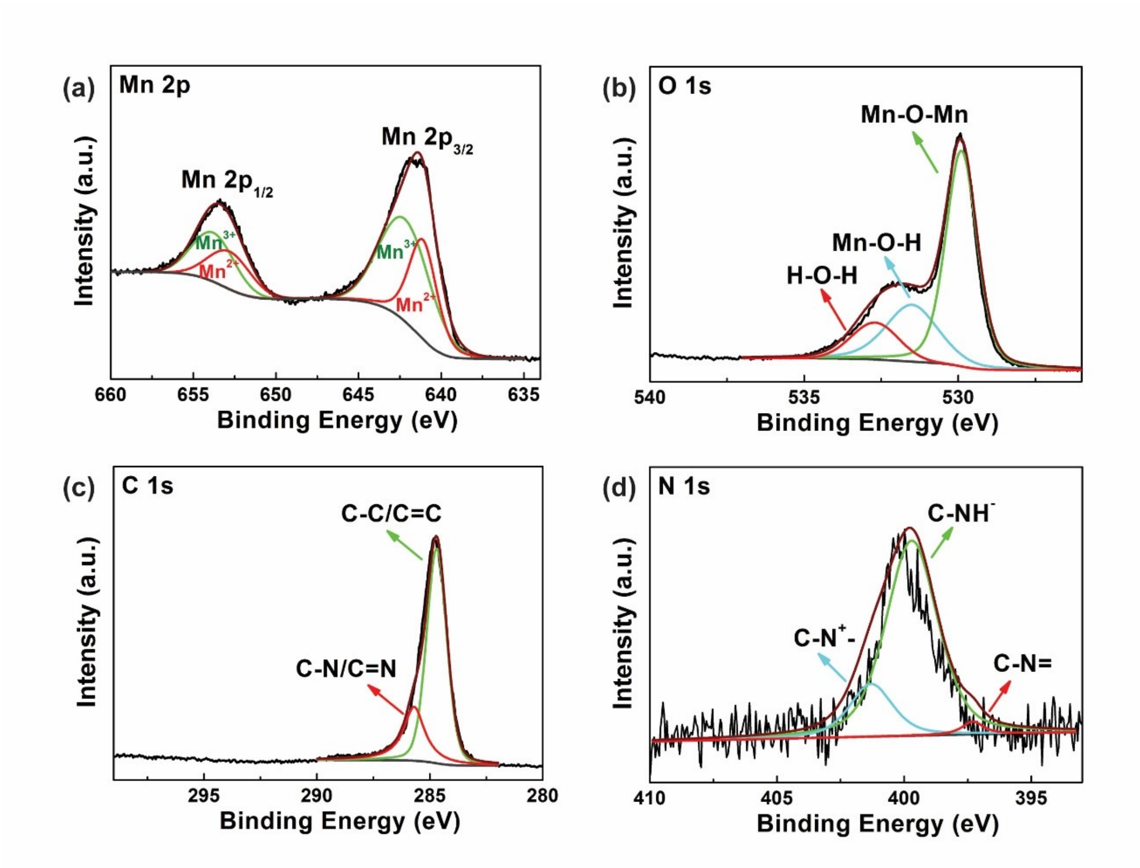


Fig. S3 X-ray photoelectron spectroscopy (XPS) spectra of (a) Mn 2p, (b) O 1s, (c) C 1s, and (d) N 1s for Mn_3O_4/PPy nanodots.

