Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.
This journal is © The Royal Society of Chemistry 2016

Supporting information

Hierarchical TiO_2 spheres assistedwith graphene for high performance lithium-sulfur battery

Lin Gao [a], Minglei Cao [a], Yong Qing Fu [b], Zhicheng Zhong [c], Yan Shen [a], and Mingkui Wang [a*]

[a] Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Luoyu Road 1037, Wuhan 430074, China

[b] Department of Physics and Electrical Engineering, Faculty of Engineering and Environment, Northumbria University, Newcastle Upon Tyne, NE1 8ST, UK

[c] Hubei Key Laboratory of Low Dimensional Optoelectronic Material and Devices, Hubei University of Art and Science, Longzhong Road 296, Xiangyang, 441053, China

Corresponding author: mingkui.wang@mail.hust.edu.cn

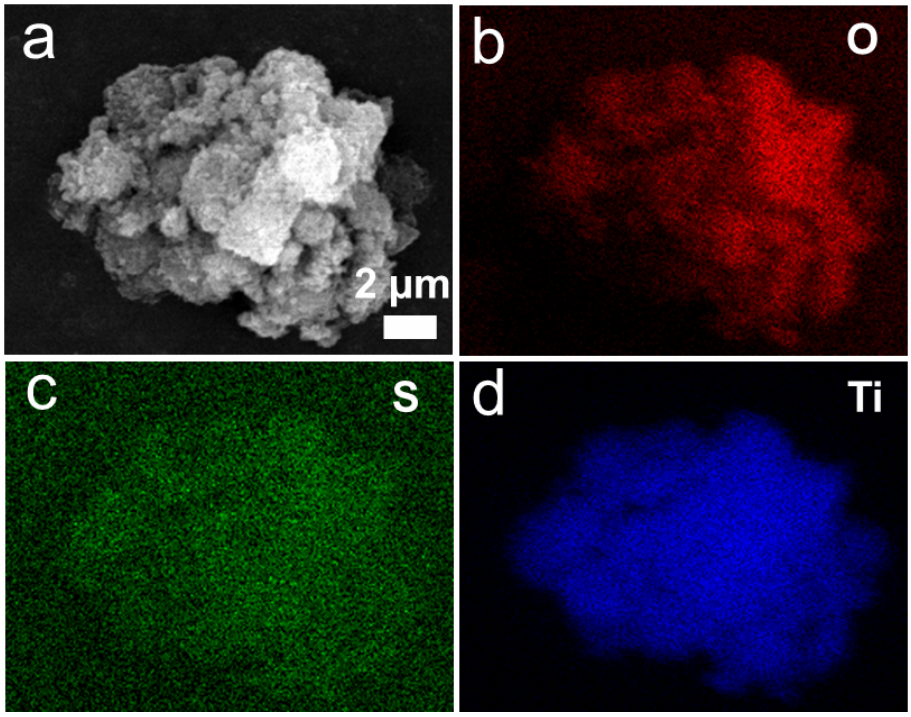

Figure S1. (a) SEM image of the TiO_2-S (TS) and the corresponding EDS mapping for element of (b) O, (c) S and, (d) Ti, respectively.

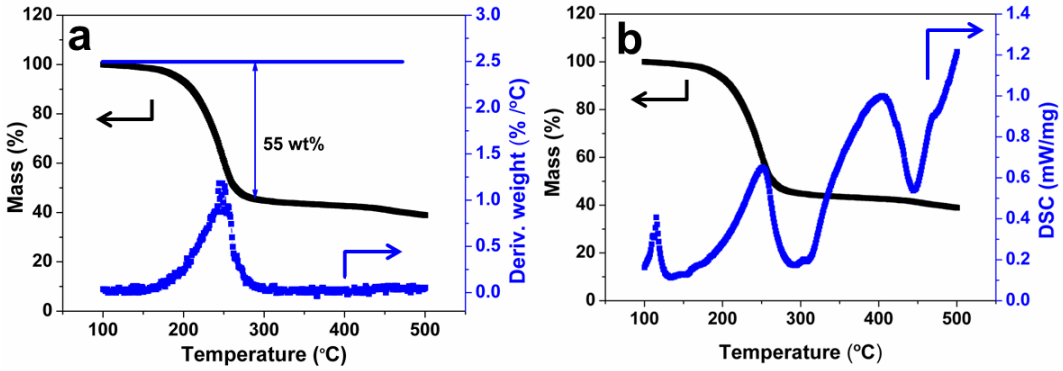

Figure S2. (a) TG and DTG curves of GTS, (b) TG and TGA-DSC curves of GTS. The weight of sulfur in the GTS is approximately 55 wt% (Fig. S2a),[1,2] The weight loss between 295 ^{o}C and 500 ^{o}C could be mainly attributed to the pyrolysis of oxygen containing functional groups in GTS.[3] There are three endothermic peaks in DSC curve which can be attributed to the melt of sulfur, the sublimation of sulfur and the pyrolysis of oxygen containing functional groups in 120 ^{o}C, 270 ^{o}C and 420 ^{o}C.[3,4]

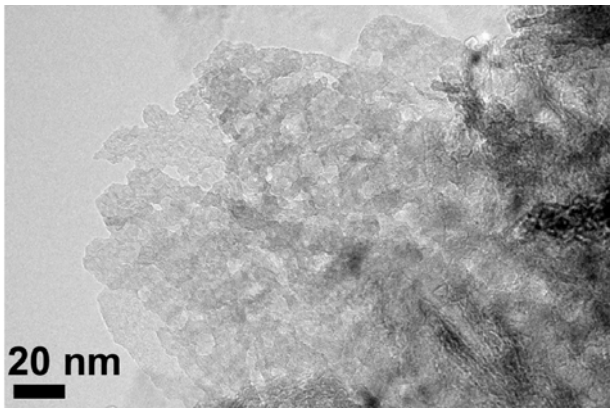

Figure S3. High magnification image of the TiO_2 nanoflake with abundant mesopores.

Figure S4. Photographs of the disassembled cells corresponding to (a) the CS, (b) the TS and (c) the GTS electrodes.

References

1. Z. Li, Y. Jiang, L. Yuan, Z. Yi, C. Wu, Y. Liu, P. Strasser, Y. Huang, *ACS Nano,* 2014, **8**, 9295-9303.
2. H. Peng, J. Liang, L. Zhu, J. Huang, X. Cheng, X. Guo, W. Ding, W. Zhu, Q. Zhang, *ACS Nano,* 2014, **8**, 11280-11289.
3. Z. Li, C. Li, X. Ge, J. Ma, Z. Zhang, Q. Li, C. Wang, L. Yin, *Nano Energy*, 2016, **23**, 15-26.
4. Y. An, W. Song, P. Wei, M. Fan, H. Chen, Q. Ju, D. Chen, G. Tian, C. Lv , K. Shu, *Renew Energy,* 2016, **99**, 289-294.