

## Supporting Information

### **Uniform lithium deposition induced by $\text{ZnF}_x(\text{OH})_y$ for high performance sulfurized polyacrylonitrile-based lithium-sulfur batteries**

Wanming Teng<sup>1,2</sup>, Yanyan Li<sup>3</sup>, Ting Ma<sup>1,2</sup>, Xiuyun Ren<sup>4</sup>, Ding Nan<sup>1,2\*</sup>, Jun Liu<sup>2</sup>, Xiaohu Wang<sup>2,5</sup>, Qin Yang<sup>6</sup>, Jiaojiao Deng<sup>6\*</sup>

<sup>1</sup> College of Chemistry and Chemical Engineering, Inner Mongolia University, Hohhot, 010021 China

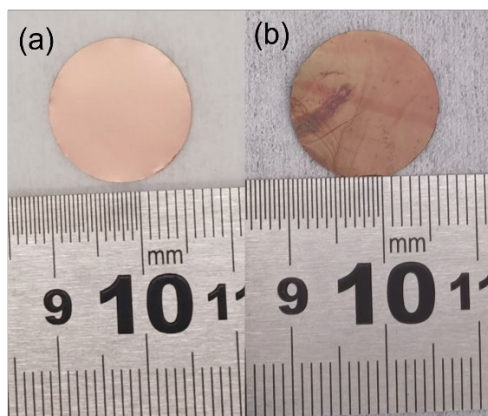
<sup>2</sup> Inner Mongolia Key Laboratory of Graphite and Graphene for Energy Storage and Coating, School of Materials Science and Engineering, Inner Mongolia University of Technology, Hohhot, 010051 China

<sup>3</sup> State Key Laboratory of High-Performance Ceramics and Superfine Microstructures, Shanghai Institute of Ceramics, Chinese Academy of Sciences, 1295 Dingxi Road, Shanghai 200050, People's Republic of China

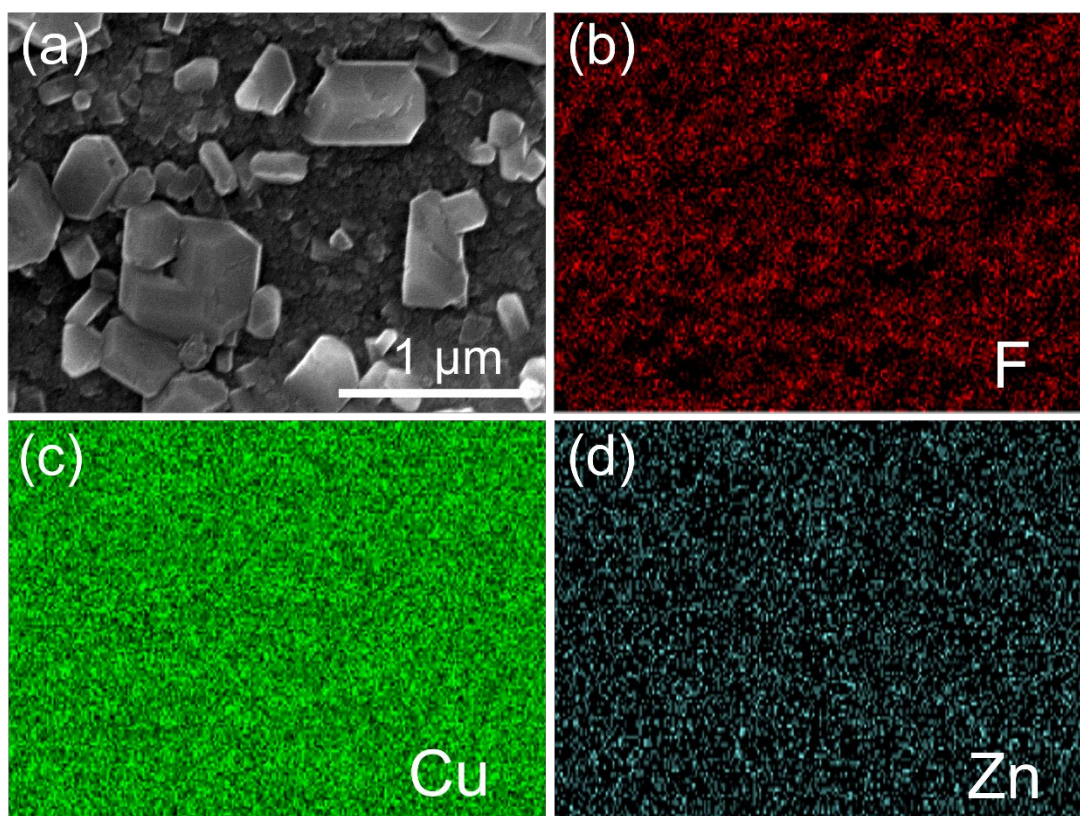
<sup>4</sup> College of Materials Science and Engineering, Qingdao University, Qingdao 266071, China

