SUPPORTING INFORMATION

An aqueous rechargeable dual-ion hybrid battery based on $Zn//LiTi_2(PO_4)_3$ electrodes

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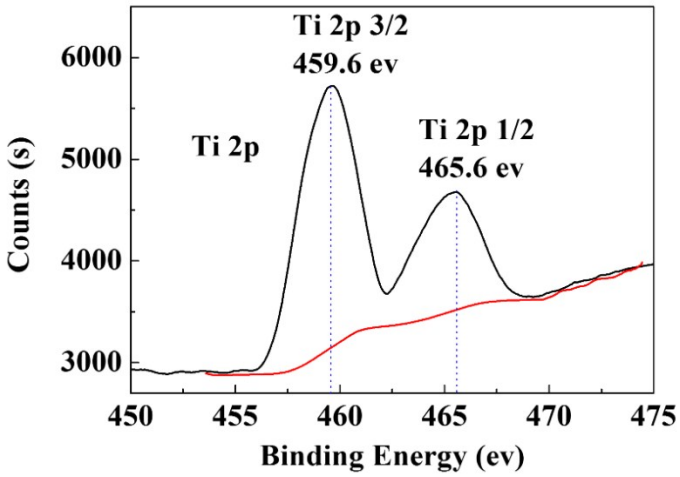

Fig S1 High resolution XPS spectrum of Ti in as-prepared $LiTi_2(PO_4)_3$@C.

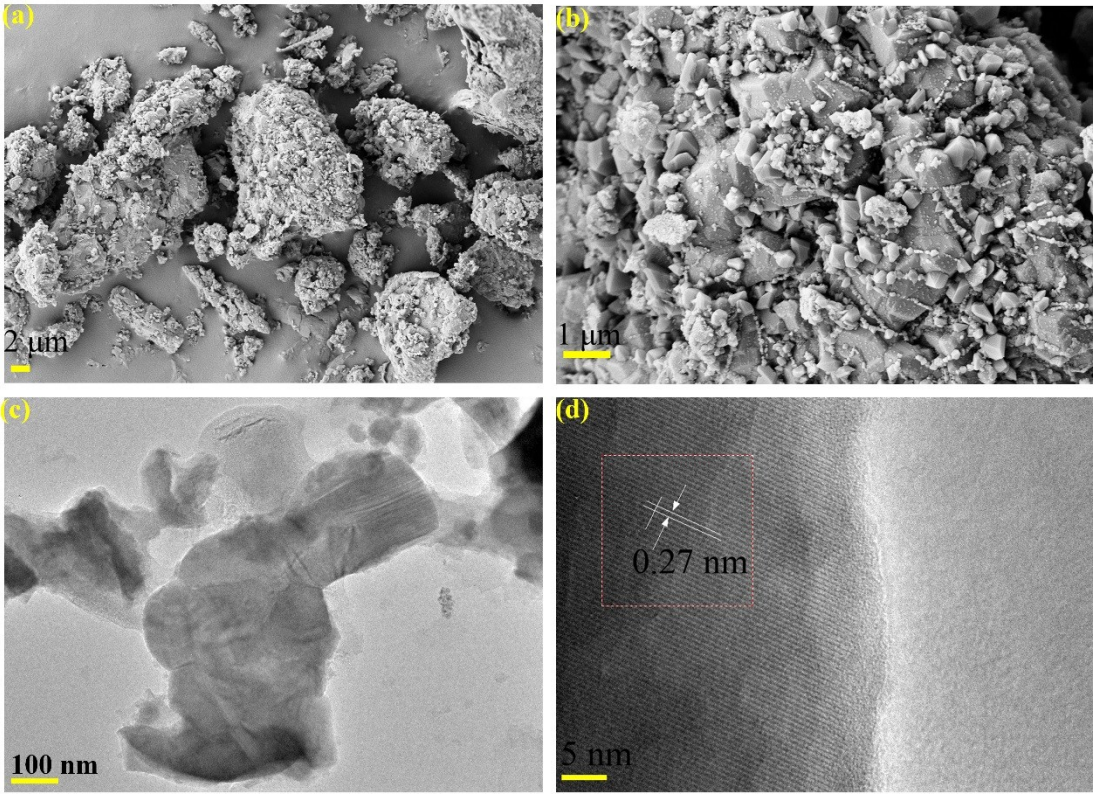

Fig S2 Scanning electron microscopy (SEM) images of $LiTi_2(PO_4)_3$@C (a) and (b). Transmission electron microscopy (TEM) imagines of $LiTi_2(PO_4)_3$@C (c) and (d).

