Electronic Supplementary Information

Ultra-small B_2O_3 nanocrystals grown in-situ on highly porous carbon microtubes for Lithium-Iodine and Lithium-Sulfur battery

Zhong Su, ‡[a] Chuan-Jia Tong, ‡[b] De-Qing He, ‡[a] Chao Lai,*[a] Li-Min Liu,*[b] Chao Wang,*[a] Kai Xi[c]

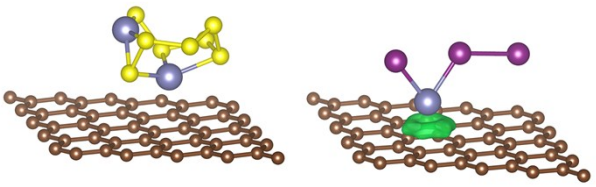
[a] School of Chemistry and Chemical Engineering, Jiangsu Normal University, Xuzhou, Jiangsu 221116, P. R. China.

[b] Beijing Computational Science Research Centre, Beijing 100193, China.

[c] Department of Materials Science and Metallurgy, University of Cambridge, Cambridge, CB2 3QZ, UK

*Corresponding author: Chao Lai, E-mail: laichao@jsnu.edu.cn; Li-Min Liu, E-mail: limin.liu@csrc.ac.cn ; Chao Wang, E-mail: wangc@jsnu.edu.cn.

‡ Zhong Su, Chuan-Jia Tong and De-Qing He contributed equally to this work.



	Li_2S_8	LiI_3
B_2O_3	-1.54 eV	-1.70 eV
Graphene	-0.84 eV	-0.79 eV

Fig. S1. The view of Li_2S_8 and LiI_3 adsorbed on graphene carbon materials and the calculated adsorption energy.

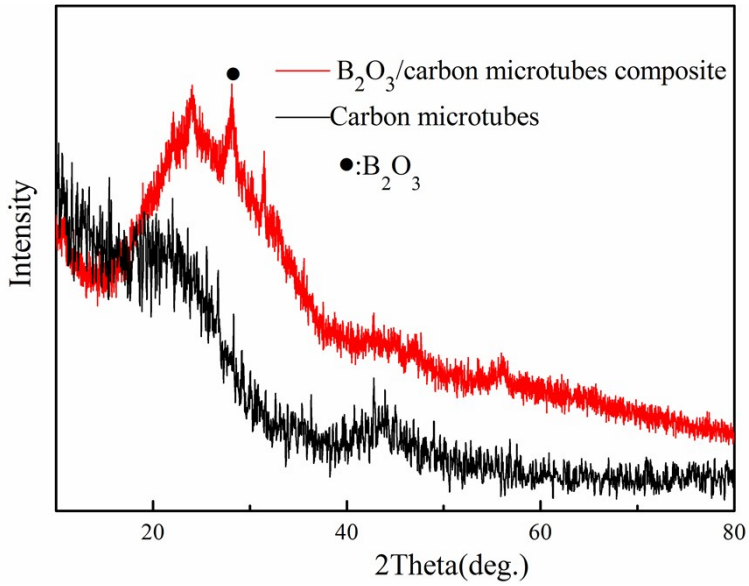


Fig. S2. XRD patterns of the prepared B_2O_3/carbon microtubes composite and pure carbon microtubes.

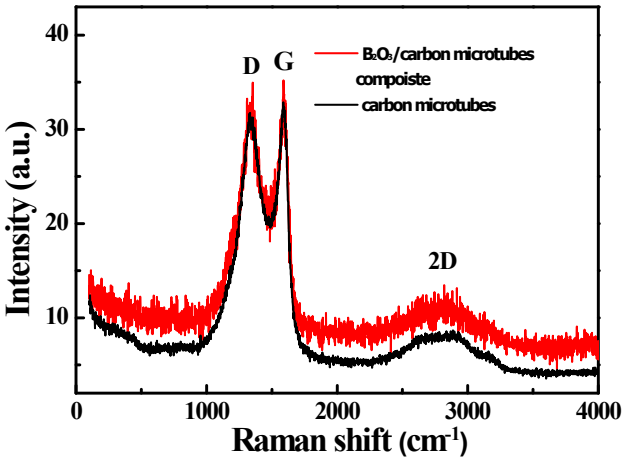


Fig. S3 Raman spectra of the the prepared B_2O_3/carbon microtubes composite and pure carbon microtubes.

