

## Supporting Information for

### Litchi-like $\text{TiO}_2@\text{TiN}$ dual-function composite material for lithium-sulfur

#### battery

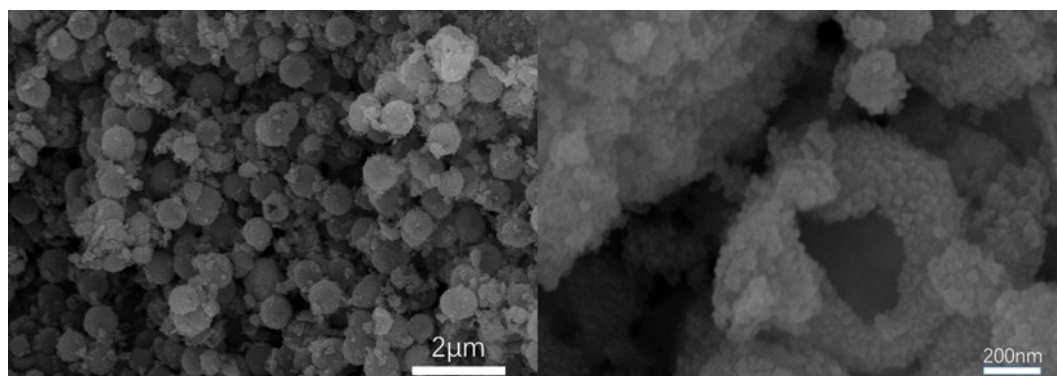
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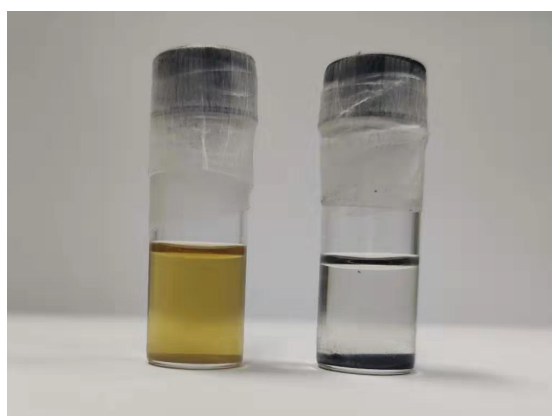
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E-mail addresses: csc@buaa.edu.cn (Shichao Zhang); xingyalan@buaa.edu.cn (Yalan Xing).

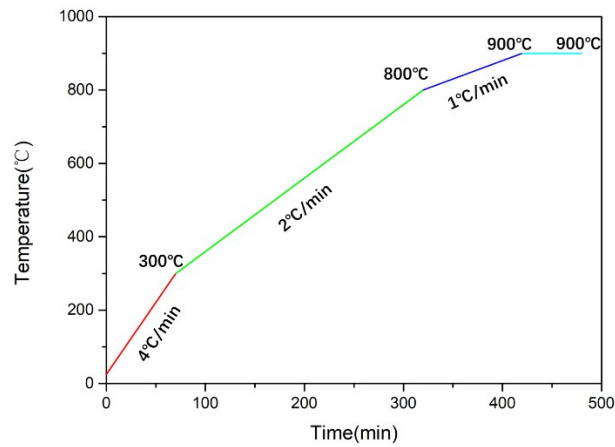
Tel: +8601082339319; fax: +8601082338148.



