Electronic Supplementary Information

Nanowire-templated formation of SnO_2/carbon nanotubes with enhanced lithium storage properties

Xiaosi Zhou,[ab] *Le Yu,*[a] *and Xiong Wen (David) Lou**[a]

[a] School of Chemical and Biomedical Engineering, Nanyang Technological University, 62 Nanyang Drive, Singapore 637459, Singapore

E-mail: xwlou@ntu.edu.sg; or davidlou88@gmail.com

Webpage: http://www.ntu.edu.sg/home/xwlou/

[b] Jiangsu Key Laboratory of Biofunctional Materials, School of Chemistry and Materials Science, Nanjing Normal University, Nanjing 210023, P. R. China

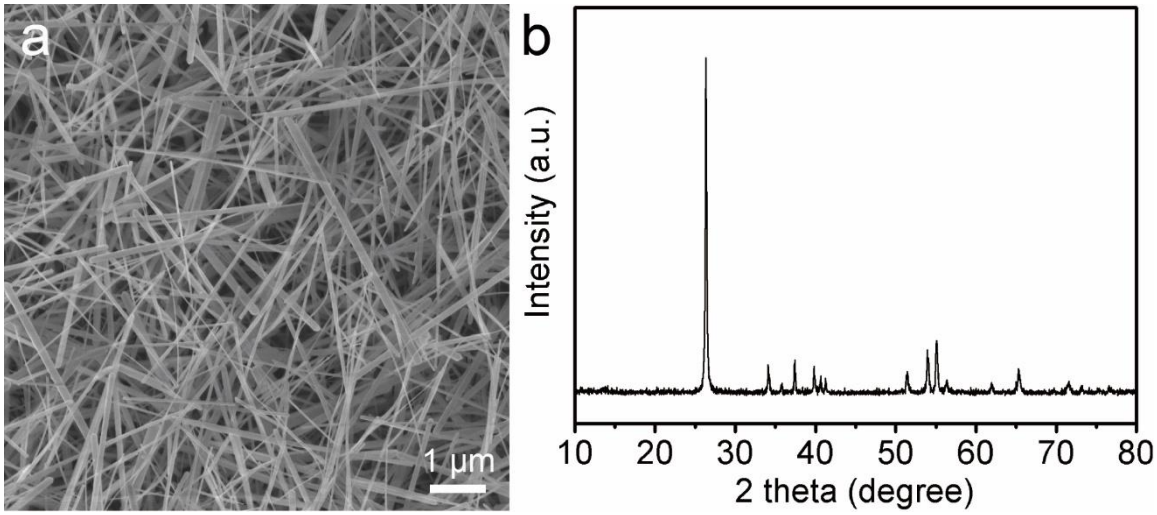

Fig. S1 (a) FESEM image and (b) XRD pattern of MnO_x nanowires.

