Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supporting Information

A metal-organic framework approach to engineer mesoporous $ZnMnO_3$/C towards enhanced lithium storage

Xi Hu, Qianhong Huang, Yuze Zhang, Hao Zhong, Zhi Lin, Xiaoming Lin,* Akif Zeb,* Chao Xu* and Xuan Xu*

Guangzhou Key Laboratory of Materials for Energy Conversion and Storage, Key Laboratory of Theoretical Chemistry of Environment, Ministry of Education, School of Chemistry, South China Normal University, Guangzhou 510006, P.R. China.

*Author to whom correspondence should be addressed: E–mail: linxm@scnu.edu.cn (X. M. Lin); akif_zeb7@yahoo.com; chaoxu@m.scnu.edu.cn (C. Xu); xuxuan@scnu.edu.cn (X. Xu).

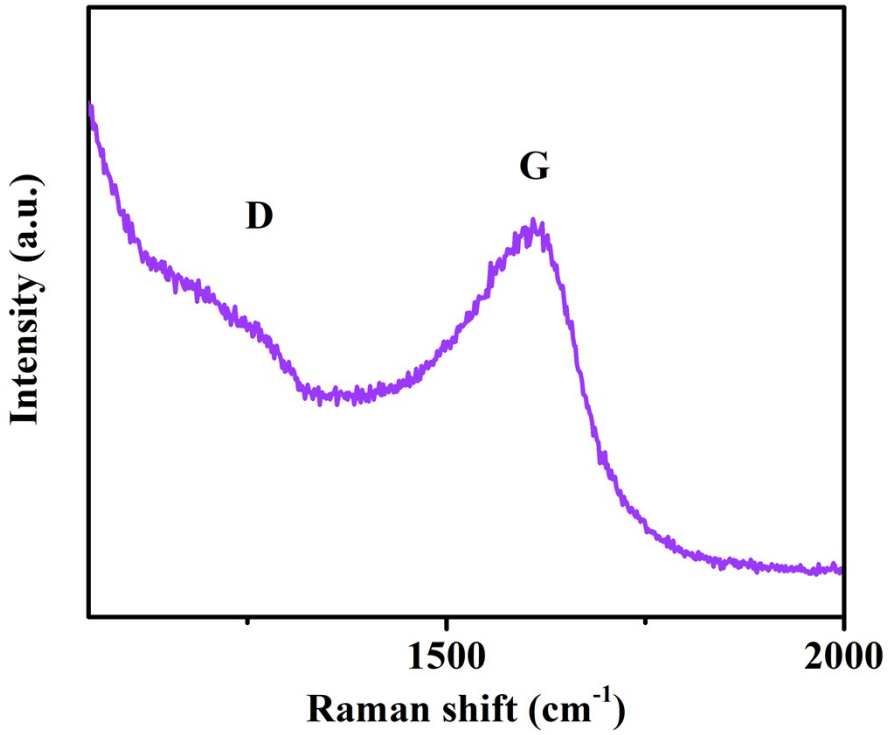

Fig. S1 Raman spectrum of $ZnMnO_3$/C.