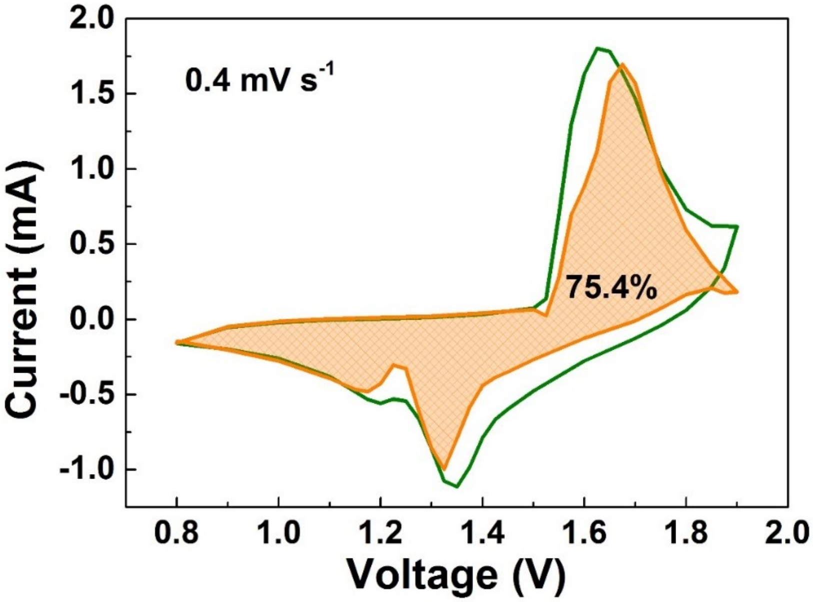


Fig. S4 Capacitive contribution (shaded) to the total Zn^{2+} storage capacity at the scan rate of 0.4 mV s^{-1} of the Mn_3O_4/PPy nanodots.

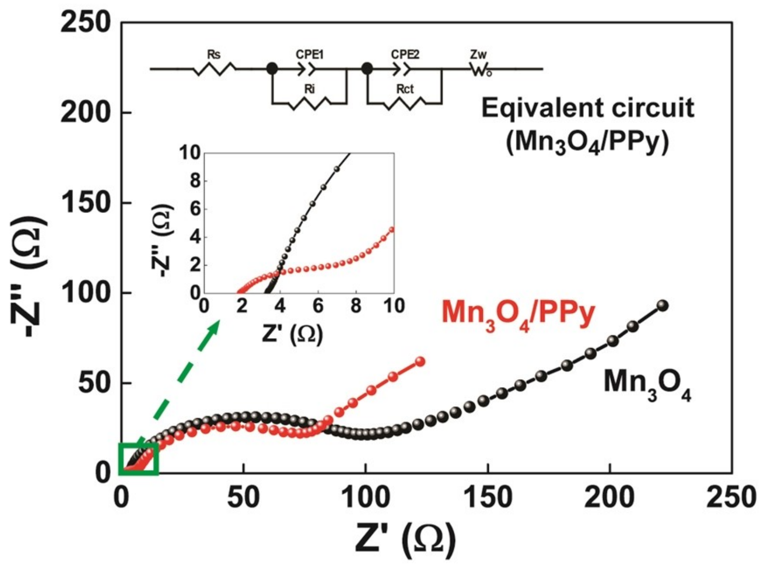


Fig. S5 Nyquist plots of both cathodes before cycling and the corresponding fitting equivalent circuit of Mn_3O_4/PPy cathode (inset).

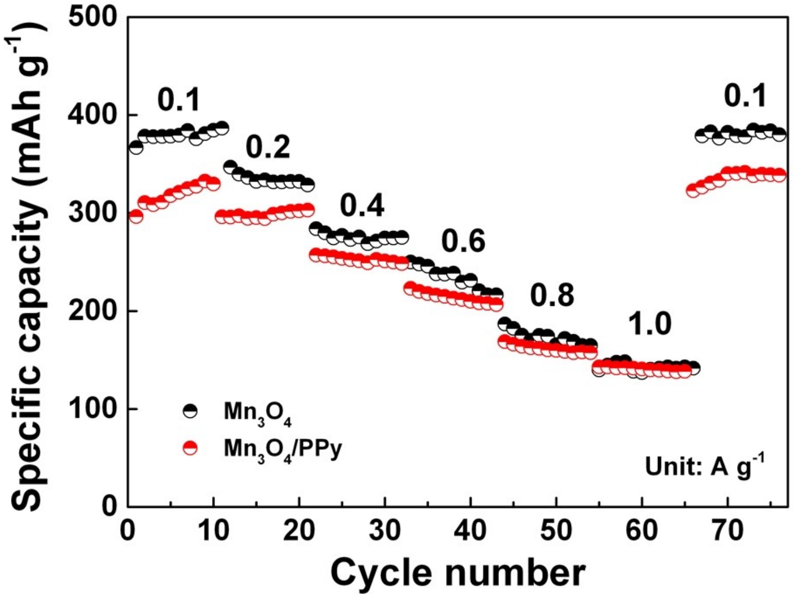


Fig. S6 Rate performance of the Zn-Mn_3O_4 and Zn-Mn_3O_4/PPy batteries.