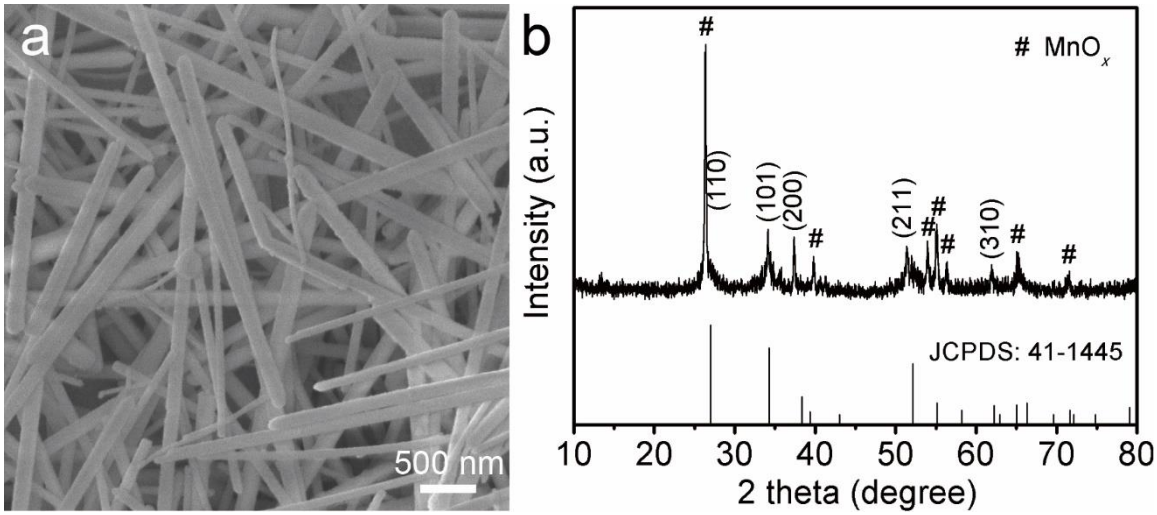

Fig. S2 (a) FESEM image and (b) XRD pattern of MnO_x/SnO_2 nanocables.

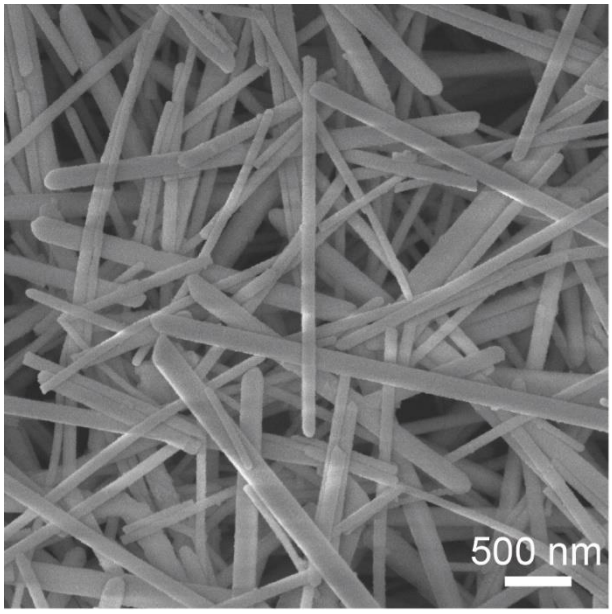

Fig. S3 FESEM image of MnO_x/SnO_2/PDA nanocables.

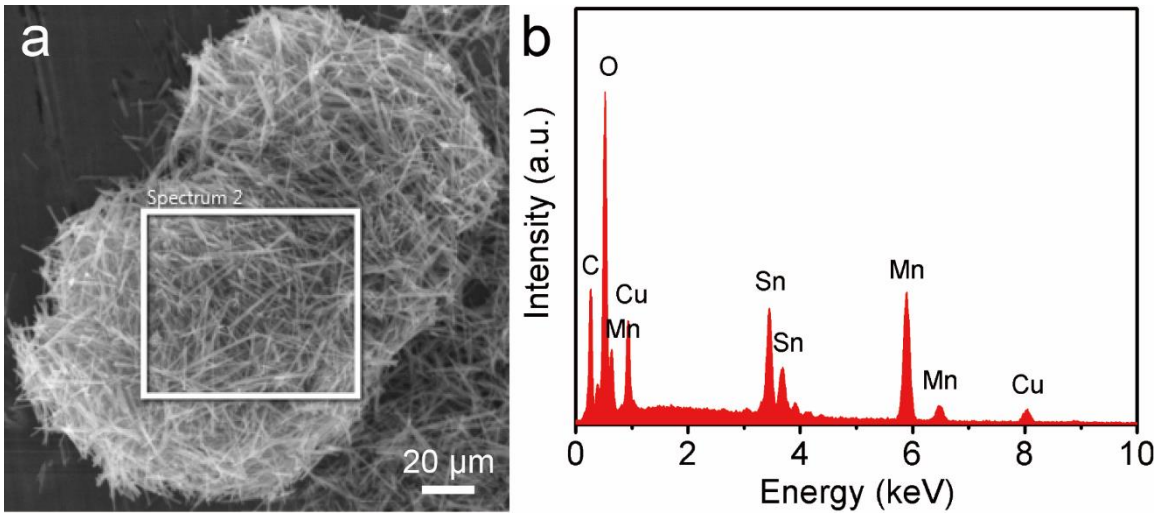

Fig. S4 (a) FESEM image and (b) corresponding EDX spectrum of the MnO_x/SnO_2/C nanocables.