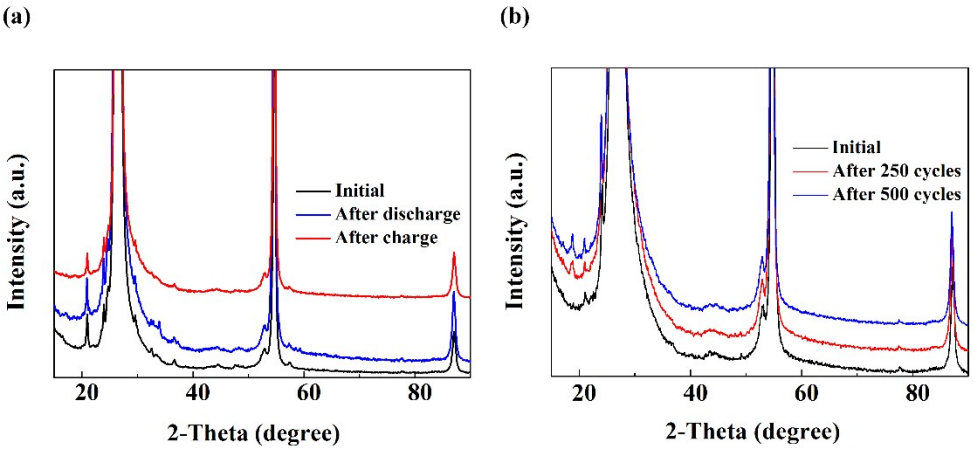

Fig S3 XRD patterns of $LiTi_2(PO_4)_3$ cathode in initial state, after discharge state, and charge state (a) and (b) in fresh state, after 250 cycles and 500 cycles.

Table S1. The comparison of the current system and other aqueous batteries

Cathode	**Anode**	**Electrolyte**	**Testing voltage (V)**	**Current rate**	**Capacity (mAh g^{-1})**	**Ref**
$LiTi_2(PO_4)_3$/C	Zn	0.5M $ZnSO_4$ + 0.25M Li_2SO_4	0-1.2	12C (1C=138 mA g^{-1})	48.52 (500 cycles)	This work
$Li_3V_2(PO_4)_3$	Zn	2 M $ZnSO_4$ +1 M Li_2SO_4	0.7-2.1	0.2C (1C=133 mA g^{-1})	86.7 (200 cycles)	[1]
$Na_3V_2(PO_4)_3$	Zn	2 M $ZnSO_4$ +1 M Li_2SO_4	0.7-2.1	0.2C (1C=118 mA g^{-1})	95 (20 cycles)	[1]
$Na_3V_2(PO_4)_3$	Zn	0.5M $Zn(CH_3COO)_2$	0.8-1.7	0.5C (1C=118 mA g^{-1})	72 (100 cycles)	[2]
$Na_3V_2(PO_4)_3$/C	Zn	1M $Zn(CH_3COO)_2$ +0.5M CH_3COONa	0.8-1.7	0.5C (1C=118 mA g^{-1})	70.84 (200 cycles)	[3]
$Na_3V_2(PO_4)_2F_3$	Zn	2M $Zn(CH_3F_3SO_3)_2$	0.8-1.9	80 mA g^{-1}	46 (4000 cycles)	[4]
$LiMn_2O_4$	$LiTi_2(PO_4)_3$/C	1M Li_2SO_4	0-1.8	0.2C (1C=138 mA g^{-1})	114 (100 cycles)	[5]

References:

1. H. B. Zhao, C. J. Hu, H. W. Cheng, J. H. Fang, Y. P. Xie, W. Y. Fang, T. N. L. Doan, T. K. A. Hoang, J. Q. Xu and P. Chen, *Scientific Reports*, 2016, **6**.
2. G. Li, Z. Yang, Y. Jiang, C. Jin, W. Huang, X. Ding and Y. Huang, *Nano Energy*, 2016, **25**, 211-217.
3. G. Li, Z. Yang, Y. Jiang, W. Zhang and Y. Huang, *Journal of Power Sources*, 2016, **308**, 52-57.
4. W. Li, K. Wang, S. Cheng and K. Jiang, *Energy Storage Materials*, 2018, **15**, 14-21.
5. Z. Huang, L. Liu, Q. Zhou, J. Tan, Z. Yan, D. Xia, H. Shu, X. Yang and X. Wang, *Journal of Power Sources*, 2015, **294**, 650-657.