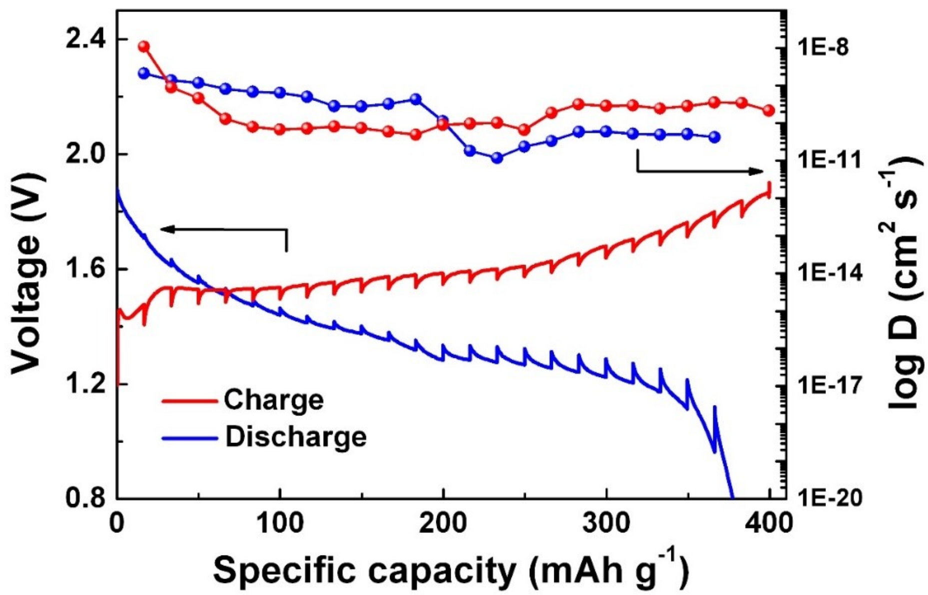


Fig. S7 GITT profiles and the corresponding calculated ion diffusion coefficient of the Mn_3O_4/PPy nanodot battery during charge and discharge process.