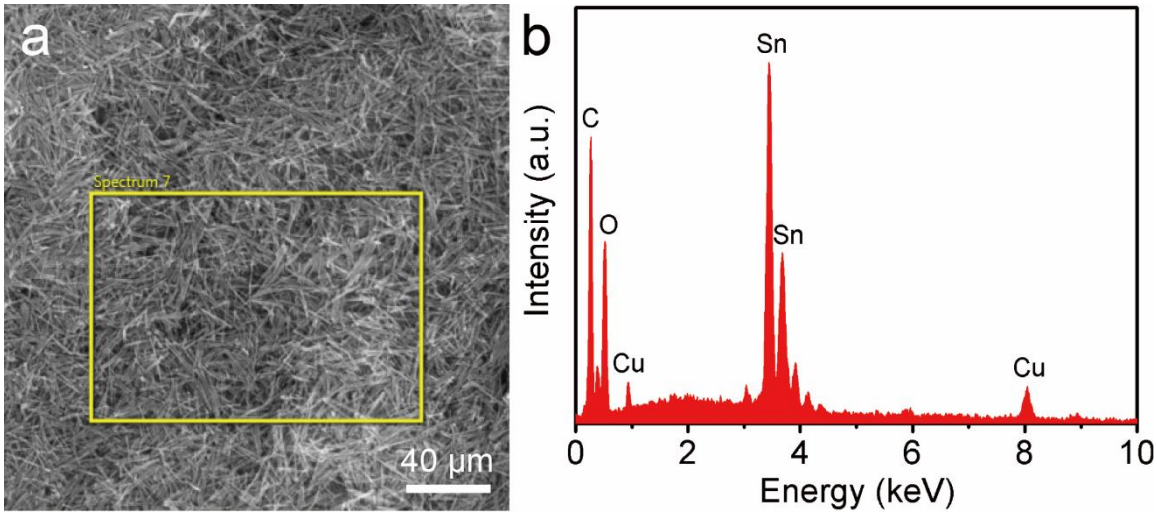

Fig. S5 (a) FESEM image and (b) corresponding EDX spectrum of the SnO_2/C-NTs nanocomposite.

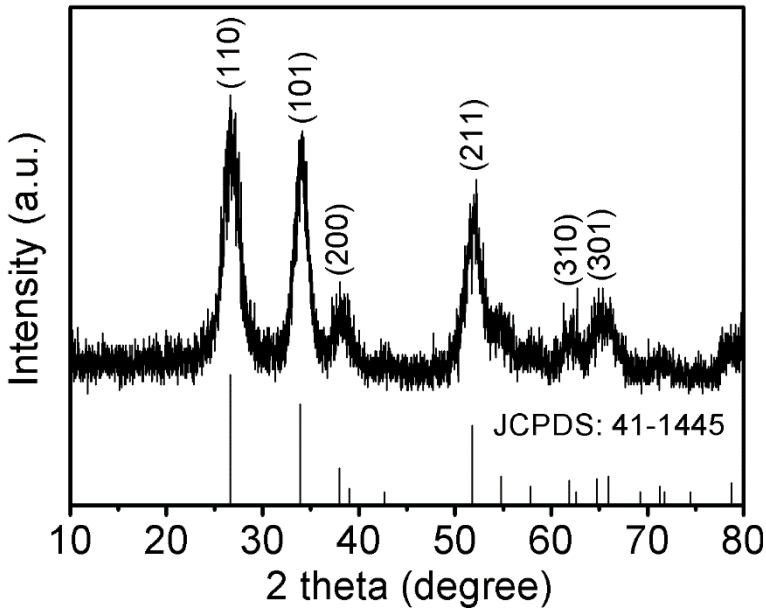

Fig. S6 XRD pattern of the SnO_2/C-NTs nanocomposite.