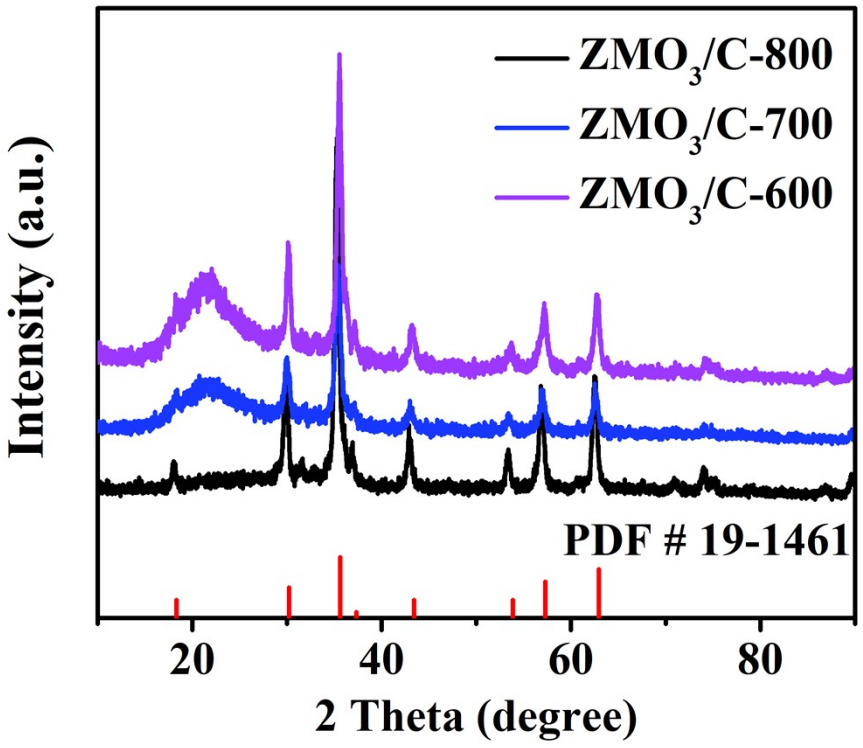

Fig. S2. XRD patterns of $ZnMnO_3$/C calcinated at 600, 700 and 800 °C.

