

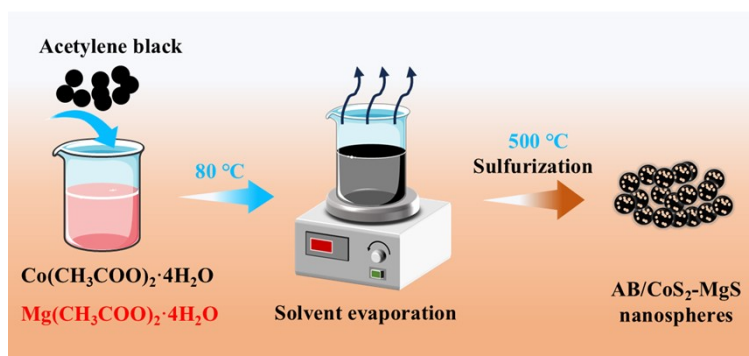
## Supporting Information

### **Accelerating Sulfur Conversion Kinetics via CoS<sub>2</sub>-MgS Heterostructure for Lithium Sulfur Batteries**

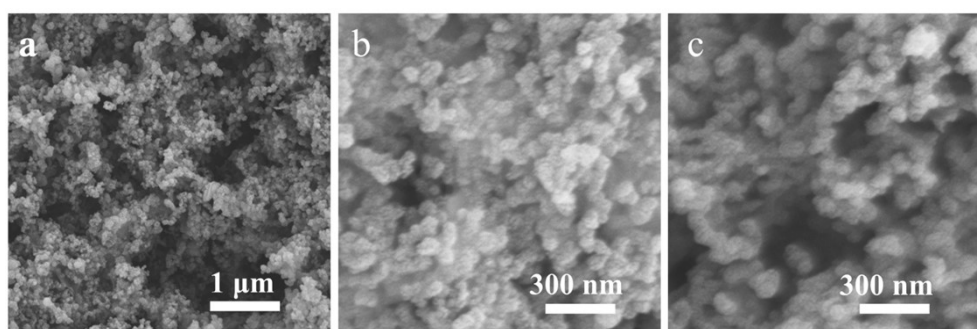
Xinliang Men, Teng Deng, Jiangxuan Che, Juan Wang\*

School of Mechanical and Electrical Engineering, Xi'an University of Architecture  
and Technology, Xi'an, Shaanxi, 710311, China.

E-mail: [juanwang168@gmail.com](mailto:juanwang168@gmail.com)