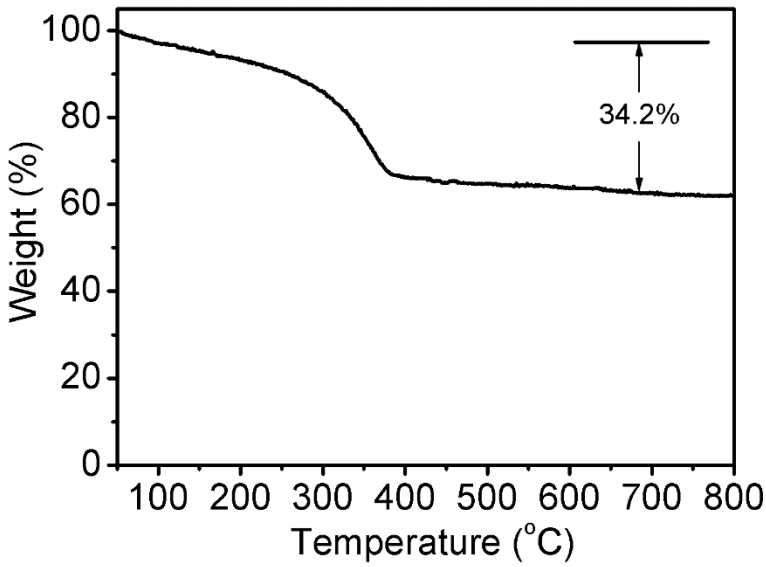

Fig. S7 TGA curve of the SnO_2/C-NTs nanocomposite.

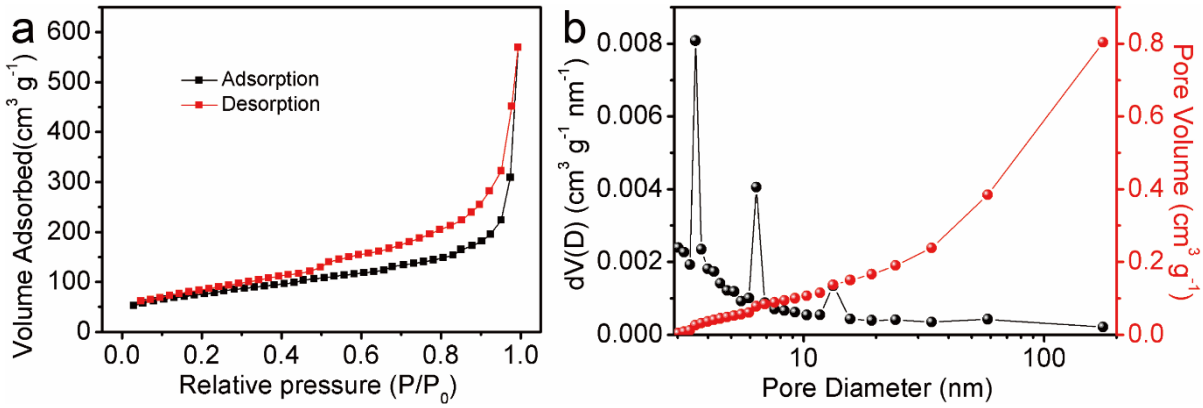

Fig. S8 (a) N_2 adsorption−desorption isotherms of the SnO_2/C-NTs nanocomposite and (b) the pore-size distribution calculated from the adsorption branch.