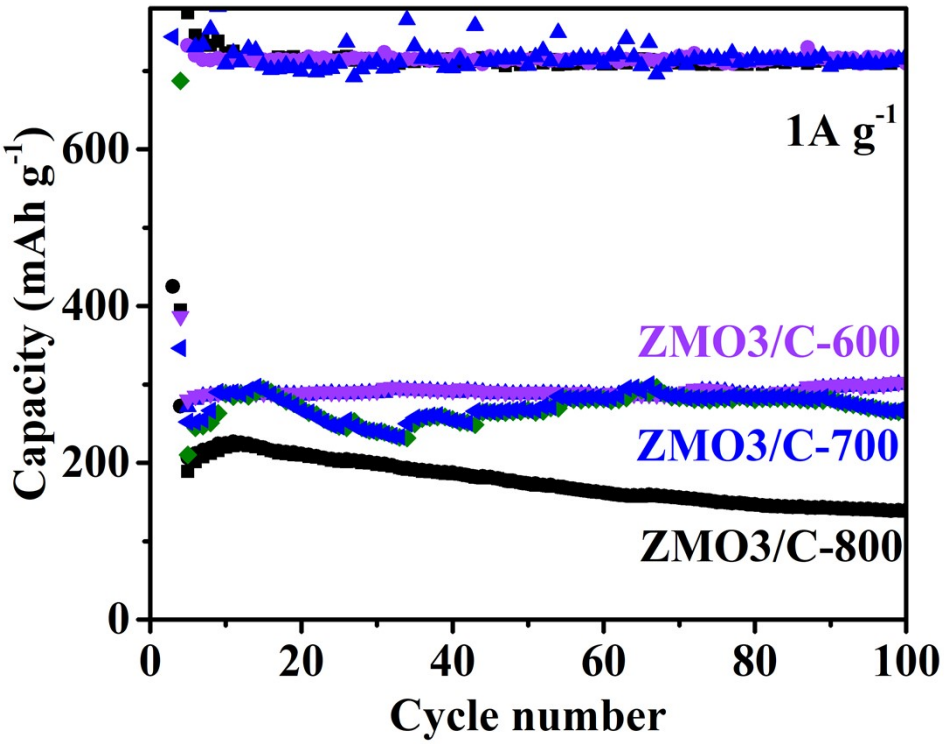

Fig. S3. Cycling performance of $ZnMnO_3$/C at 1 A g^{-1}

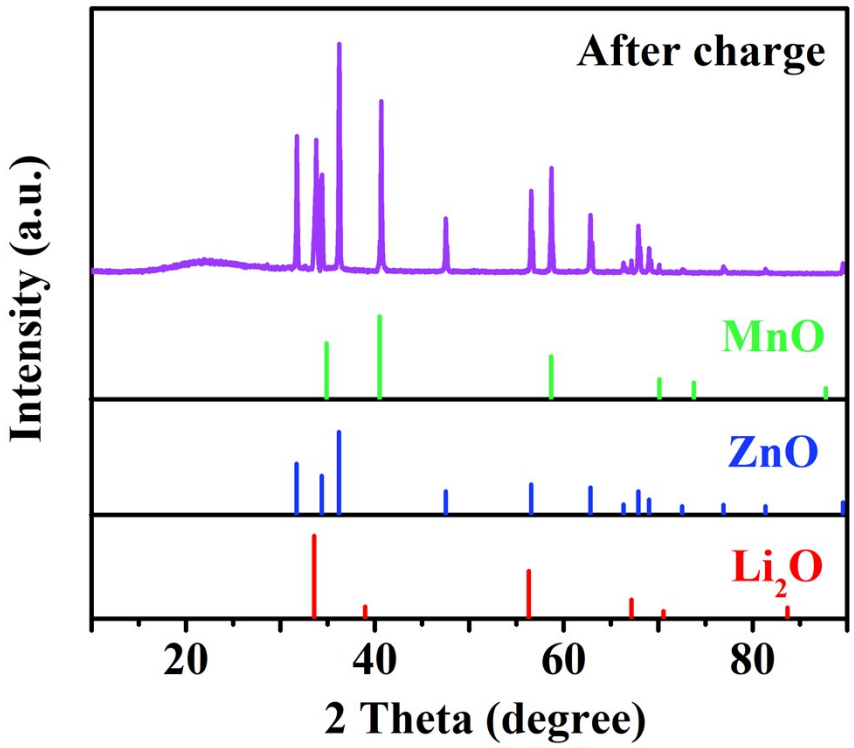

Fig. S4. XRD patterns of the $ZnMnO_3$/C electrode after 20 cycles of the charge process.

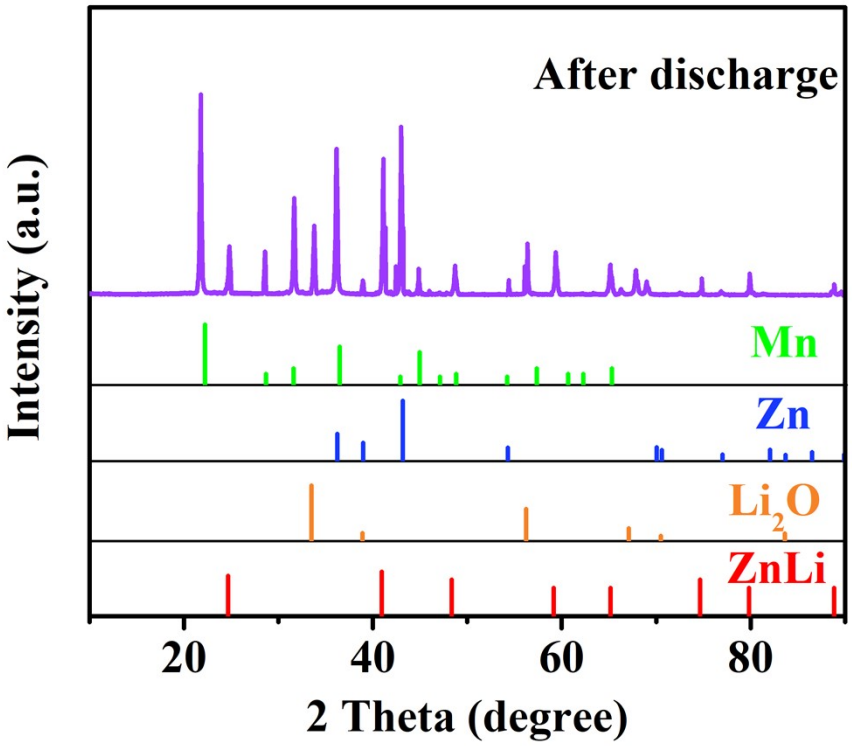

Fig. S5. XRD patterns of the $ZnMnO_3$/C electrode after 20 cycles of the discharge process.

