

Supplementary Information

Integrating Polysulfide Adsorption and Electrocatalysis on a Mineral-Based Separator for High-Rate and Long-Life Li-S Batteries

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Materials

All reagents were analytically pure and could be used without further purification. Natural serpentine was purchased from Xiangxi City, Hunan Province, China. Hydrochloric acid (HCl, 37%), N-methylpyrrolidone (NMP for 99.89%) were purchased from Xilong Science Co. Polyvinylidene fluoride (PVDF, 99.95%) and acetylene black (99.95%) were provided by Cyber Electrochemical Materials Network. Commercial polypropylene (PP) separator (Celgard 2500) was purchased from Celgard, USA. Lithium flakes were obtained from China Energy Lithium Corporation. The electrolyte was 1.0 M Li bis (tri-flu-oro-methanesulphonyl) imide (LiTFSI) dissolved in 1, 3-dioxolane (DOL) and 1, 2-dimethoxyethane (DME) (1:1 by volume) with 1.0 wt.% LiNO₃ as additive.

Supplementary figures

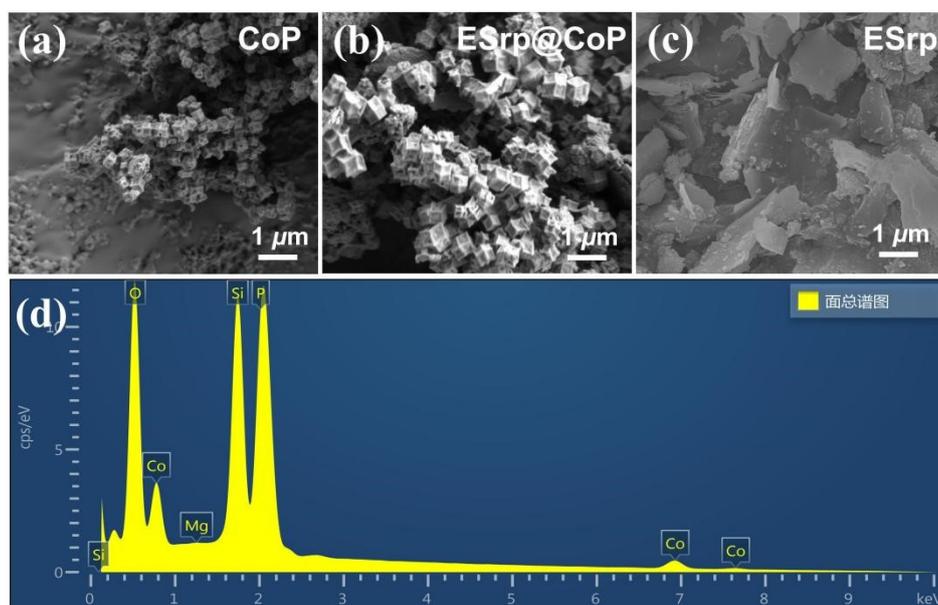


Fig. S1 SEM image of (a) CoP. (b) ESrp@CoP. (c) ESrp. (d) Quantitative EDS elemental analysis of the ESrp@CoP.

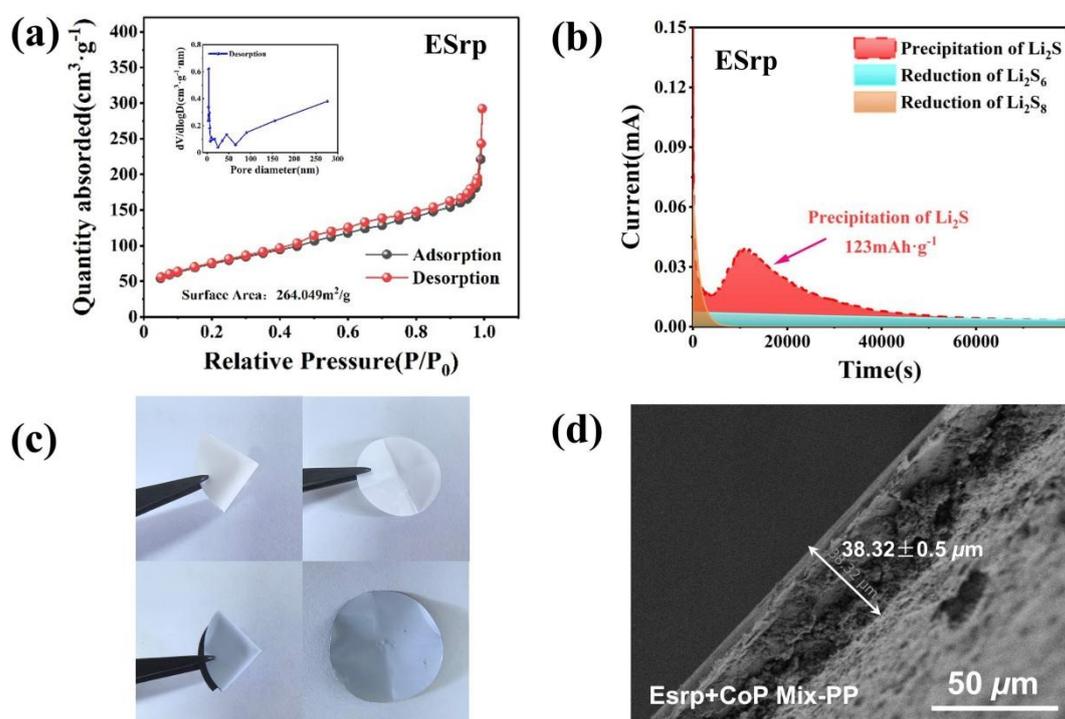


Fig. S2 (a) N₂ adsorption-desorption isotherm and the corresponding pore size distribution curve (inset) of ESrp. (b) Li₂S nucleation test of ESrp. (c) Digital photographs comparing the folding creases on the bare PP separator and the ESrp@CoP-coated separator after a folding-unfolding test. (d) Cross-sectional SEM images of ESrp+CoP Mix-PP

