Supporting information

SnO_2 as High-efficiency Polysulfide Trap in Lithium-Sulfur Battery

Jing Liu, Lixia Yuan*, Kai Yuan, Zhen Li, Zhangxiang Hao, Jingwei Xiang, and Yunhui Huang*

State Key Laboratory of Material Processing and Die & Mould Technology, School of Materials Science and Engineering, Huazhong University of Science and Technology, Wuhan, Hubei 430074, China.

*Corresponding author. Tel.: +86 27 87558241. E-mail: yuanlixia@hust.edu.cn (L.X. Yuan); huangyh@hust.edu.cn (Y.H. Huang).

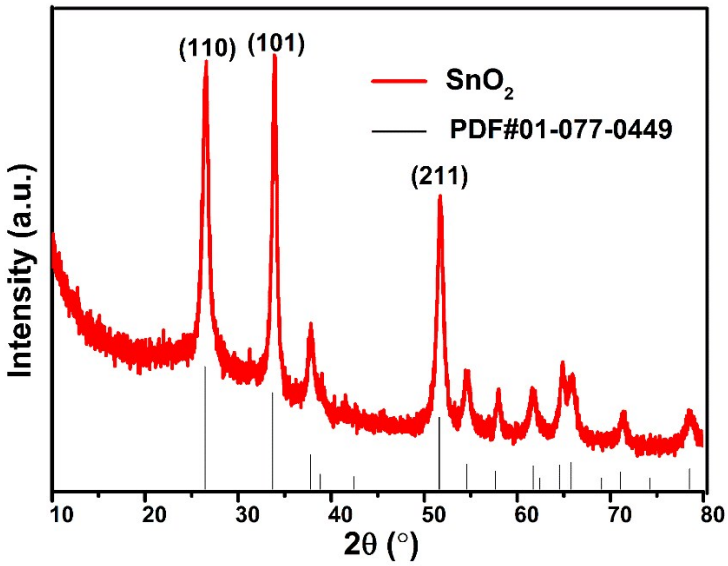

Figure S1. XRD pattern of ethanol-thermal method synthesized pure SnO_2

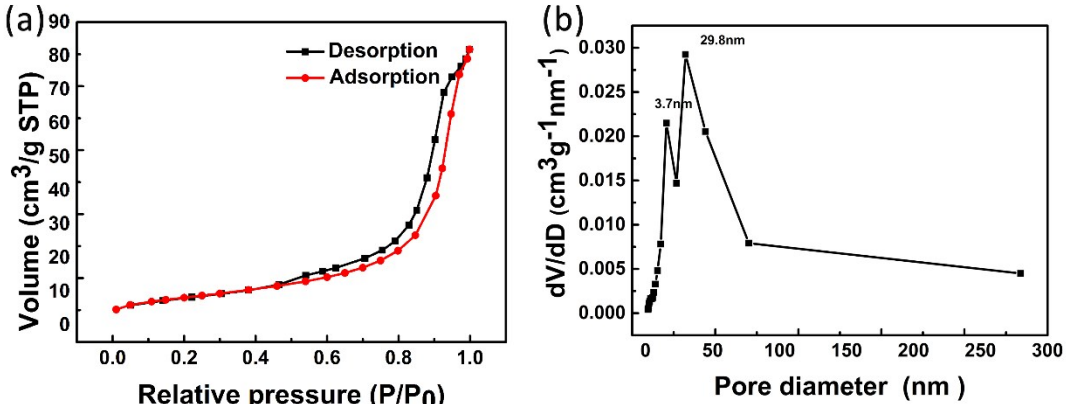

Figure S2. (a) BET isotherm curve and (b) pore size distribution of synthesized SnO_2.

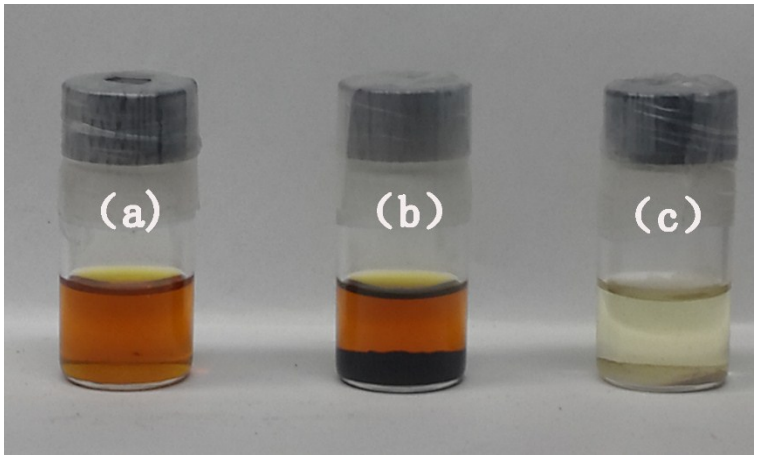

Figure S3. A visualized experiment to exhibit the adsorption ability of SnO_2. (a), pristine Li_2S_4 solution; (b), the solution with Super P; (c), the solution with SnO_2.