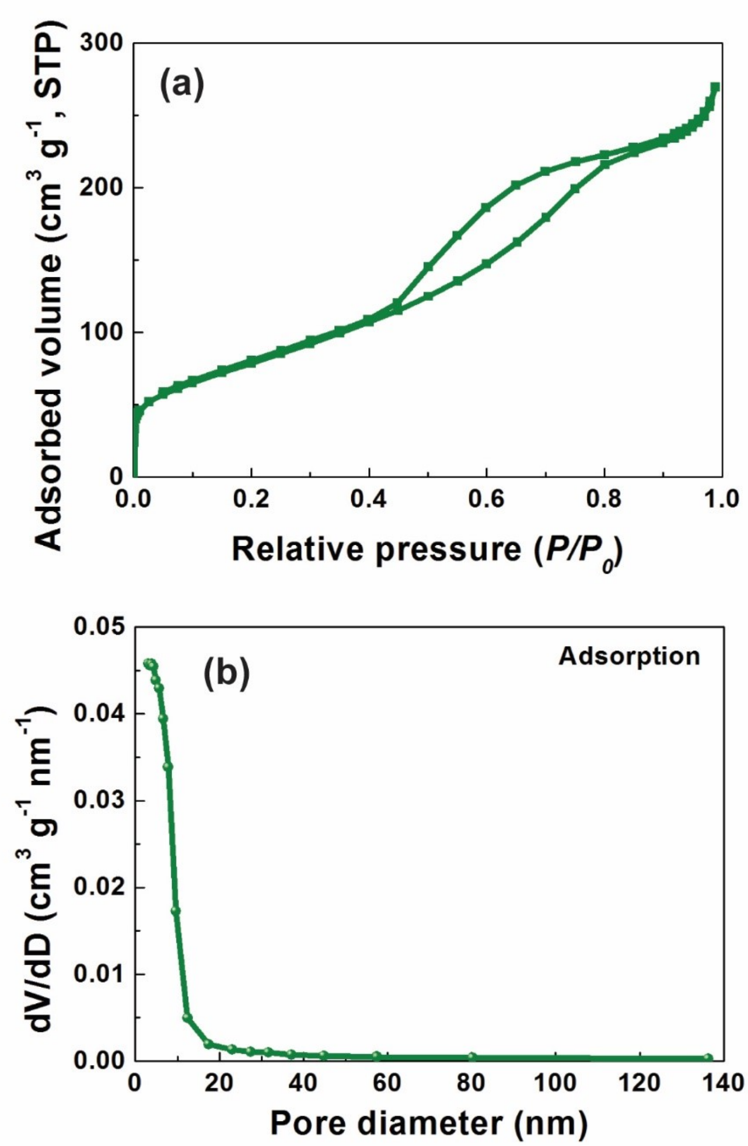


Fig. S8 (a) N_2 isothermal adsorption curve and (b) the corresponding pore size distribution curve of Mn_3O_4/PPy nanodots.

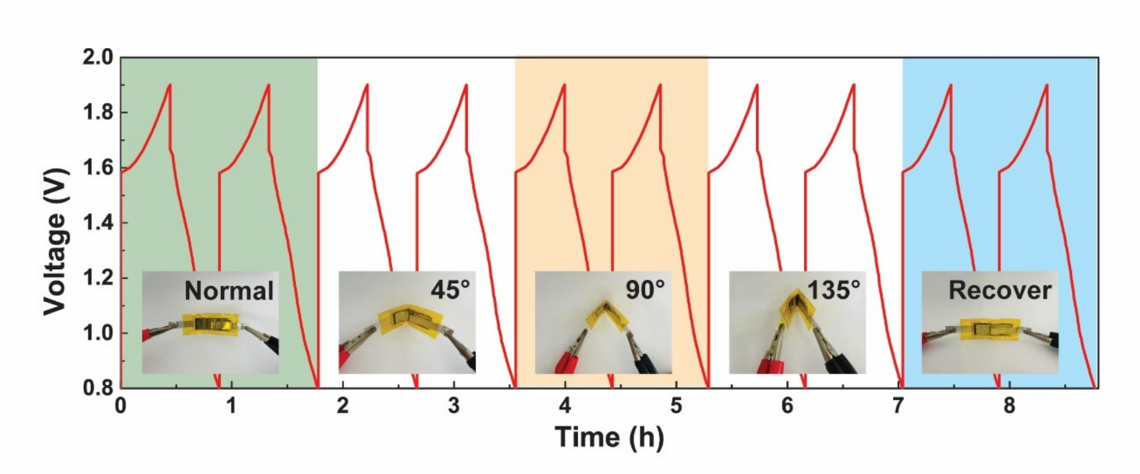


Fig. S9 Charge/discharge curves (voltage *versus* time) of a single flexible Zn-Mn_3O_4/PPy battery at different bending angles.

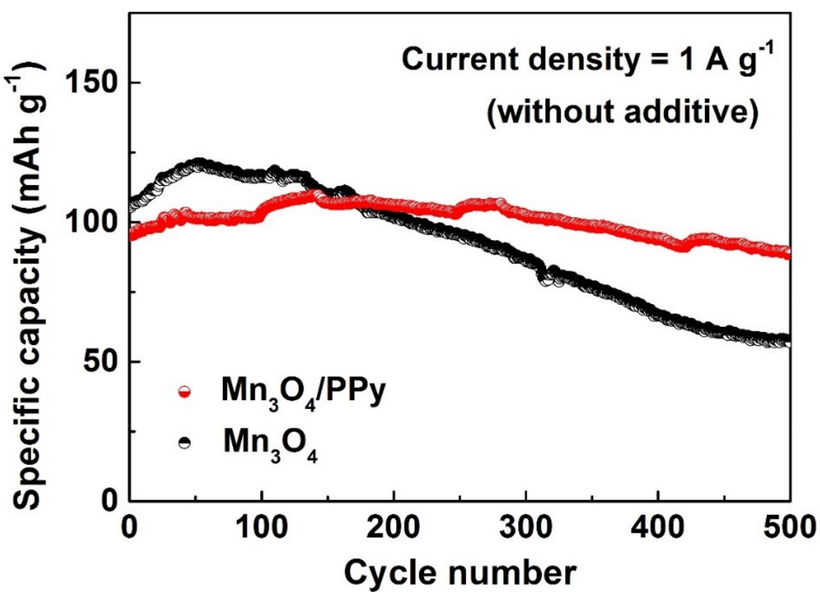
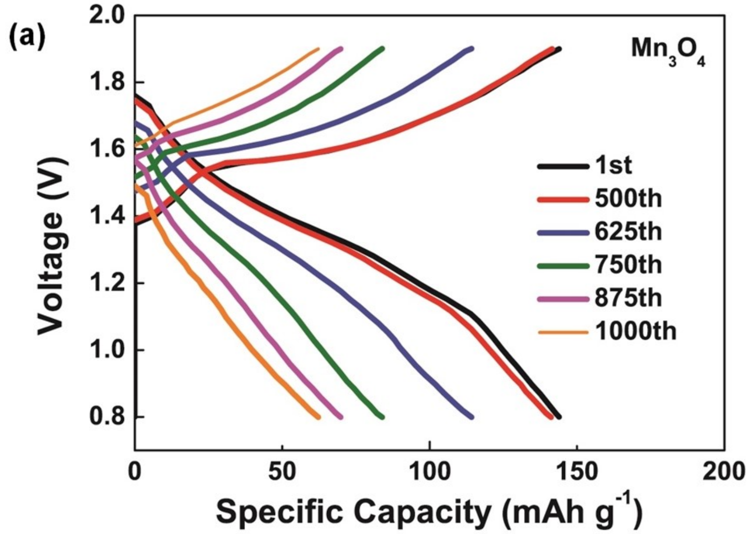


