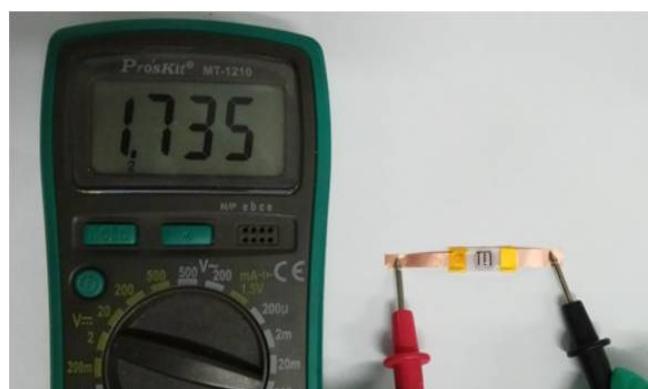


## Electronic Supplementary Information (ESI)

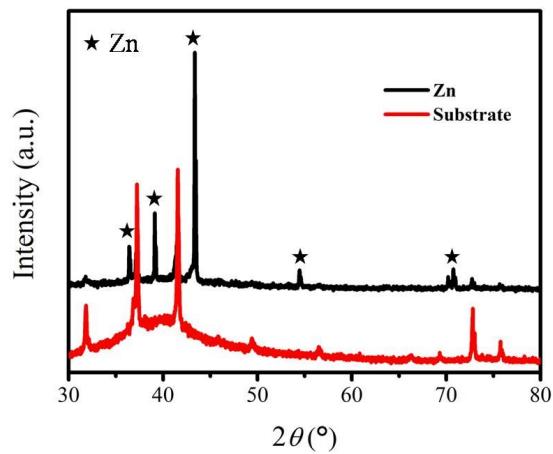
### Aqueous Zn-MnO<sub>2</sub> rechargeable microbattery

Guoqiang Sun, Xuting Jin, Hongsheng Yang, Jian Gao and Liangti Qu\*

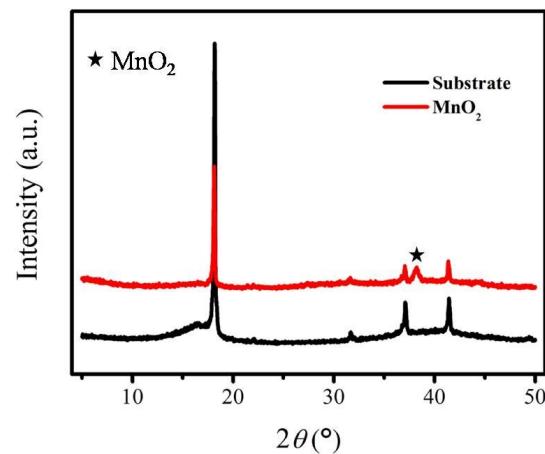
*Key Laboratory of Photoelectronic/Electrophotonic Conversion Materials, Key Laboratory of Cluster Science, Ministry of Education of China, School of Chemistry, Beijing Institute of Technology, Beijing 100081, P. R. China. E-mail: [lqu@bit.edu.cn](mailto:lqu@bit.edu.cn)*



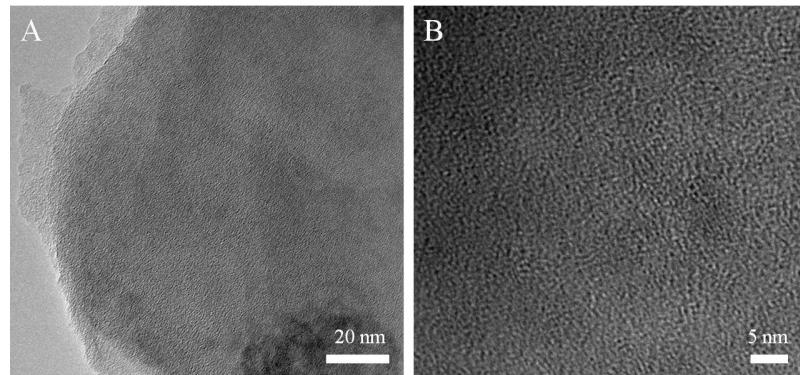
**Fig. S1.** The open circuit voltage of the microdevice.