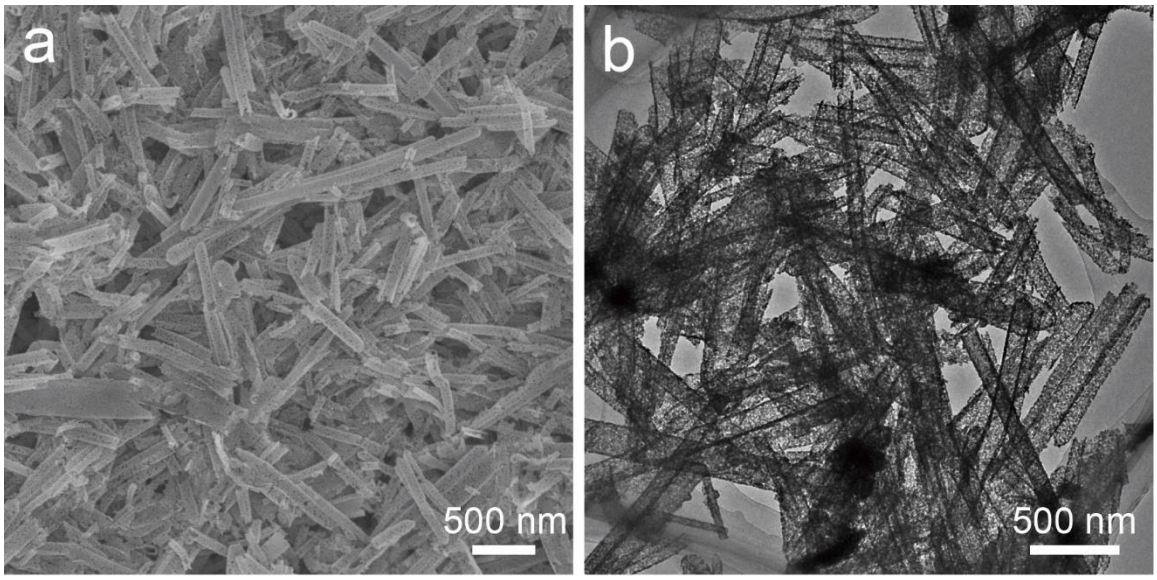

Fig. S9 (a) FESEM and (b) TEM images of SnO_2-NTs obtained after calcining SnO_2/C-NTs in air at 550 ^{o}C.

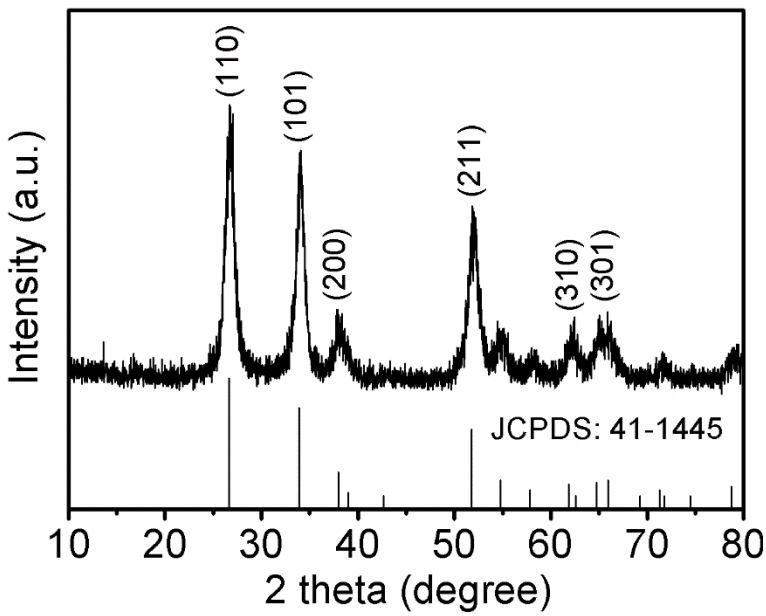

Fig. S10 XRD pattern of SnO_2-NTs.