Fig. S10 Cycling performance of Mn_3O_4 and Mn_3O_4/PPy in electrolyte without $MnSO_4$ additive at 1.0 A g^{-1} for 500 cycles.



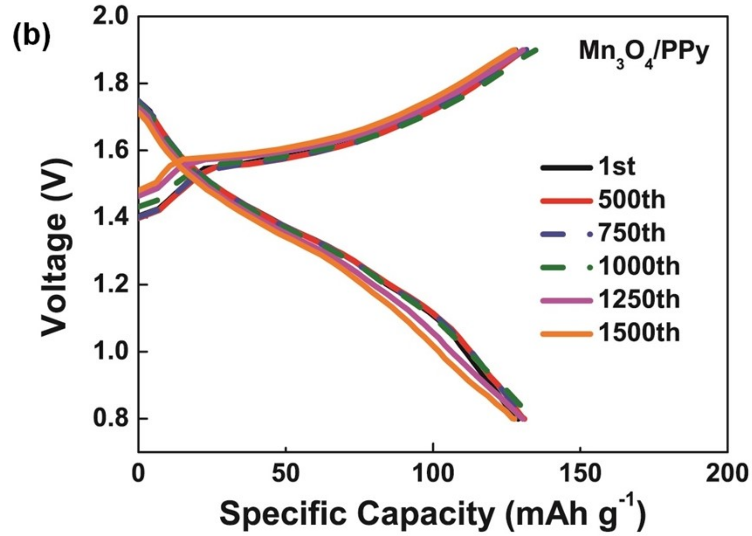


Fig. S11 Charge/discharge profiles of (a) Mn_3O_4 and (b) Mn_3O_4/PPy at different cycling times at 1.0 A g^{-1}.

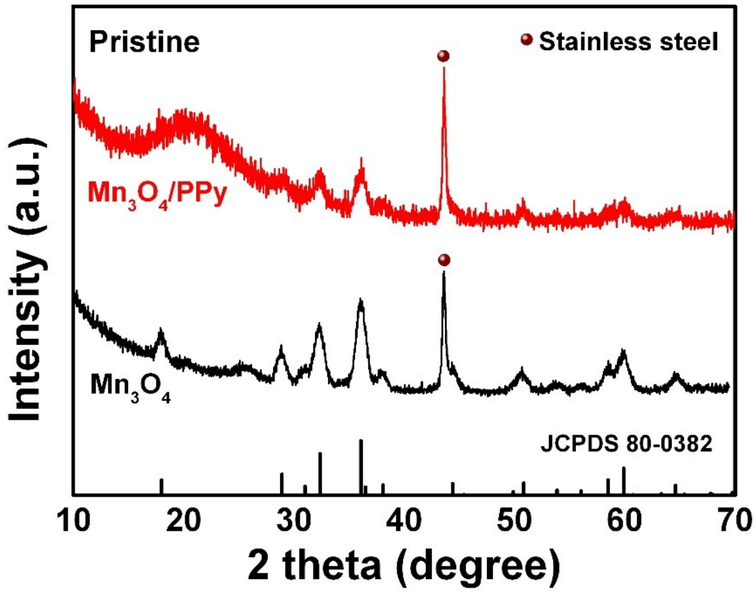


Fig. S12 *Ex situ* XRD patterns of Mn_3O_4 nanodot and Mn_3O_4/PPy composite cathode before cycle.