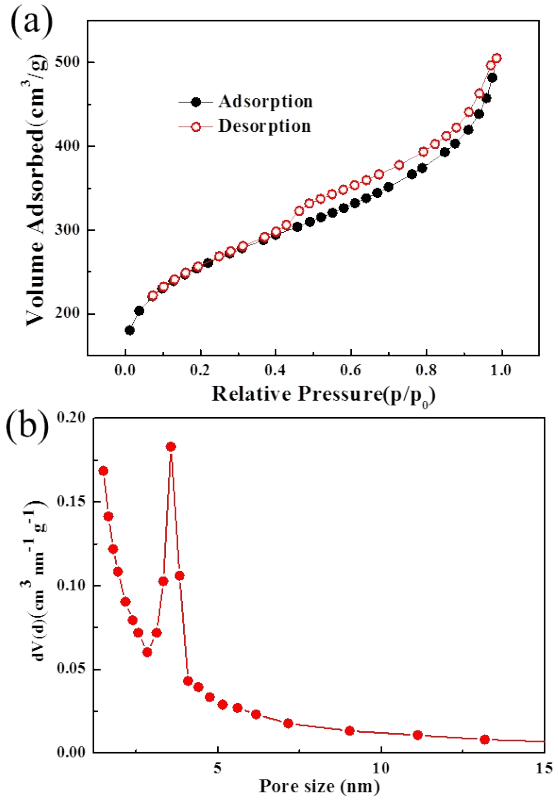


Fig. S4 N_2 adsorption-desorption isotherms (a) and corresponding pore size distribution calculated from desorption branch by the BJH method (b) of the as-prepared B_2O_3/carbon microtubes composite.

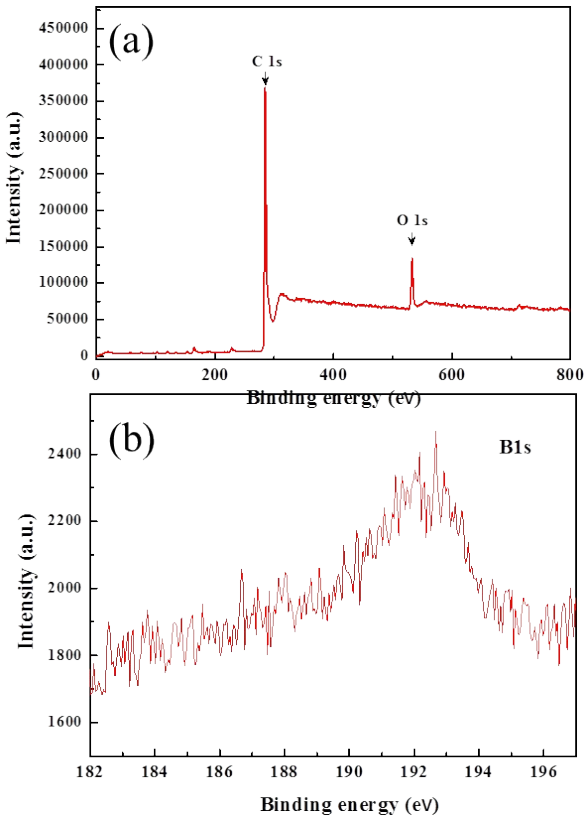


Fig. S5 XPS survey scan (a) and high resolution scan of B 1s of B_2O_3/carbon microtubes composite.