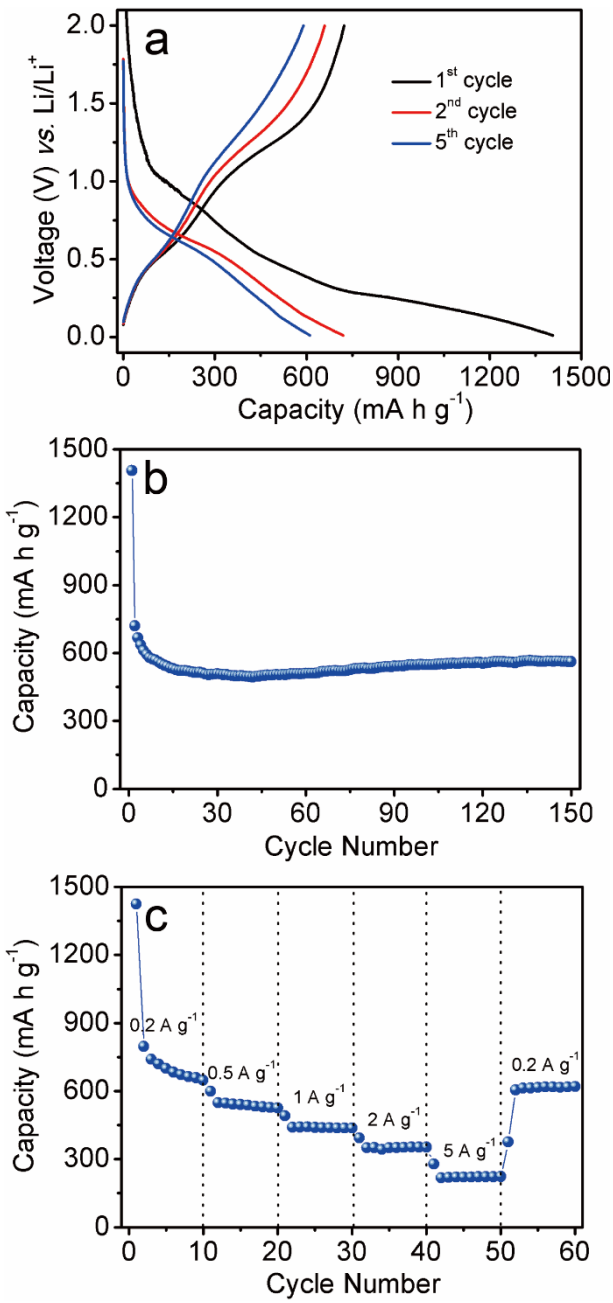

Fig. S11 (a) Charge−discharge voltage profiles, (b) cycling performance, and (c) rate capability of the $MnO_x/SnO_2/C$ nanocables in the voltage range of 0.01−2 V vs. Li/Li^+ at a current density of 500 mA g^{-1}.

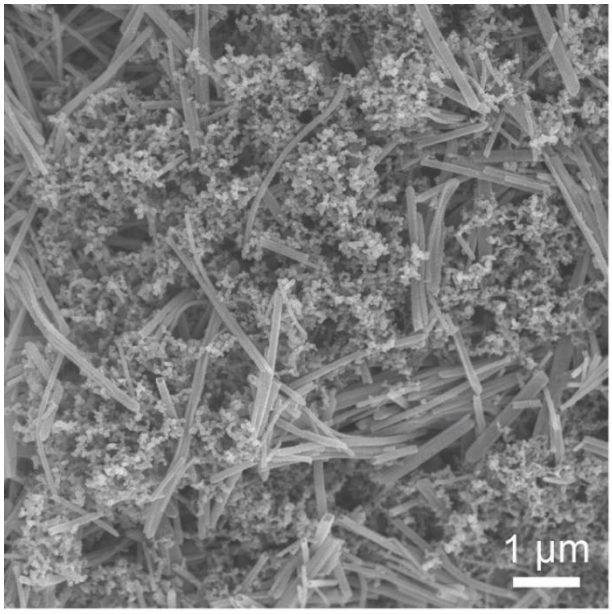

Fig. S12 FESEM image of the SnO_2/C-NTs electrode before cycling. It should be noted that the small nanoparticles in the electrode are carbon black (Super-P-Li).