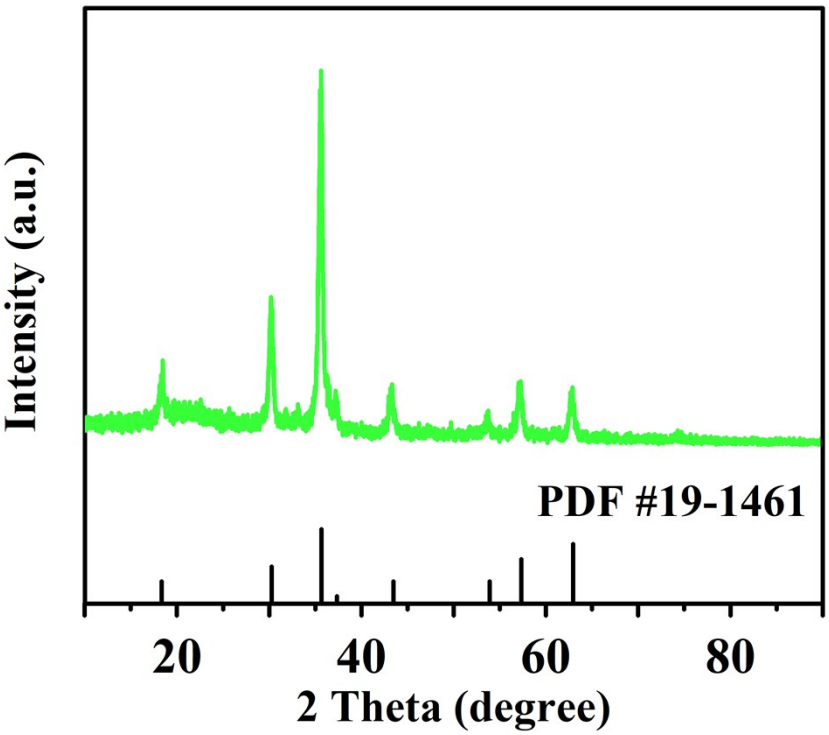

Fig. S6. XRD pattern of $ZnMnO_3$.

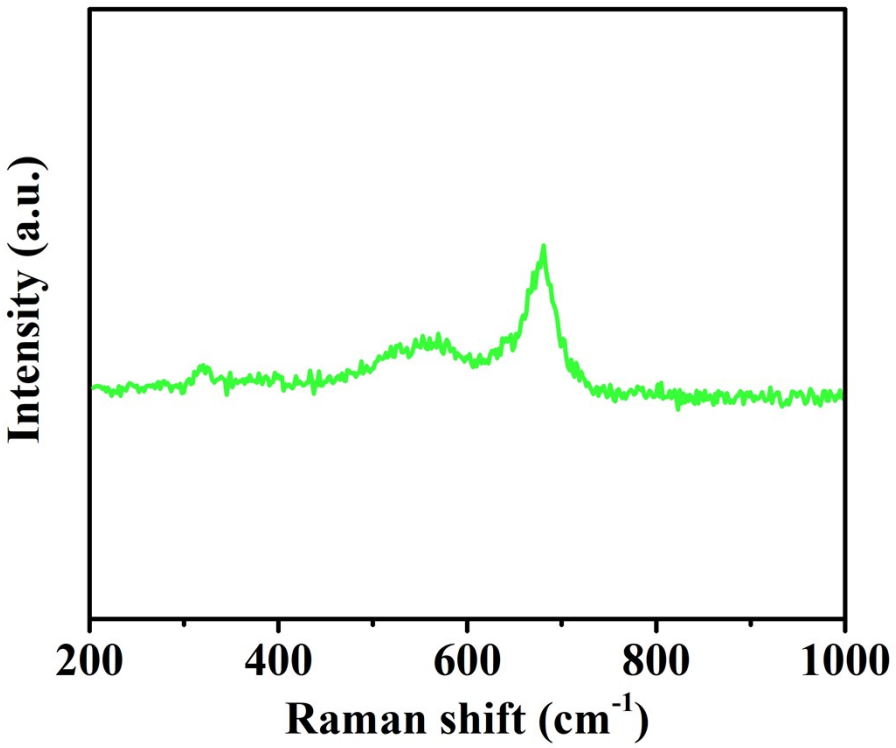

Fig. S7. Raman spectrum of $ZnMnO_3$.