<sup>5</sup> Rising Graphite Applied Technology Research Institute, Chinese Graphite Industrial Park-Xinghe, Ulanqab, Inner Mongolia, 013650, China

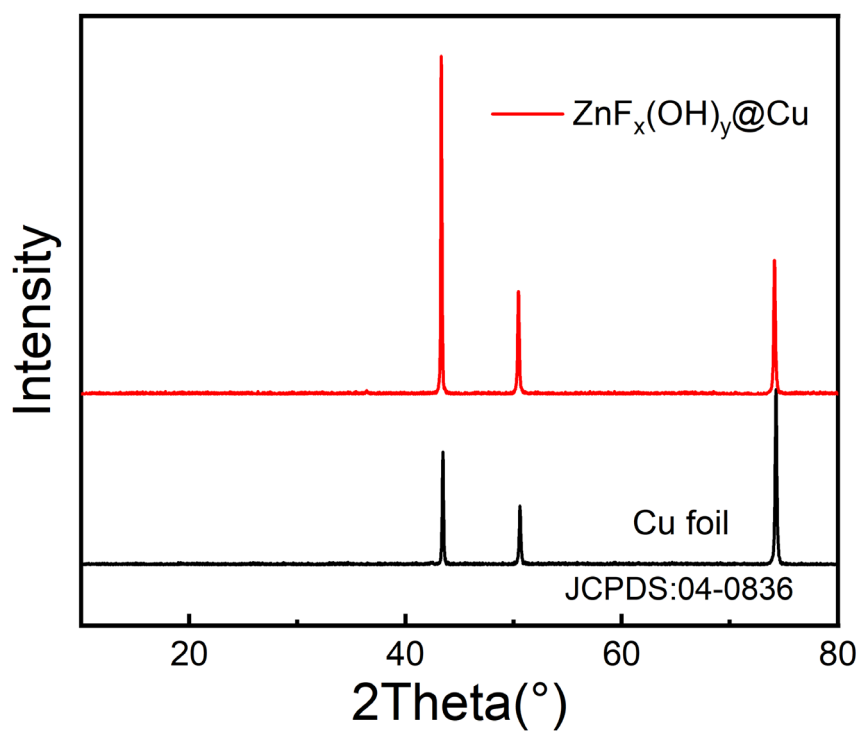
<sup>6</sup> Shenzhen Key Laboratory on Power Battery Safety and Shenzhen Geim Graphene Center, Tsinghua Shenzhen International Graduate School (SIGS), Shenzhen, 518071 China