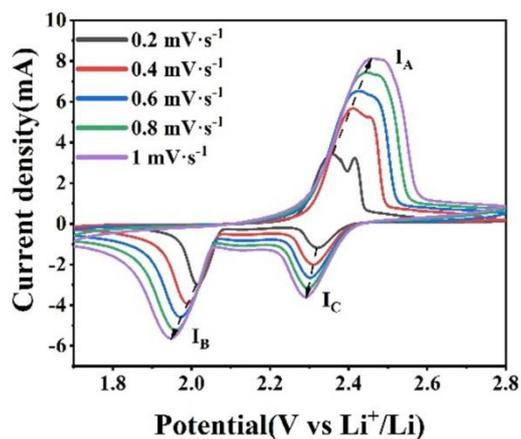


Fig. S3 Cyclic voltammetry (CV) curves of the cell with the ESrp-PP separator at various scan rates.

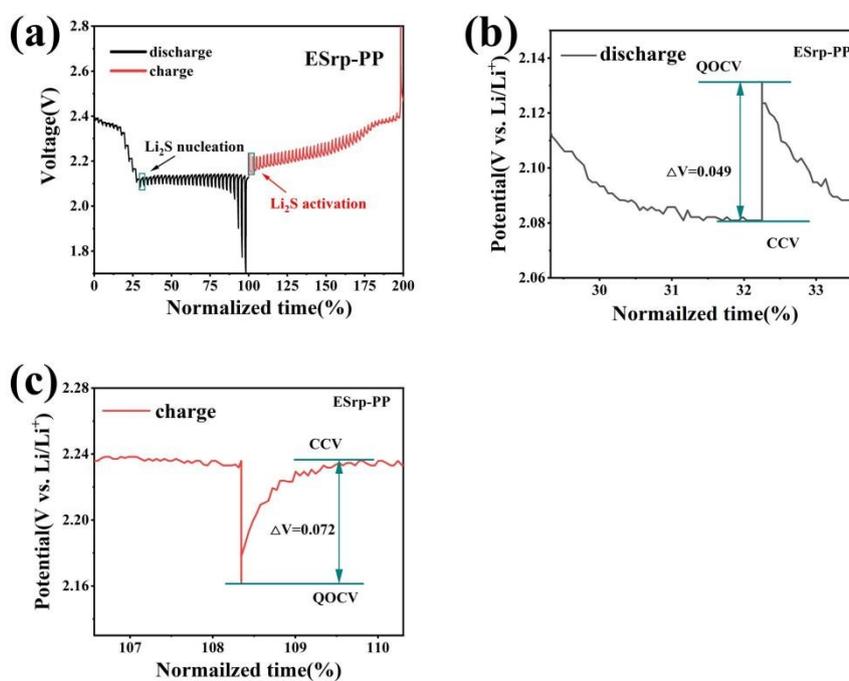


Fig. S4 (a) GITT profile of the ESrp-PP cell. (b) Discharge and (c) charge polarization voltage (ΔV) of the ESrp-PP cell obtained from GITT.

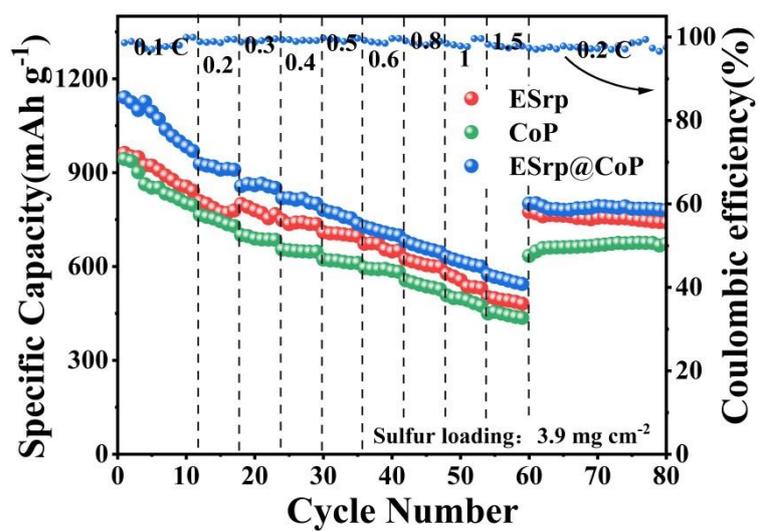


Fig. S5 High sulfur loading rate image

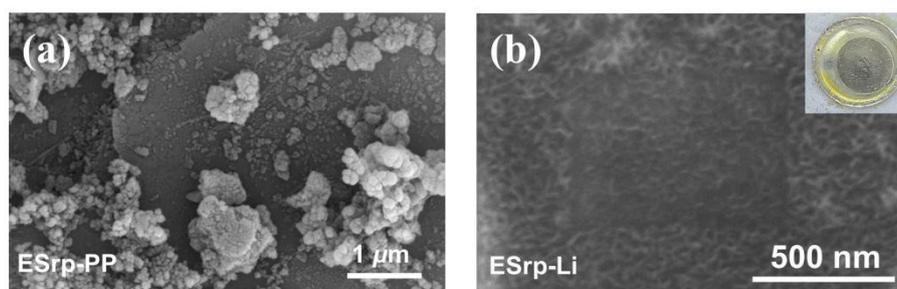


Fig. S6 (a) SEM image of ESrp. (b) Scanning electron microscope images of the ESrp coating on the PP membrane after cycling.