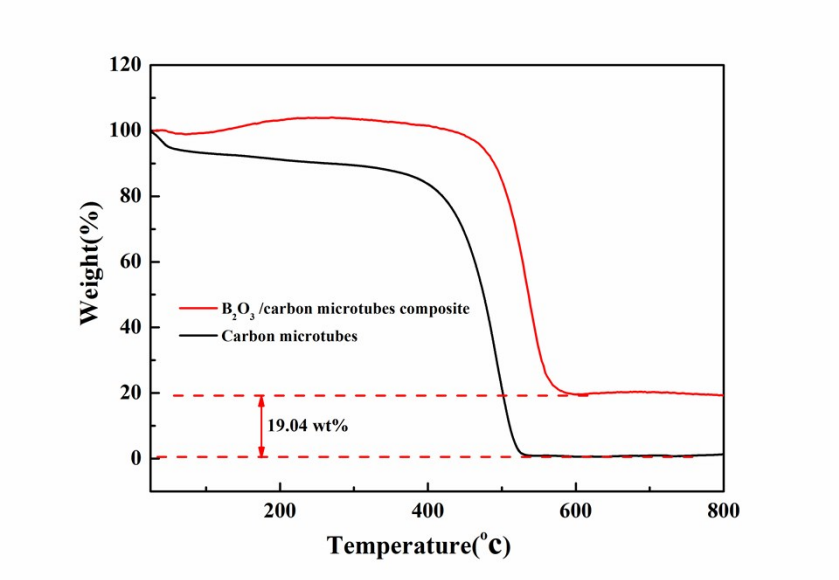


Fig. S6 TGA curves of prepared B_2O_3/carbon microtubes composite and pure carbon microtubes.

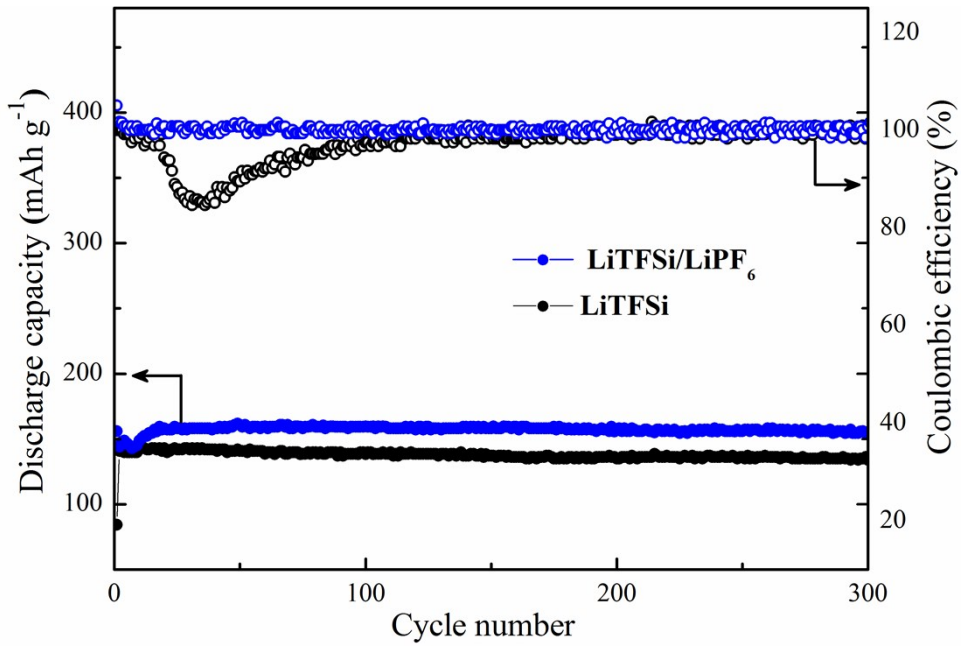


Fig. S7. Cycle performance of iodine cathodes in different electrolytes at the rate of 20 C.