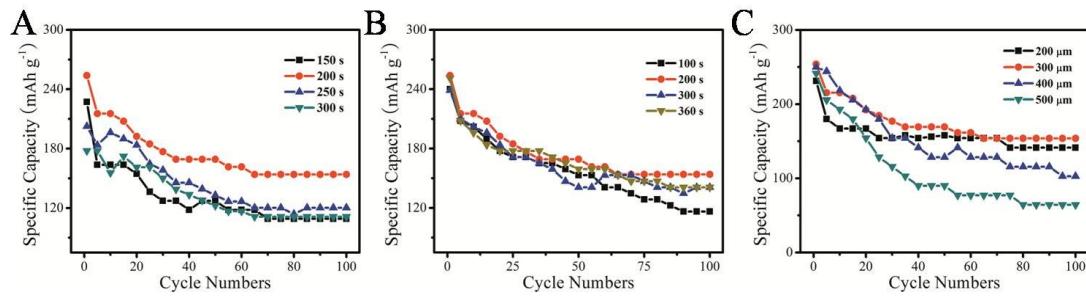
**Fig. S2.** XRD patterns of the substrate before and after modified with Zn anode.



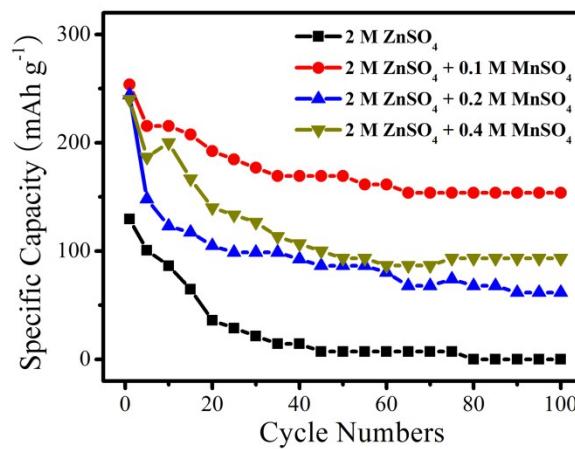
**Fig. S3.** XRD patterns of the substrate before and after modified with MnO<sub>2</sub> cathode.



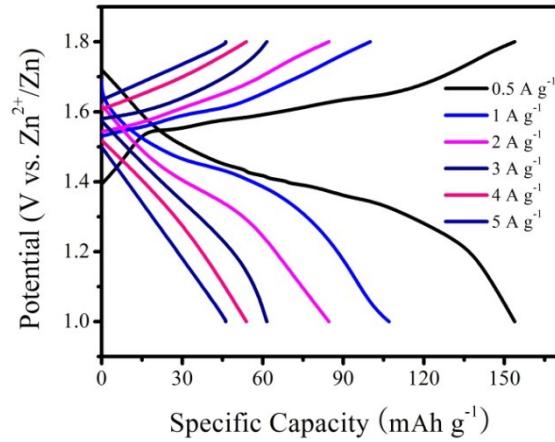
**Fig. S4.** TEM and high-resolution TEM images of as-synthesized  $\text{MnO}_2$ .