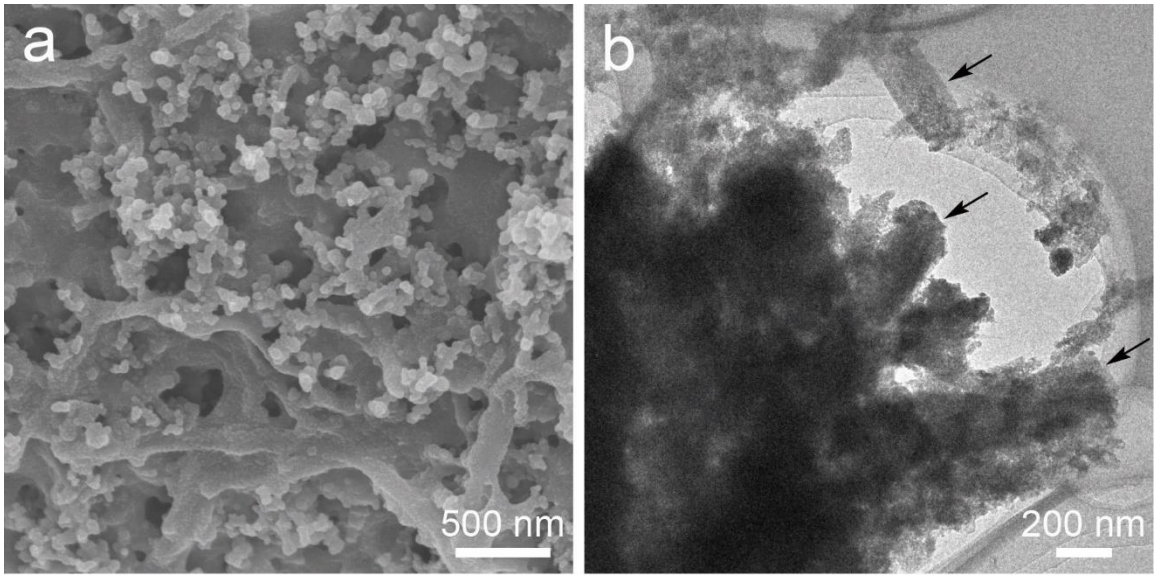

Fig. S13 (a) FESEM image and (b) TEM image of the SnO_2/C-NTs electrode after 100 charge−discharge cycles at a current density of 500 mA g^{-1} between 0.01 and 2 V. It is worth mentioning that the nanoparticles in the electrode are carbon black (Super-P-Li).

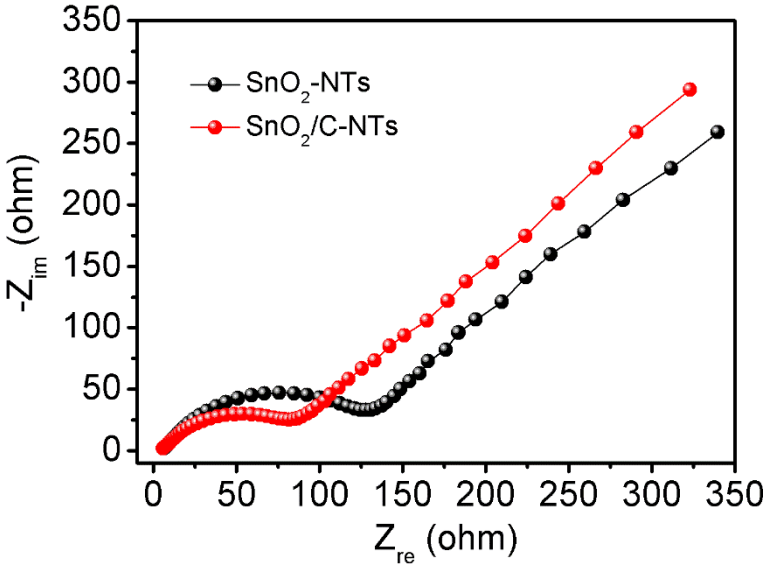

Fig. S14 Nyquist plots of the SnO_2-NTs and SnO_2/C-NTs electrodes.