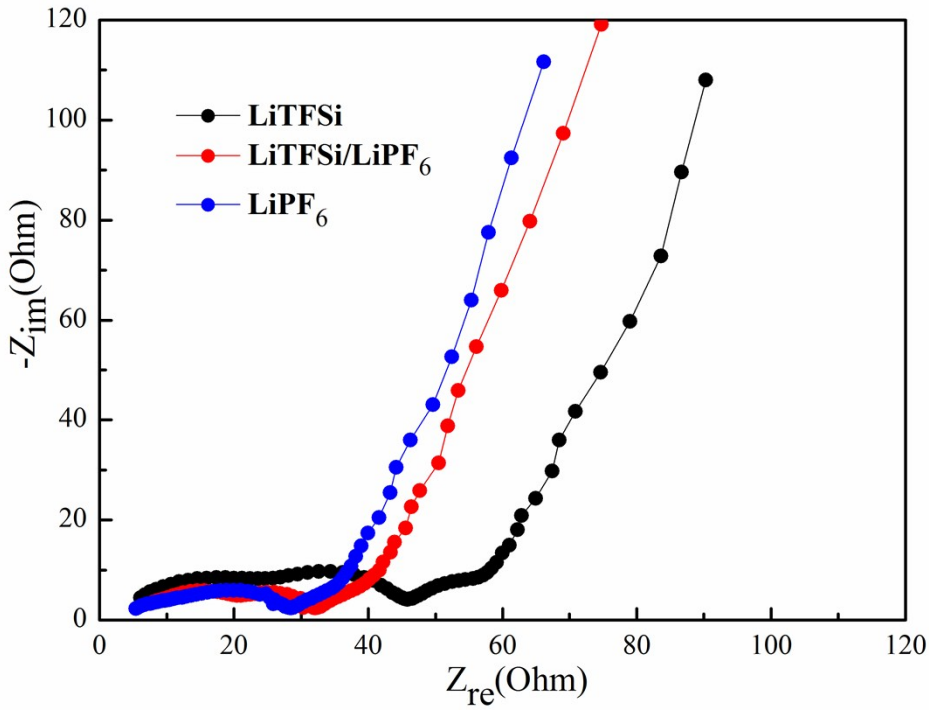


Fig. S8. The Nyquist plots of the Li-I_2 batteries in different electrolytes after 300 cycles at the rate of 20 C.

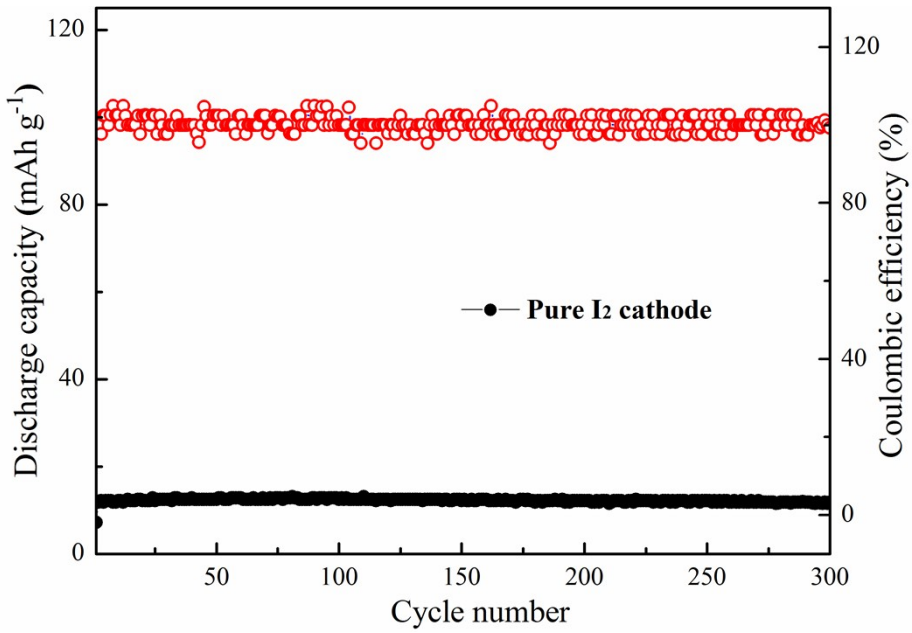


Fig. S9. Cycle performance of iodine cathode without interlayer at the rate of 20C.