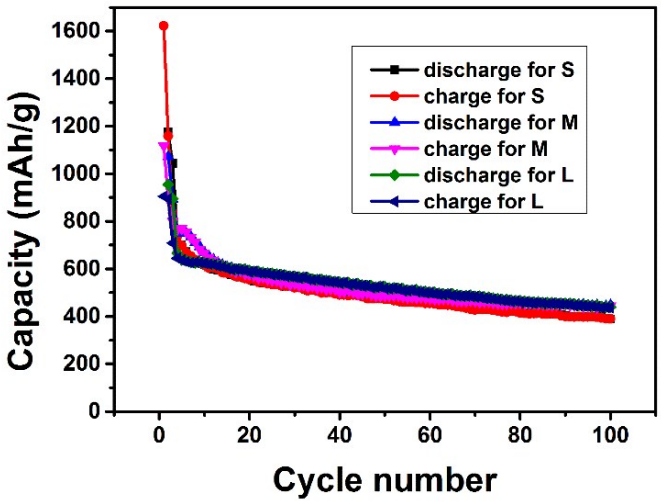

Figure S4. Cycle performance of coin cells with different sized cathodes

Positive electrode with the same mass loading (2 mg_{sulfur} cm^{2-}) but different diameters varied from 8 mm to 12 mm and 15mm, denoted as S (small electrode), M (middle electrode), L (large electrode)，were used to assemble the coin cells with the modified separators of the same size (19 mm).

The positive electrode was constructed by 50% sulfur, 40% Super P, 10% PVDF binder, with a mass loading of ~2mg cm^{-2}. The Φ19mm membrane was modified by a carbon layer consist of 90% Super P and 10% PVDF binder. The ration of electrolyte to sulfur is 40μl/mg. The coin cell was galvanostatically cycled between 1.7-2.8 V at 0.1 C for first two cycles (activation procedure) and then 1.5-3 V at 1 C. It shows that when the modified separator keeps unchanged, and the diameter of cathode varies, the absolute weight proportion of carbon layer changes correspondingly, but no obvious difference can be observed in the cycle stability.

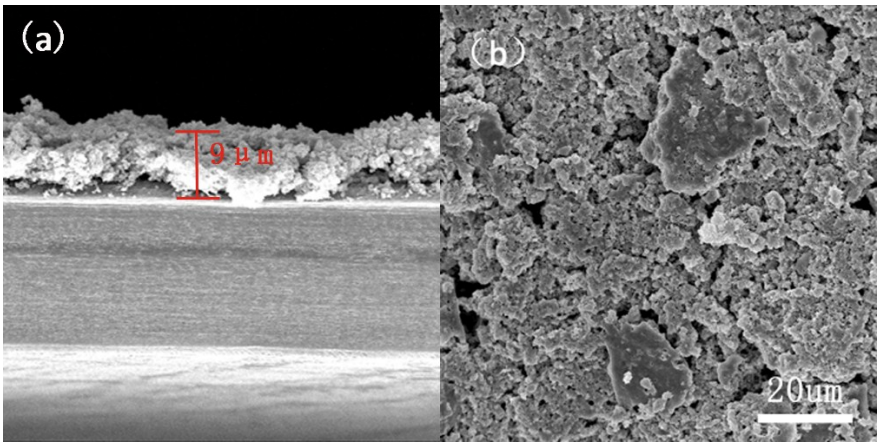

Figure S5. (a) Section view and (b) front view of the membrane modified by and HPC@SnO_2

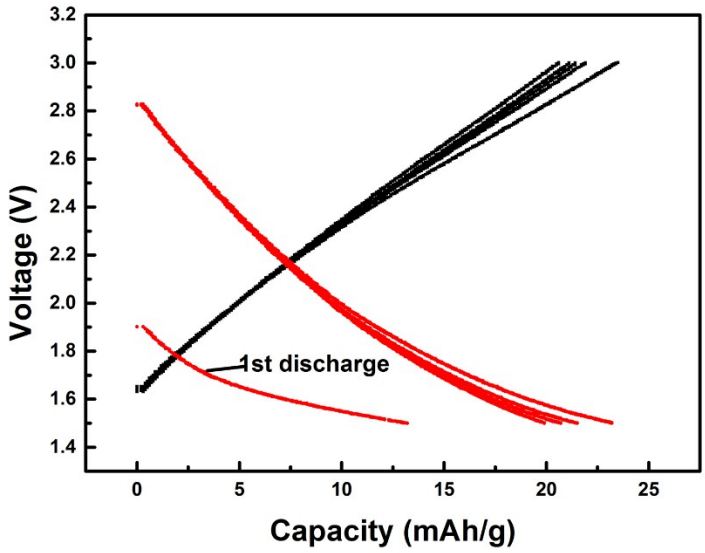

Figure S6. Discharge-charge profile of pure HPC@SnO_2 cathode at a current density of 100 mAh g^{-1} SnO_2

