Supporting Information

Aqueous rechargeable sodium ion battery based on $NaMnO_2$-$NaTi_2(PO_4)_3$ hybrid system for stationary energy storage

Zhiguo Hou, [a] Xiaona Li, [a] Jianwen Liang, [a] Youngchun Zhu, [a*] and Yitai Qian [a b*]

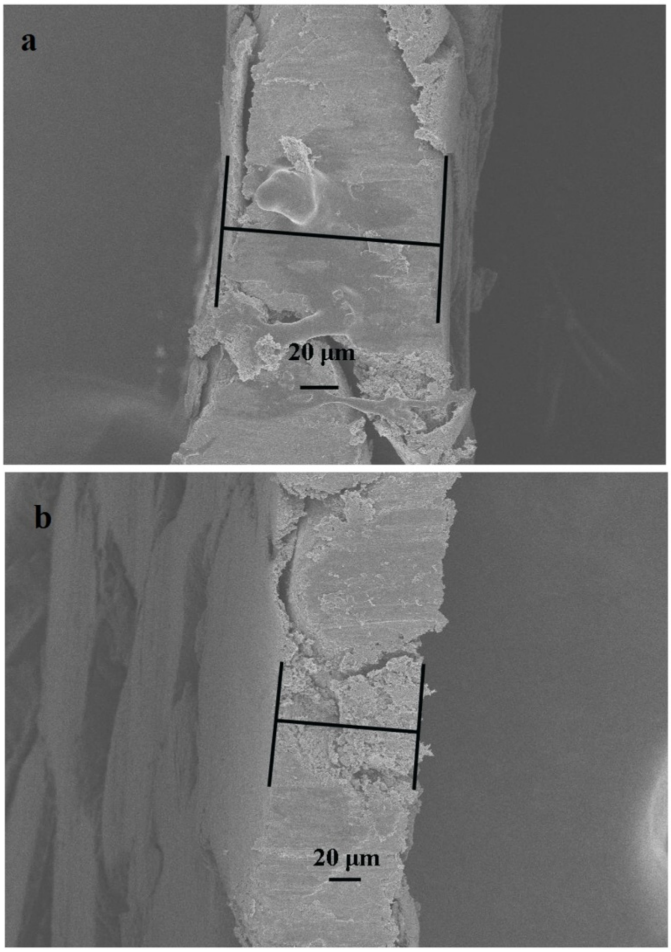

Fig. S1 (a) SEM image of the as-prepared fresh cathode electrode, (b) SEM image of the as-prepared fresh anode electrode.

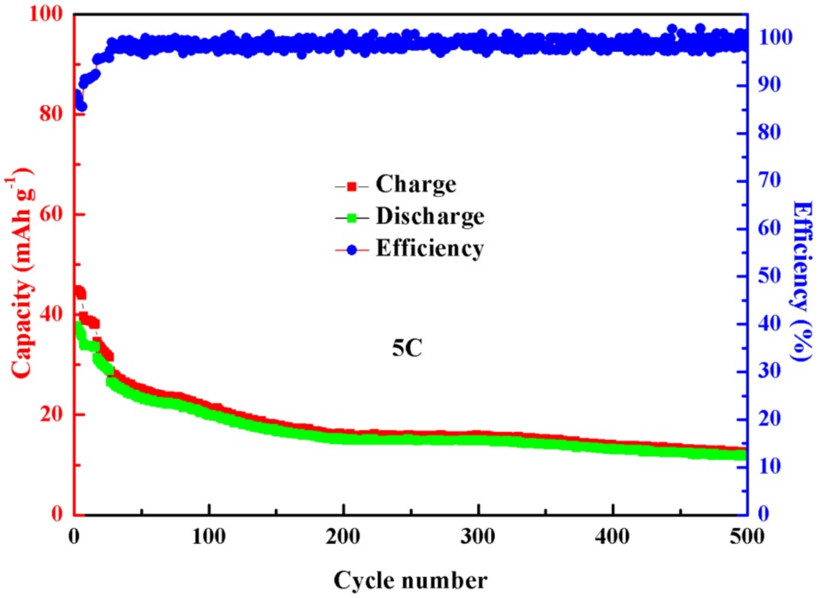

Fig. S2 Cycle performance of the full cell using 1 M Na_2SO_4 as electrolyte at a rate of 5 C.