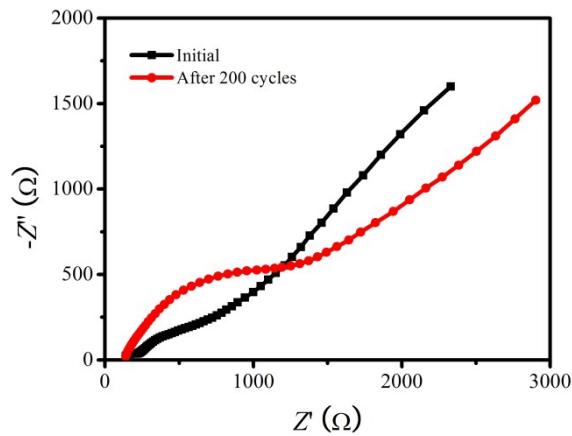
**Fig. S5.** The effect of some conditions on electrochemical performance: (A) Deposition time of  $\text{MnO}_2$ . (B) Deposition time of Zn. (C) The width of gap.



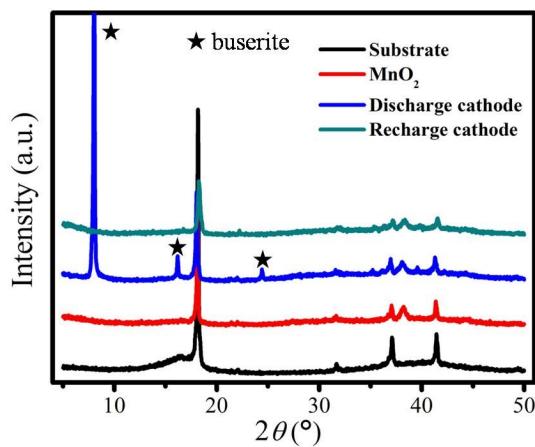
**Fig. S6.** Cycling performance of the micro-ZMB collected in electrolyte with different concentration of  $\text{MnSO}_4$ .



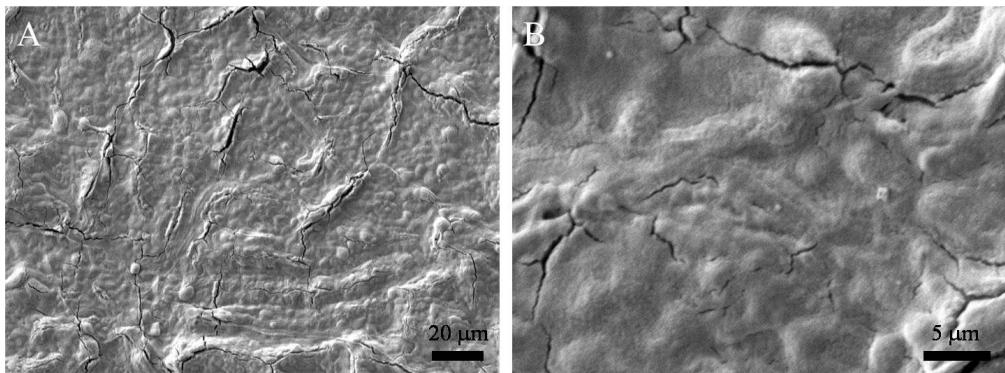
**Fig. S7.** Charge/discharge profiles at varying current density.



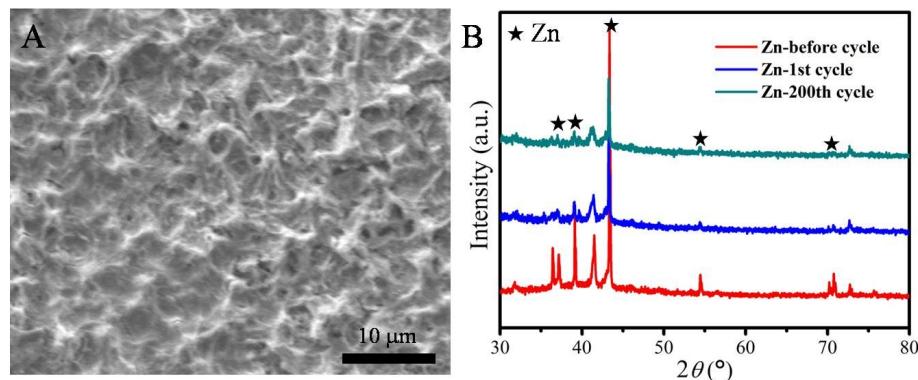
**Fig. S8.** Nyquist plots of the microbattery before and after 200 cycles.