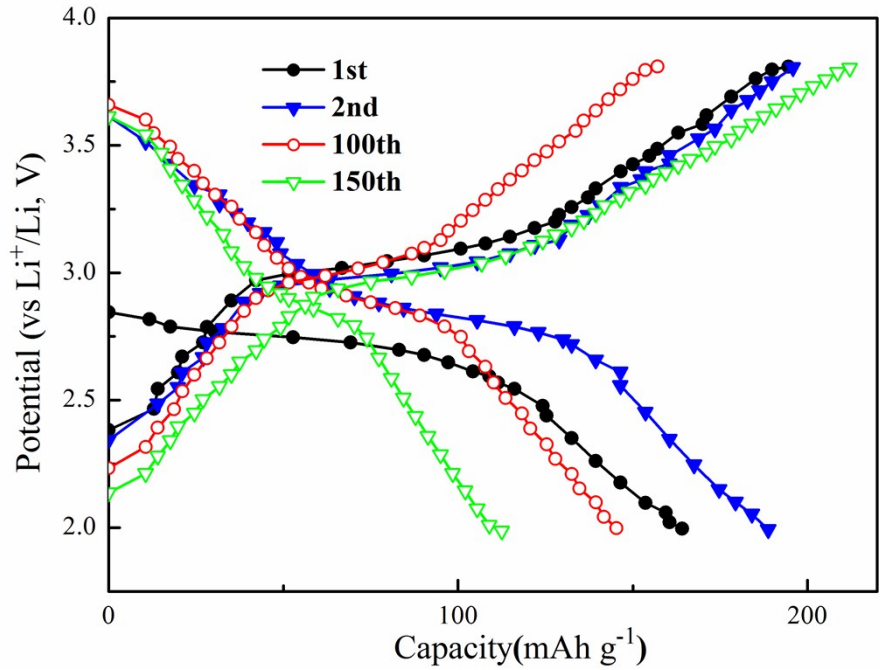


Fig S10. The discharge-charge curves of I_2/B_2O_3 modified carbon microtubes composite at the rate of 20 C.