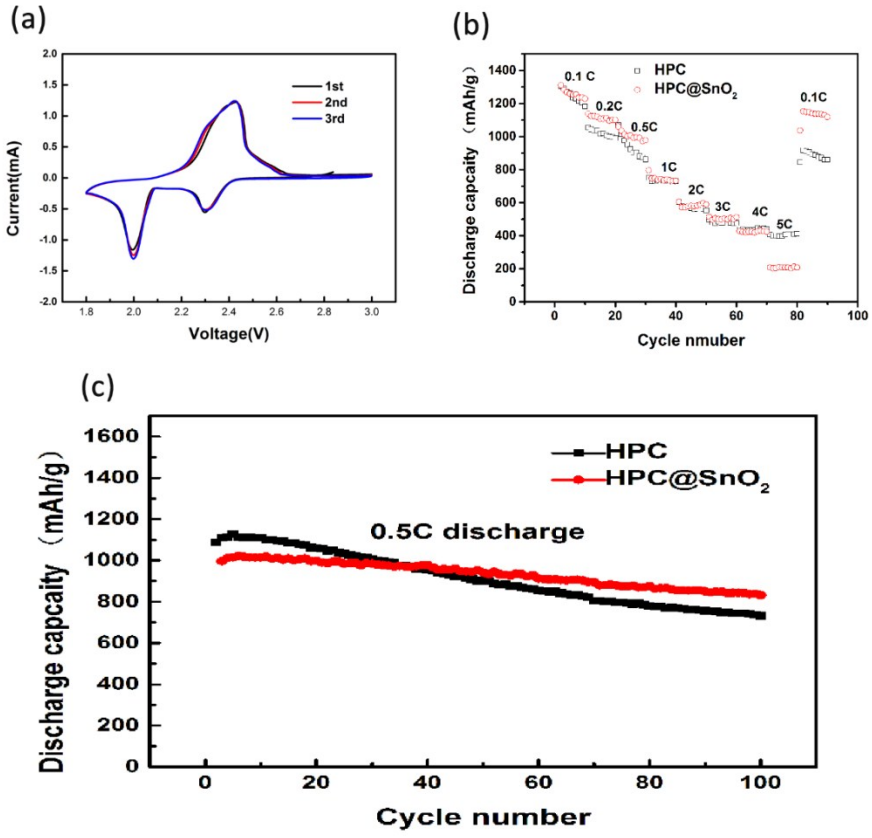

Figure S7. The electrochemical performance of HPC and HPC@SnO_2 modified membrane: (a), CV curve of HPC@SnO_2 modified membrane; (b), rate performance of HPC and HPC@SnO_2 modified membrane; (c), cycle performance of HPC-modified membrane and HPC@SnO_2-modified membrane at 0.5 C.

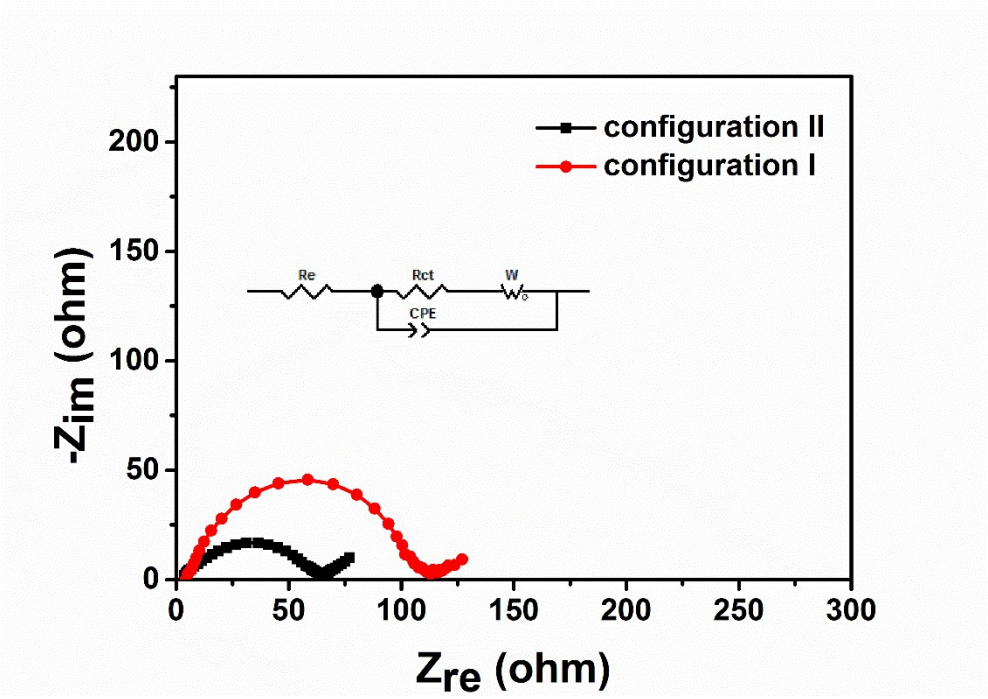

Figure S8. Nyquist plots for configuration II and configuration I in the frequency range of 100 mHz to 100 kHz cycling