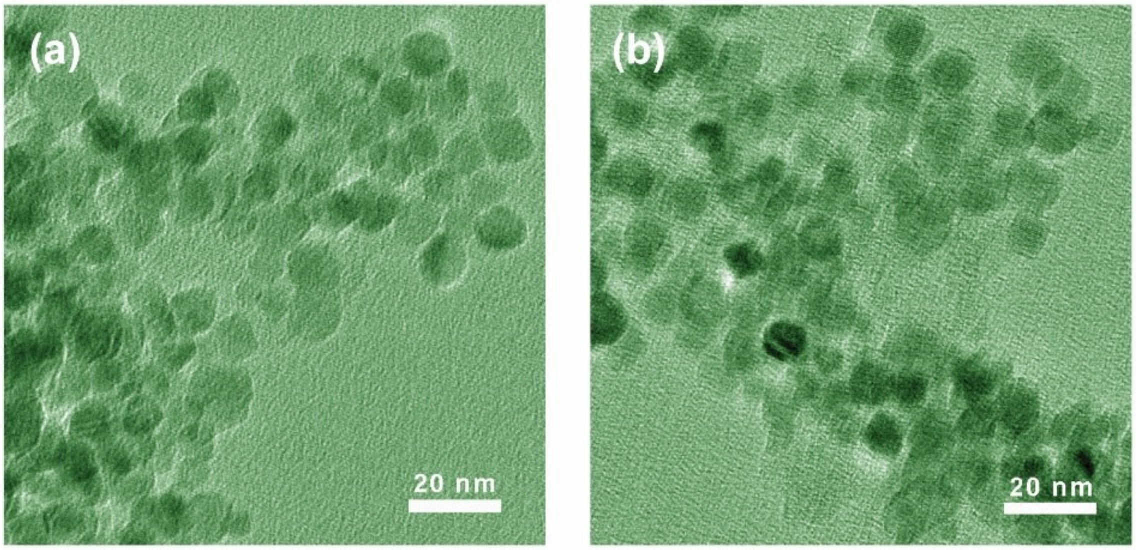


Fig. S13 Low magnified TEM images of (a) Mn_3O_4/PPy-lp and (b) Mn_3O_4/PPy-mp core-shell nanodots, respectively.

Table S1. The comparison for electrochemical performance of various Mn_3O_4-related cathode materials in ZIBs.

Cathode	Specific capacity at 0.1 A g^{-1}	Cycling performance	Ref#
Mn_3O_4/PPy	332.5 mA h g^{-1}	92.5% after 1500 cycles at 1.0 A g^{-1}	This work.
Mn_3O_4@C	323.2 mA h g^{-1}	77% after 200 cycles at 0.5 A g^{-1}	1
Mn_3O_4 (50~100 nm)	239.2 mA h g^{-1}	~70% after 300 cycles at 0.5 A g^{-1}	2
Mn_3O_4 nanoflower	296 mA h g^{-1}	~67% after 500 cycles at 0.5 A g^{-1}	3
Ball-milled Mn_3O_4	221 mA h g^{-1}	~80% after 500 cycles at 0.5 A g^{-1}	4
Mn_3O_4 nanodots	386.7 mA h g^{-1}	~85% after 500 cycles at 0.5 A g^{-1}	5
MCM4@ Mn_3O_4	~300 mA h g^{-1}	~85% after 1000 cycles at 0.6 A g^{-1}	6
Mn_3O_4@NC	280 mA h g^{-1}	~75% after 500 cycles at 1.0 A g^{-1}	7
Mn_3O_4/GO	215.6 mA h g^{-1}	~75% after 500 cycles at 1.0 A g^{-1}	8

Note and references

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