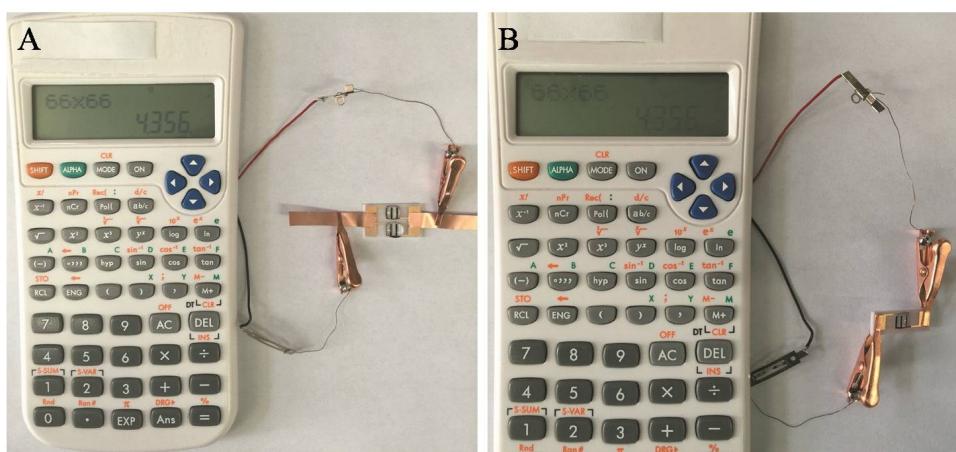
**Fig. S9.** XRD patterns of the  $\text{MnO}_2$  electrode before and after the first cycle.



**Fig. S10.** SEM and magnified SEM images of the  $\text{MnO}_2$  electrode after 200 cycles.



**Fig. S11.** (A) SEM image of the Zn anode after 200 cycles. (B) XRD patterns of the Zn anode before and after 200 cycles.



**Fig. S12.** Photograph of a calculator powered by (A) parallel device and (B) signal device.

**Table S1.** Comparison of the capacity of the micro-ZMB with other Zn-ion batteries.

Cathode	Current density (A g <sup>-1</sup> )	Discharge capacity (mAh g <sup>-1</sup> )	References
$\alpha$ -MnO <sub>2</sub> nanorod	0.21	120	1
$\delta$ -MnO <sub>2</sub>	0.123	123	2
MnO <sub>2</sub> nanoflakes	0.377	150	3
MnO <sub>2</sub> nanofibers	0.308	260	4
ZnMn <sub>2</sub> O <sub>4</sub>	0.5	90	5
Amorphous MnO <sub>2</sub> particles	0.5	227.3	This work

**Table S2.** Comparison of the electrochemical performance of the micro-ZMB with other microbatteries.

Method	Electrolytes	Cycle numbers	References
Reactive ion etching and chemical vapor deposition	LiPON	60	6
Photolithography and pyrolysis	LiClO <sub>4</sub> in EC and DMC	12	7
3D printing	LiClO <sub>4</sub> in EC and DMC	30	8
photolithography and atomic layer deposition	Li(TFSI) in EC and DMC	50	9
Lithography and electrodeposition	LiClO <sub>4</sub> in EC and DMC	15	10
Screen-print, laser carving and electrodeposition	ZnSO <sub>4</sub> and MnSO <sub>4</sub> aqueous solution	100	11
Laser carving and electrodeposition	ZnSO <sub>4</sub> and MnSO <sub>4</sub> aqueous solution	200	This work

Note, EC: ethylene carbonate; DMC: dimethyl carbonate

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