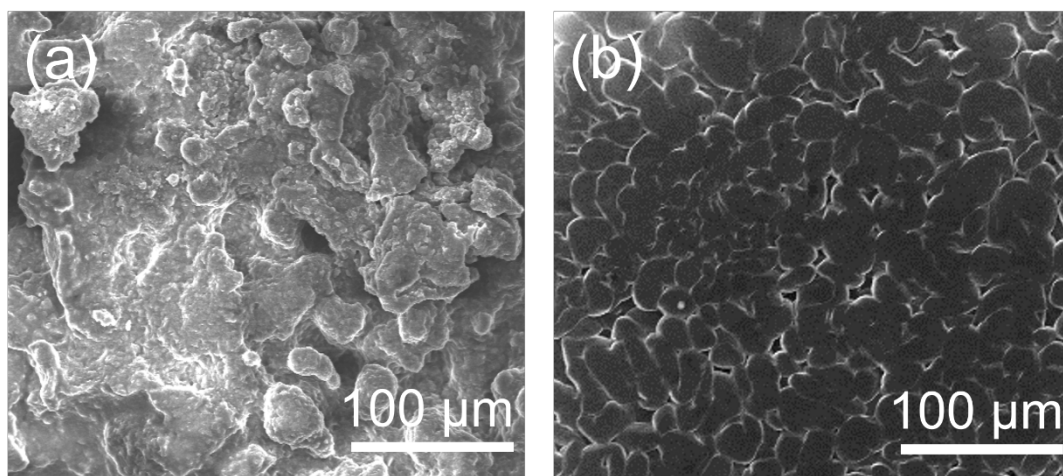
**Figure S1** The Optical photographs of (a) bare Cu foil and (b)  $\text{ZnF}_x(\text{OH})_y@\text{Cu}$ .



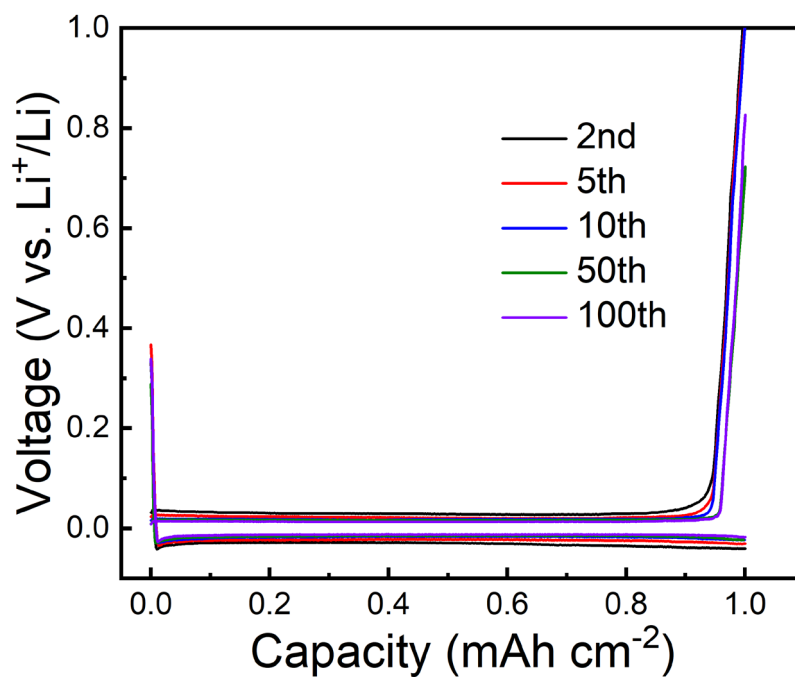
**Figure S2** (a) SEM image of  $\text{ZnF}_x(\text{OH})_y@\text{Cu}$ . (b-d) EDS elemental mapping images of  $\text{ZnF}_x(\text{OH})_y@\text{Cu}$  (fluorine, zinc, copper).



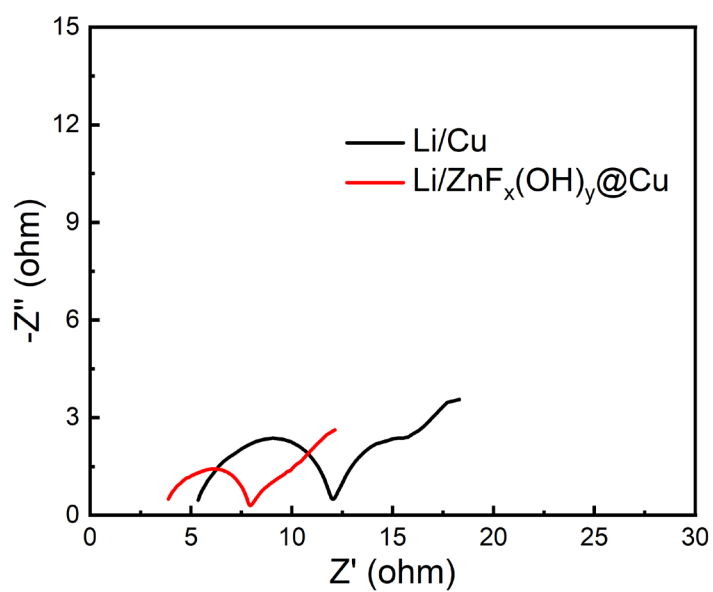
**Figure S3** Comparison of XRD patterns of copper-based current collectors before and after the reaction.