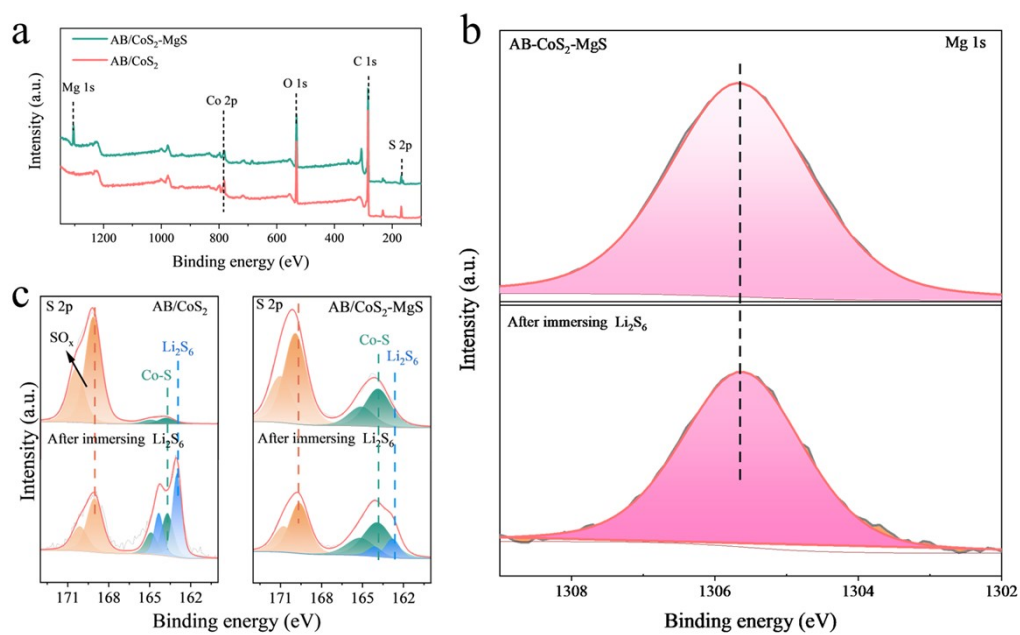


**Fig. S1.** The synthetic scheme of AB/CoS<sub>2</sub>-MgS.

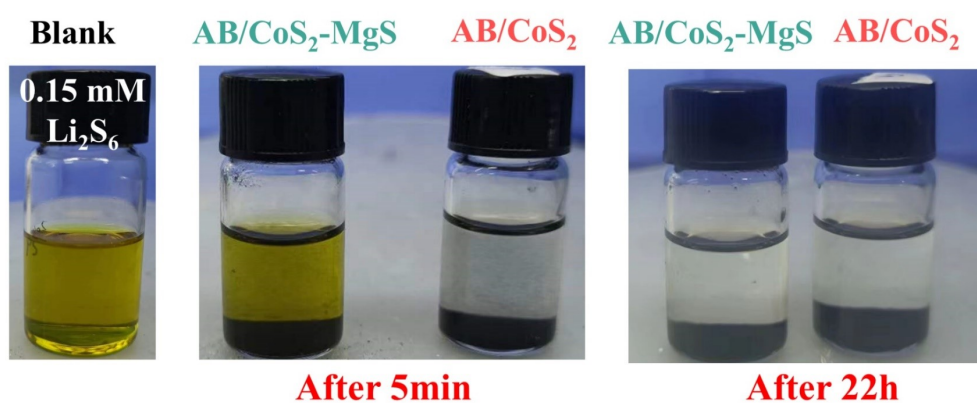


**Fig. S2.** SEM images of (a) AB/CoS<sub>2</sub>, higher resolution (b) AB/CoS<sub>2</sub> and (c)

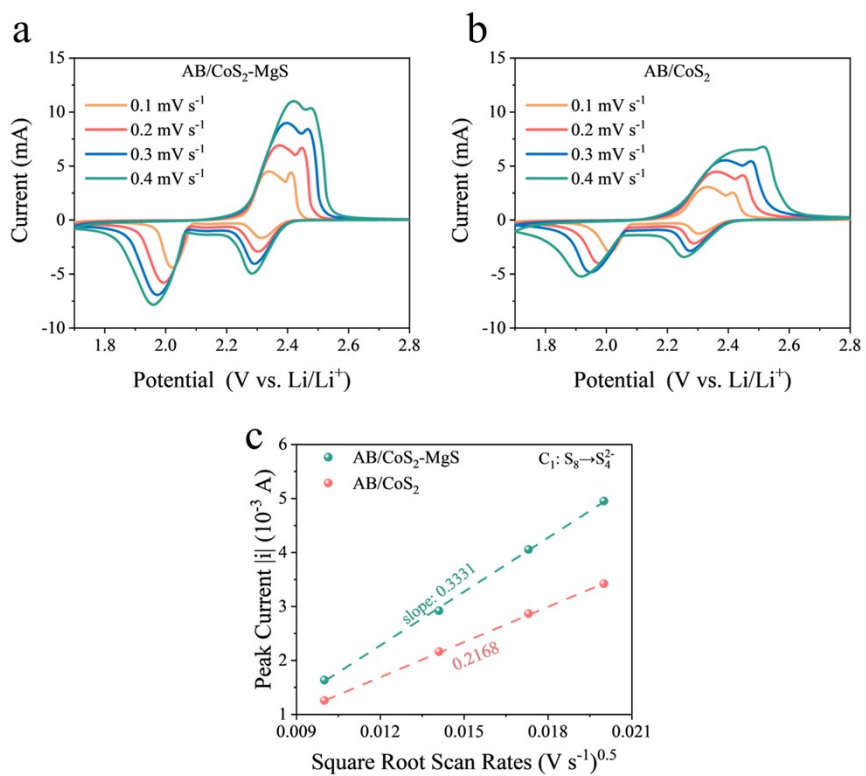
AB/CoS<sub>2</sub>-MgS



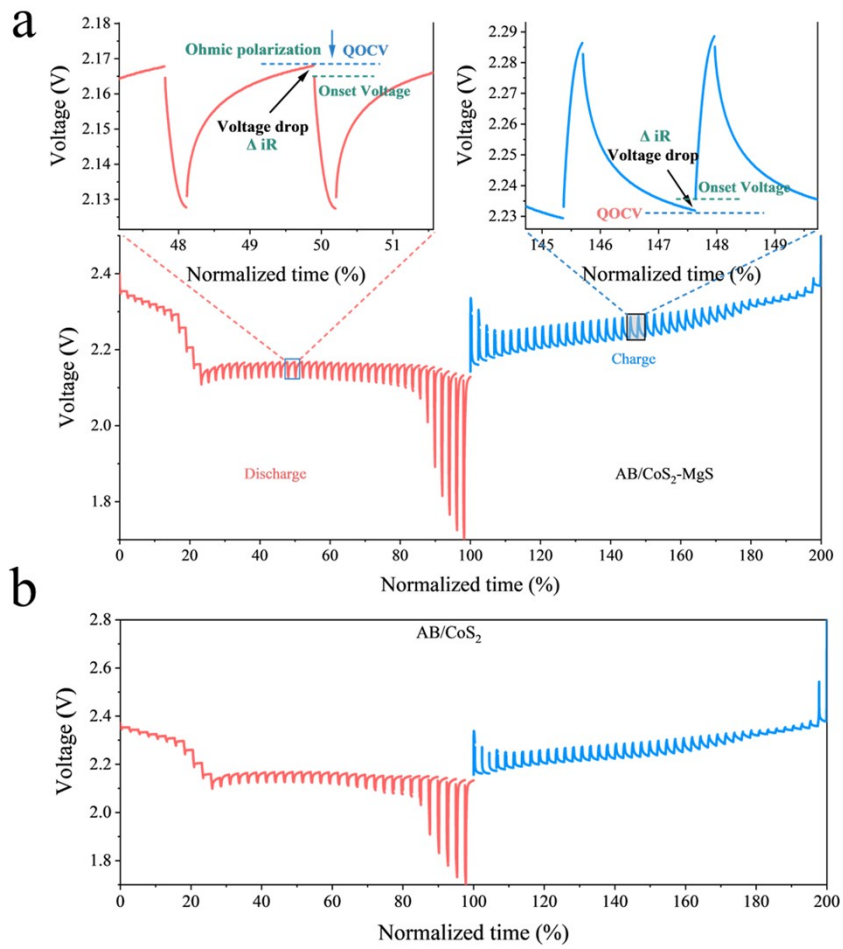
**Fig. S3.** (a) XPS full spectrum of AB/CoS<sub>2</sub>-MgS and AB/CoS<sub>2</sub>. (b) Mg 1s spectra of AB/CoS<sub>2</sub>-MgS before and after immersion in Li<sub>2</sub>S<sub>6</sub>. (c) S 2p spectra of AB/CoS<sub>2</sub> and AB/CoS<sub>2</sub>-MgS before and after immersion in Li<sub>2</sub>S<sub>6</sub>



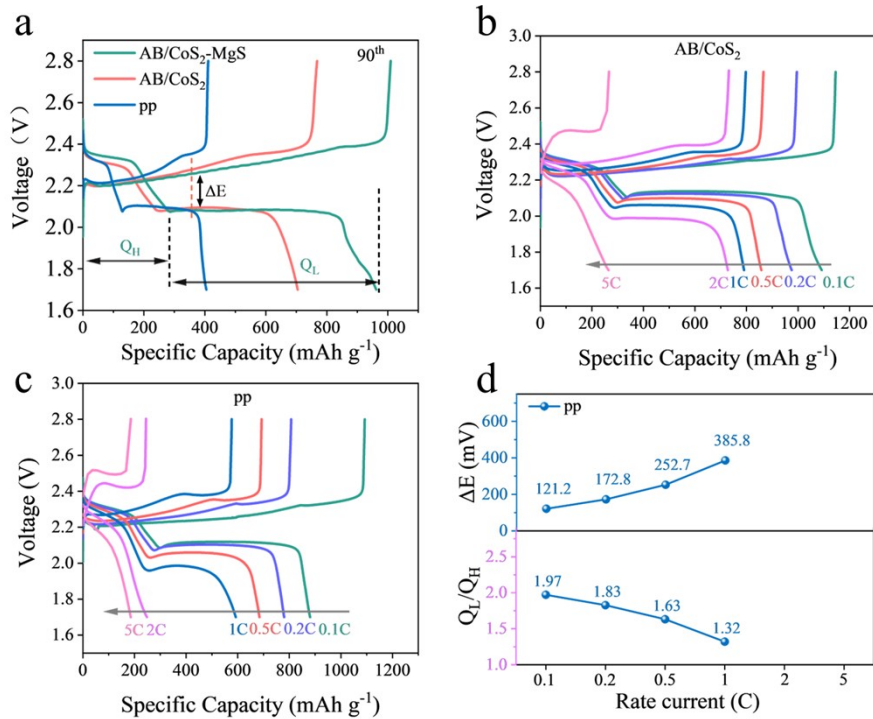
**Fig. S4.** Visualized adsorption photos of Li<sub>2</sub>S<sub>6</sub> for AB/CoS<sub>2</sub>-MgS and AB/CoS<sub>2</sub>



**Fig.S5.** CV curves of LBSs with separator coating at various scan rates for (a) AB/CoS<sub>2</sub>-MgS and (b) AB/CoS<sub>2</sub>. (c) Fitted C<sub>1</sub> stage Li-ion diffusion curves for various scan rates.



**Fig. S6.** GITT curves of LSBs with (a) AB/CoS<sub>2</sub>-MgS and (b) AB/CoS<sub>2</sub> separator coating during charge-discharge.



**Fig. S7.** The voltage versus specific capacity curves for batteries at (a) 0.2 C at 90th cycle. The charge-discharge curve of batteries with (b) AB/CoS<sub>2</sub> separator coating and (c) unmodified pp separator at C-Rate. (d) Scatter plots of voltage gap and Q<sub>L</sub>/Q<sub>H</sub> for battery with pp separator at various C-rate currents.