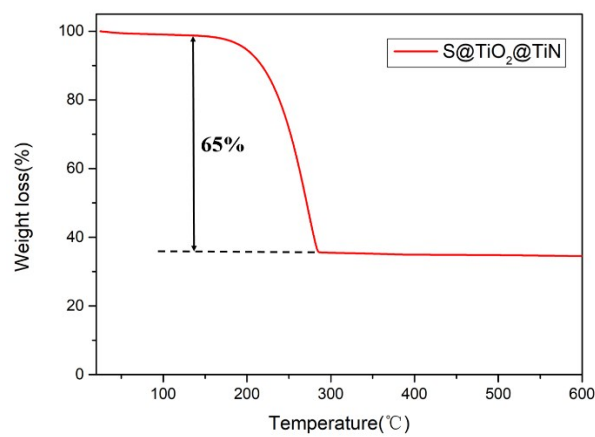
**Fig. S1** SEM images of broken LTTHS



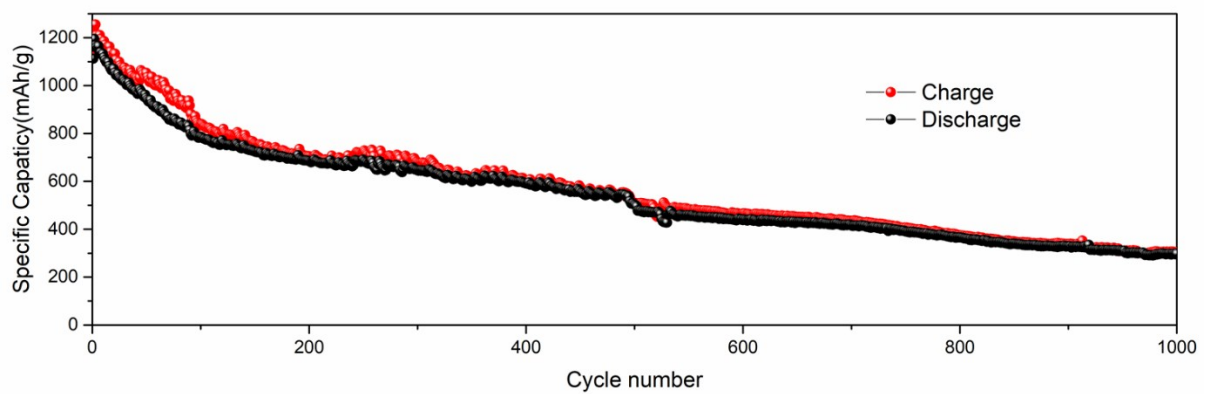
**Fig. S2** Static adsorption of  $\text{Li}_2\text{S}_6$  by LTTHS materials.