**Figure S4** SEM image after lithium deposition. (a) Bare Cu (b)  $\text{ZnF}_x(\text{OH})_y@\text{Cu}$  (current density:  $0.5 \text{ mA cm}^{-2}$ ; deposition capacity:  $1.0 \text{ mAh cm}^{-2}$ )



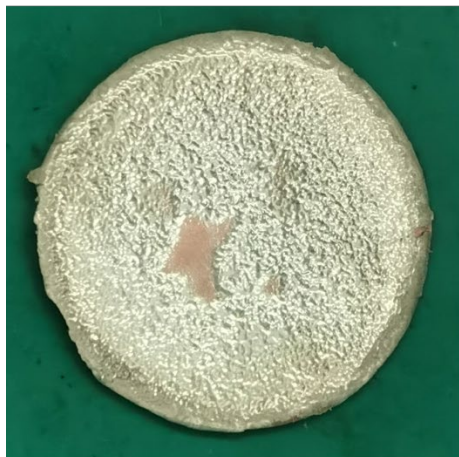
**Figure S5** Electrochemical Li plating/stripping curves of the  $\text{ZnF}_x(\text{OH})_y@\text{Cu}$  at  $0.5 \text{ mA cm}^{-2}$  with a specific capacity of  $1 \text{ mAh cm}^{-2}$ .



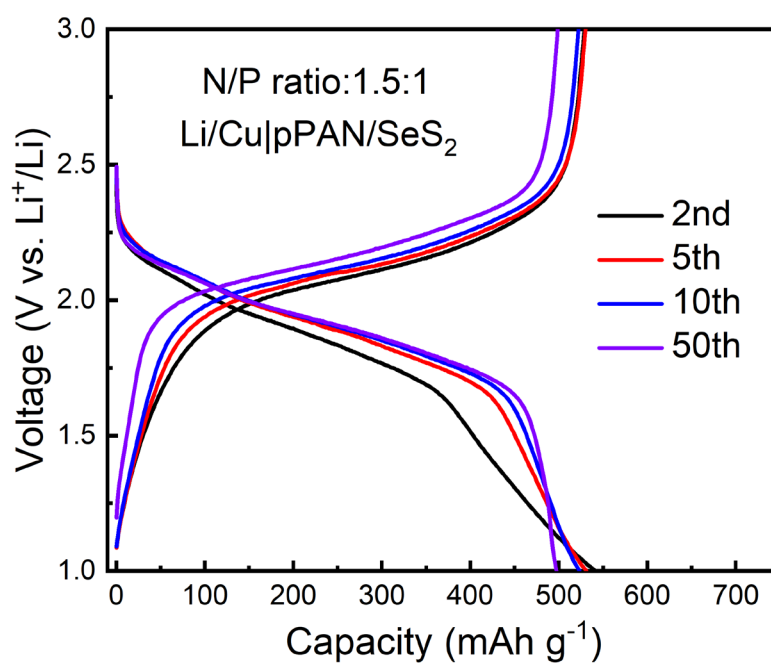
**Figure S6** The EIS plots of the  $\text{ZnF}_x(\text{OH})_y@\text{Cu}$  and bare Cu electrodes after the 5th cycles.

Bare Cu foil

$\text{ZnF}_x(\text{OH})_y@\text{Cu}$



**Figure S7.** Photo images of the bare Cu foil and the  $\text{ZnF}_x(\text{OH})_y@\text{Cu}$  foil after Li deposition at  $6.0 \text{ mAh cm}^{-2}$ .



**Figure S8.** The discharge-charge curves of Li/Cu|pPAN/SeS<sub>2</sub> full-cell at  $0.1 \text{ A g}^{-1}$ .