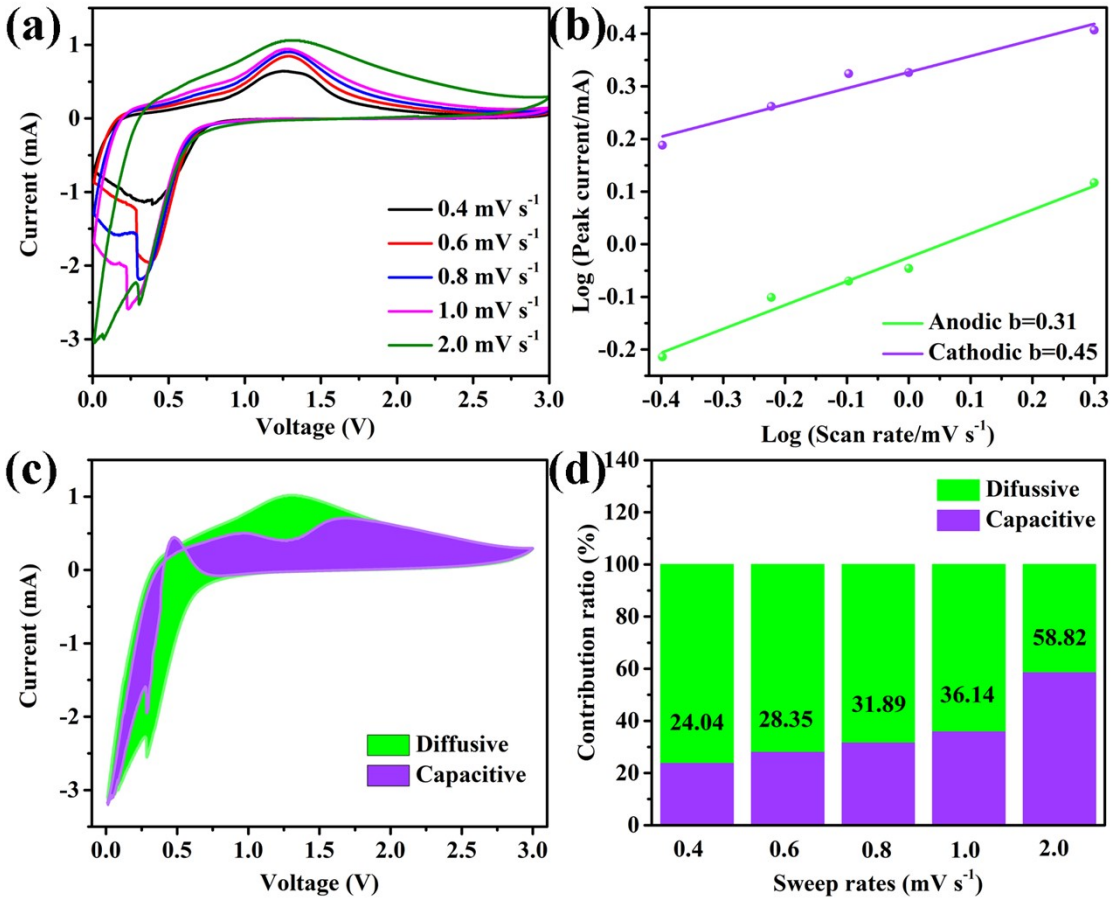

Fig. S8. (a) CV curves of $ZnMnO_3$ electrode at different sweep rates; (b) A linear relationship between log (scan rate) and log (peak current); (c) Typical capacitive contribution of $ZnMnO_3$ electrode at 2.0 mV s^{-1}; (d) Contribution ratios of capacitance at different scan rates.

Table S1 The comparison of specific capacitance hybrid materials and other reported materials

Electrode materials	Cycle capacity (mAh g^{-1})	Cycle number	Ref
$ZnMnO_3$ porous spherulites	729/0.5 A g^{-1}	50	S1
Hierarchical porous $ZnMnO_3$ yolk-shell microspheres	540/0.4 A g^{-1}	300	S2
Porous $ZnMnO_3$	560/0.4 A g^{-1}	300	S3
Multi-shelled $ZnMnO_3$ hollow micro-spheres	290/0.4 A g^{-1}	150	S4
1D $ZnMnO_3$	382.9/0.8 A g^{-1}	100	S5
MOF-derived $ZnMnO_3$/C	460/1 A g^{-1}	500	This work

References

(S1) X. R. Liu, C. H. Zhao, H. Zhang and Q. Shen, Facile synthesis of porous $ZnMnO_3$ spherulites with a high lithium storage capability, *Electrochim. Acta*, 2015, **151**, 56-62.

(S2) X. R. Su, J. Huang, B. Y. Yan, Z. P. Hong, S. Y. Li, B. C. Pang, Y. L. Luo, L. Feng, M. J. Zhou and Y. Y. Xia, Hierarchical porous $ZnMnO_3$ yolk–shell microspheres with superior lithium storage properties enabled by a unique one-step conversion mechanism, *RSC Adv.*, 2018, **8**, 31388-31395.

(S3) C. H. Zhao, Z. G. Teng, D. N. Zhao, Z. B. Hu and K. Y. Liu, Porous $ZnMnO_3$ plates prepared from Zn/Mn–sucrose composite as high-

performance lithium-ion battery anodes, *Micro & Nano Letters*, 2016, **11**, 494-497.

(S4) J. Y. Xu, H. Zhang, R. F. Wang, P. B. Xu, Y. L. Tong and F. Gao, Delicate control of multishelled Zn-Mn-O hollow microspheres as a high-performance anode for lithium-ion batteries, *Langmuir*, 2018, **34**, 1242-1248.

(S5) Y. Tian, Z. X. Chen, W. J. Tang, Z. H. Yang, W. X. Zhang, S. Li, K. Wang, Y. H. Su, Q. Xia and B. Guo, A facile synthetic protocol to construct 1D Zn-Mn-Oxide nanostructures with tunable compositions for high-performance lithium storage, *J. Alloy. Compd.*, 2017, **720**, 376-382.