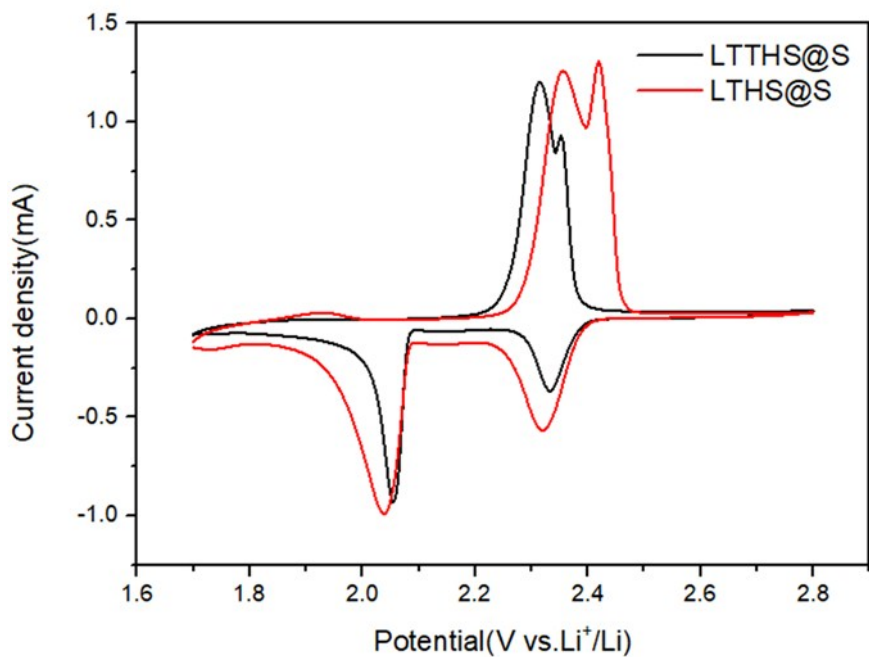
**Fig. S3** Heating rate



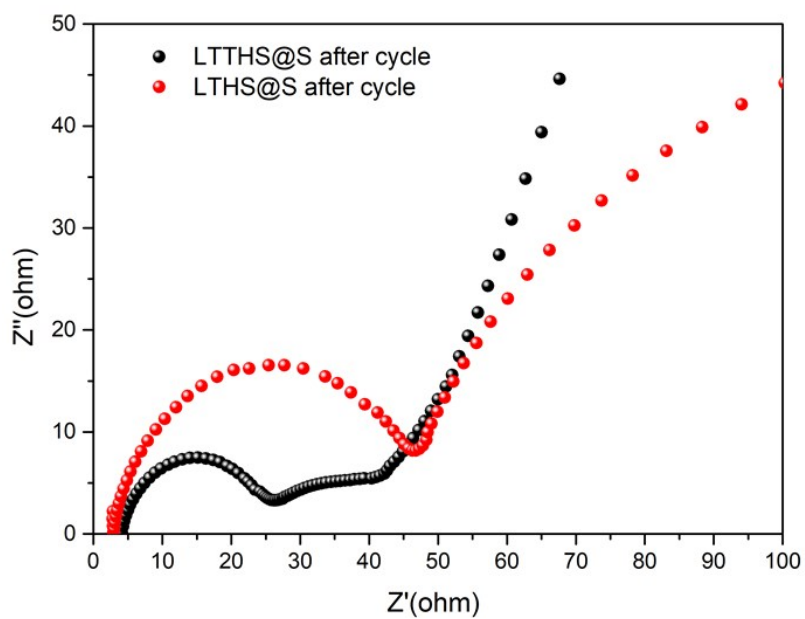
**Fig. S4** TGA curves of S@TiO<sub>2</sub>@TiN



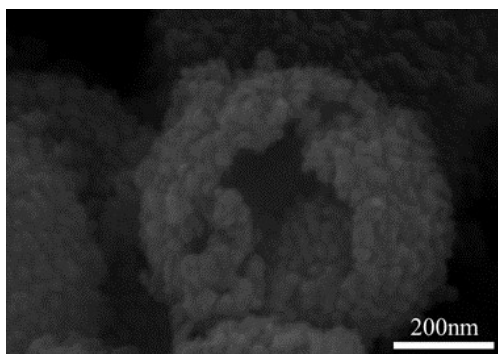
**Fig. S5** Cycle performance of LSTHS over 1000 cycles at 0.2 C.



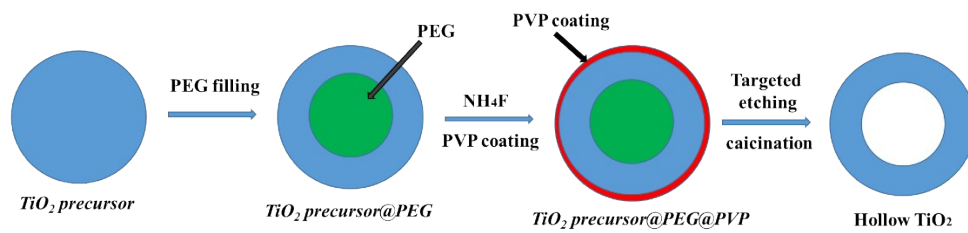
**Fig. S6** CV profiles of LTTHS@S and LTHS@S at a scan rate of  $0.1 \text{ mV s}^{-1}$ .



**Fig. S7** Electrochemical impedance spectra of LTTHS@S and LTHS@S after cycle.



**Fig. S8** SEM images of the TiN sample



**Fig. S9** Schematic illustration of formation of hollow structures of TiO<sub>2</sub> spheres