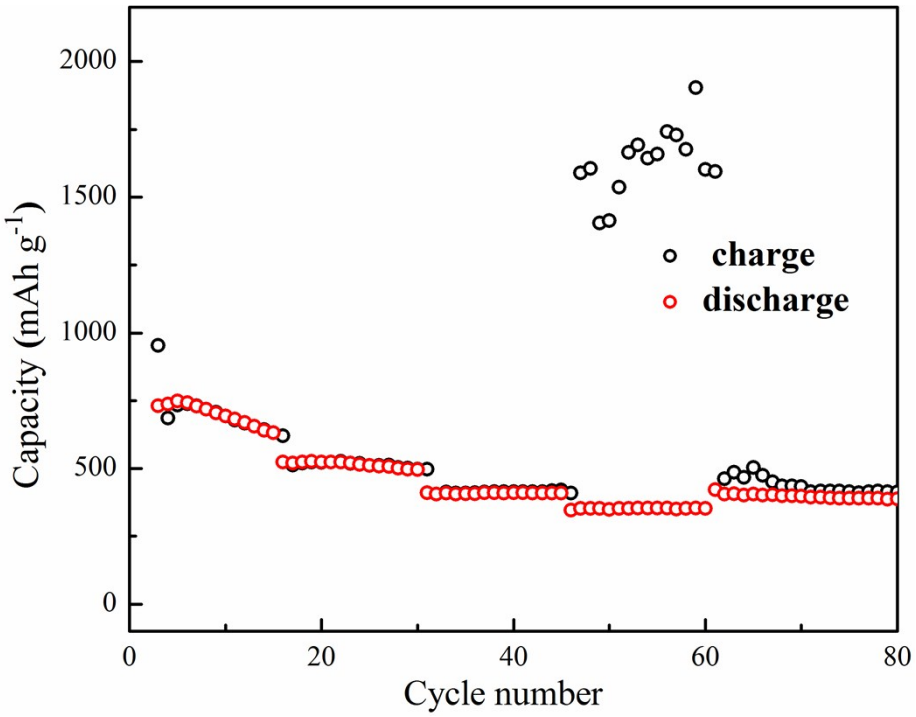


Fig. S11. Cycle performance of sulfur cathode at various rates with pure carbon microtubes interlayer (1^{st}-15^{th}: 0.5C; 16^{th}-30^{th}: 1C;31^{th}-45^{th}: 2C;46^{th}- 60^{th}: 4C; 60^{th}-80^{th}: 2C).

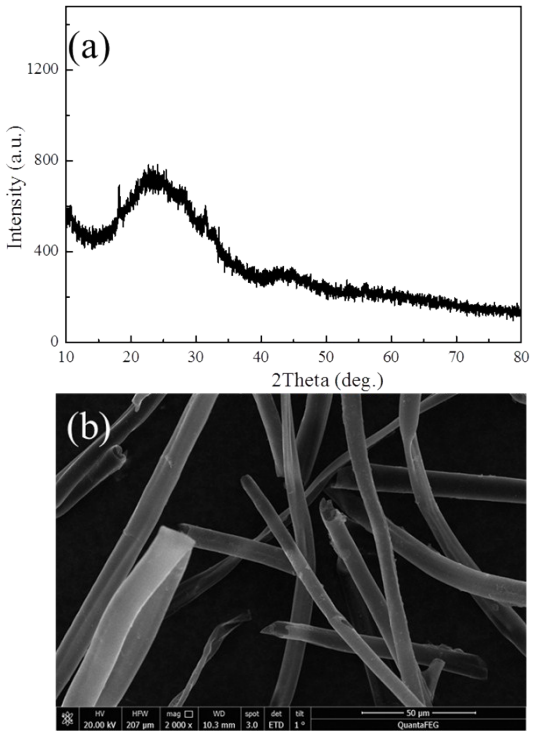


Fig. S12 XRD pattern (a) and SEM image (b) of the B_2O_3/carbon microtubes composite after washing B_2O_3.

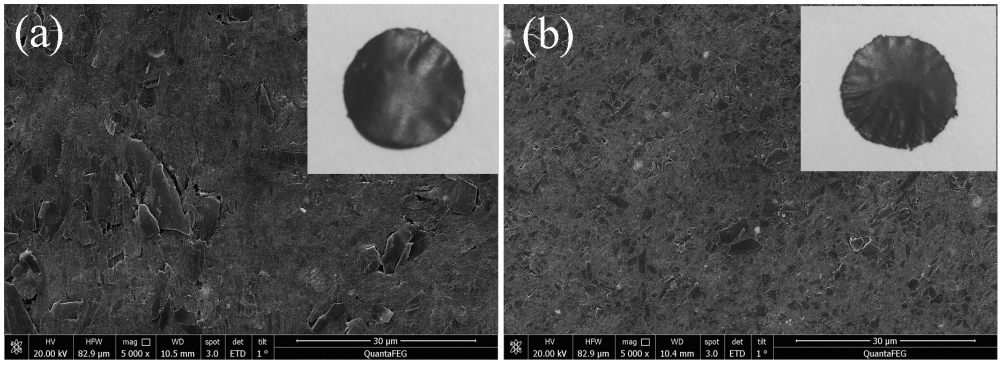


Fig. S13 SEM images of the compressing pieces of interlayer. (a) B_2O_3/carbon microtubes composite; (b) carbon microtubes.