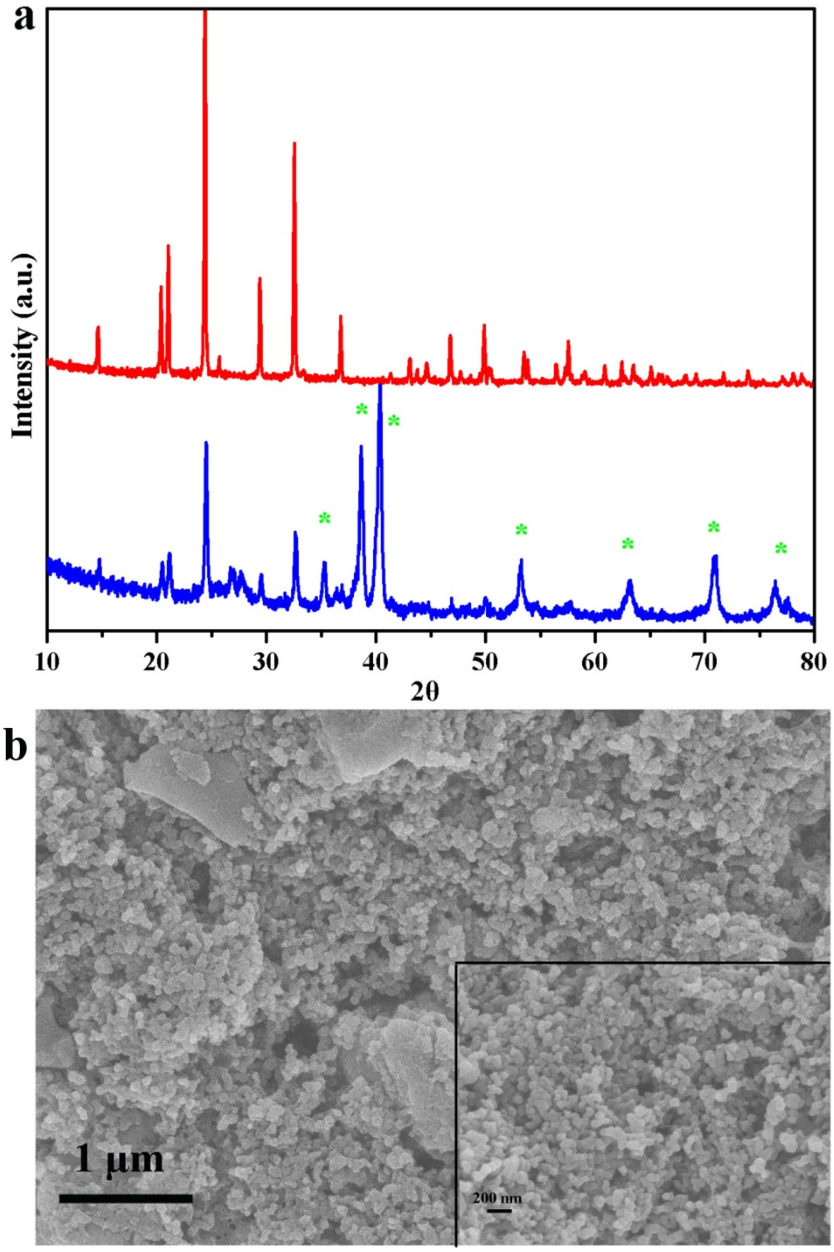

Fig. S3 (a) XRD patterns of anode material, red represented pristine anode material and blue represented anode material after 500 cycles (green stars belong to Ti). (b) SEM images of the anode material after 500 cycles.