Table S1. Electrochemical performance of various SnO_2-based anode materials for lithium-ion batteries.

SnO_2-based anode materials	**Voltage range (V)**	**Current density (mA g^{-1})**	**Discharge capacity (mA h g^{-1})**	**Reference**
SnO_2-tube-in-CNT nanostructures	0.05−3	~300	542 (after 200 cycles)	1
Mesoporous SnO_2 overlaying MWCNTs hybrid composites	0.25−2	33.3	344.5 (after 50 cycles)	2
Tin nanoparticles encapsulated in elastic hollow carbon spheres	0.05−3	500	550 (after 100 cycles)	3
Coaxial SnO_2@carbon hollow nanospheres	0.05−2	500	460 (after 100 cycles)	4
SnO_2 nanotubes	0.05−1.5	100	468 (after 30 cycles)	5
SnO_2 nanosheets	0.05−3	78.2	559 (after 20 cycles)	6
SnO_2 hierarchical structures	0.01−1.2	400	516 (after 50 cycles)	7
Graphene-supported SnO_2 nanosheets	0.01−1.2	400	518 (after 50 cycles)	8
SnO_2 nanoboxes	0.01−2	~150	570 (after 40 cycles)	9
CNTs@SnO_2@carbon coaxial nanocables	0.01−2	400	505 (after 60 cycles)	10
SnO_2@carbon hierarchical tubular structures	0.05−1.5	200	700 (after 50 cycles)	11
Porous SnO_2 microboxes	0.05−1.5	200	550 (after 150 cycles)	12
SnO_2/C-NTs	0.01−2	500	596 (after 200 cycles)	This work

Supplementary References

1 Y. Wang, H. C. Zeng and J. Y. Lee, *Adv. Mater.*, 2006, **18**, 645.

2 Z. H. Wen, Q. Wang, Q. Zhang and J. H. Li, *Adv. Funct. Mater.*, 2007, **17**, 2772.

3 W. M. Zhang, J. S. Hu, Y. G. Guo, S. F. Zheng, L. S. Zhong, W. G. Song and L. J. Wan, *Adv. Mater.*, 2008, **20**, 1160.

4 X. W. Lou, C. M. Li and L. A. Archer, *Adv. Mater.*, 2009, **21**, 2536.

5 J. F. Ye, H. J. Zhang, R. Yang, X. G. Li and L. M. Qi, *Small*, 2010, **6**, 296.

6 C. Wang, Y. Zhou, M. Y. Ge, X. B. Xu, Z. L. Zhang and J. Z. Jiang, *J. Am. Chem. Soc.*, **2010**, **132**, 46.

7 H. B. Wu, J. S. Chen, X. W. Lou and H. H. Hng, *J. Phys. Chem. C*, 2011, **115**, 24605.

8 S. Ding, D. Luan, F. Y. C. Boey, J. S. Chen and X. W. Lou, *Chem. Commun.*, 2011, **47**, 7155.

9 Z. Y. Wang, D. Y. Luan, F. Y. C. Boey and X. W. Lou, *J. Am. Chem. Soc.*, 2011, **133**, 4738.

10 S. Ding, J. S. Chen and X. W. Lou, *Chem.−Asian J.*, 2011, **6**, 2278.

11 L. Zhang, G. Zhang, H. B. Wu, L. Yu and X. W. Lou, *Adv. Mater.*, 2013, **25**, 2589.

12 L. Zhang, H. B. Wu, B. Liu and X. W. Lou, *Energy Environ. Sci.*, 2014, **7**, 1013.