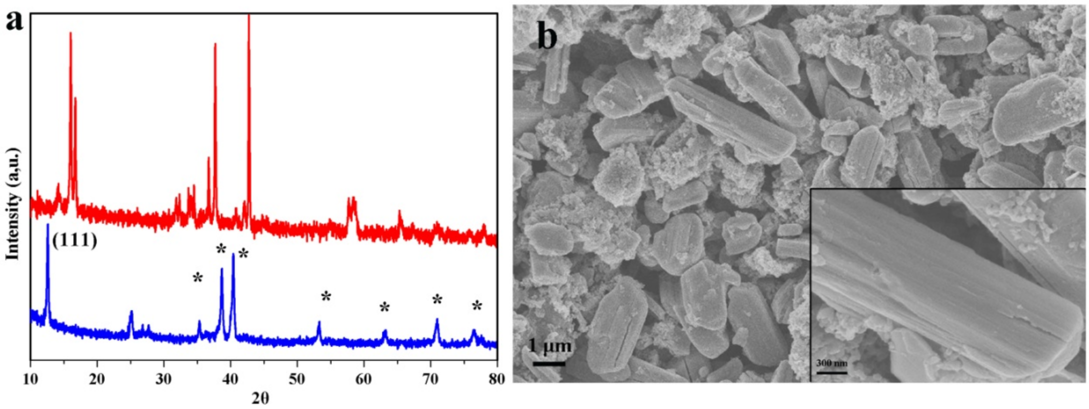

Fig. S4 (a) XRD patterns of cathode material, red represented pristine cathode material and blue represented cathode material after 500 cycles (black stars belong to Ti). (b) SEM images of the cathode material after 500 cycles.

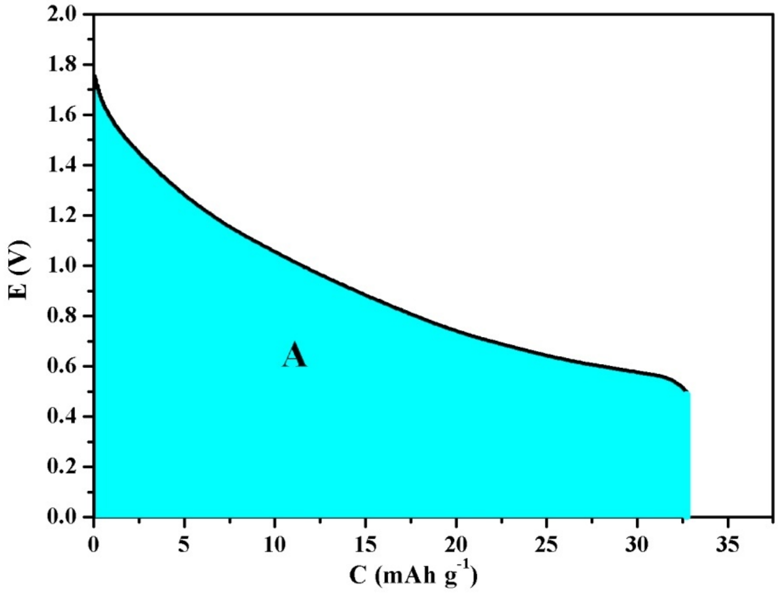

Fig. S5 Discharging curves of $NaTi_2(PO_4)_3$-$NaMnO_2$ battery at a rate of 1 C, the specific capacity C is based on the total mass of active electrode materials.

The energy density of the full cell should be:

$$W=\int EdC$$

C (mAh g^{-1}) represented the capacity (based on the total mass of the anode and cathode active materials), and E (V) represented voltage. As shown in **Figure S5**, the area of zone A (dark green) equals to the specific energy density based on the total mass of active electrode materials. The area of zone A is calculated to be 30 Wh kg^{-1}.

The power density of the full cell is:

$$P=IE_{1/2}$$

I (mA g^{-1}) was represented the current density, and $E_{1/2}$ (V) was represented the average discharge voltage.

For example, at 1C rate the cathode electrode material mass was 5 mg, the power density should be:

P=60*0.005*0.8/(0.005*0.8+0.0025*0.75) *(0.5+1.8)/2 W kg^{-1} = 50 W kg^{-1}

Type (anode/cathode)	Average operating voltage / V	Energy density / Wh kg^{-1}	Reference
$NaTi_2(PO_4)_3/Na_{0.44}MnO_2$	1.1	33	[1]
$AC/Na_{0.44}MnO_2$	0.9	<30	[2]
$NaTi_2(PO_4)_3/Na_2NiFe(CN)_6$	1.27	43	[3]
$AC/NaMnO_2$	0.95	19.5	[4]
$NaTi_2(PO_4)_3/NaMnO_2$	1.15	30	this work

Table S1 Energy densities and average operating voltages of different ARSIB (energy density was calculated based on the total mass of active electrode materials).

[1] Z. Li, D. Young, K. Xiang, W. C. Carter and Y. M. Chiang, *Advanced Energy Materials*, 2013, 3, 290-294

[2] J. Whitacre, A. Tevar and S. Sharma, *Electrochemistry Communications*, 2010, **12**, 463-466.

[3] X. Wu, Y. Cao, X. Ai, J. Qian and H. Yang, *Electrochemistry communications*, 2013, **31**, 145-148.

[4] J. Whitacre, A. Tevar and S. Sharma, *Electrochemistry Communications*, 2010, **12**, 463-466.