Support Information

An electrolyte additive of bromoxoindole enables uniform Li-ion flux and tunable Li_2S deposition for high-performance lithium-sulfur batteries

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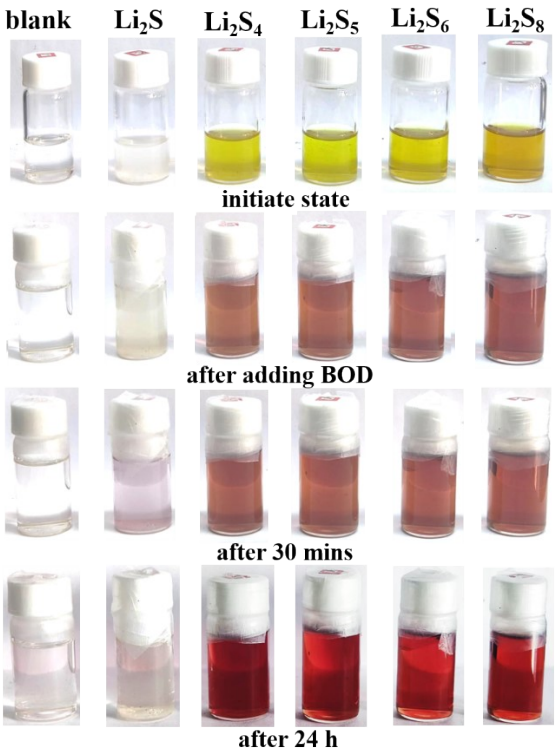

Figure S1. Digital photographs of the Li_2S_n ($4 \leq n \leq 8$) color changes after adding 0.5 wt% BOD for 30 min, 1 h, and 24 h.

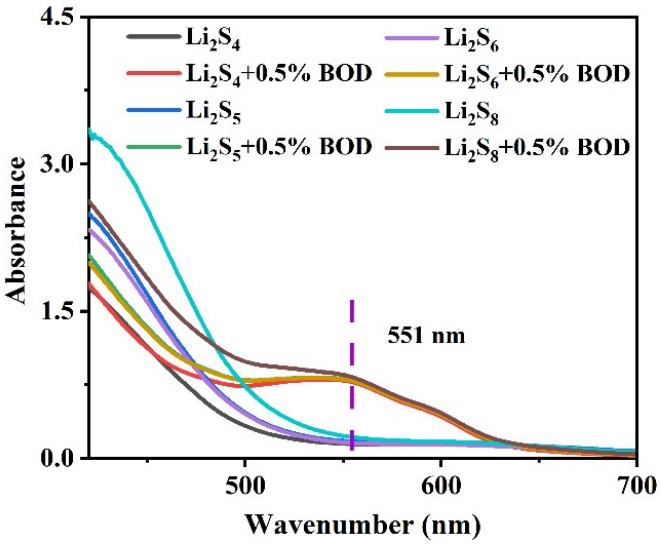

Figure S2. UV-vis spectra of Li_2S_n ($4 \leq n \leq 8$) solution before and after adding 0.5 wt% BOD electrolyte.

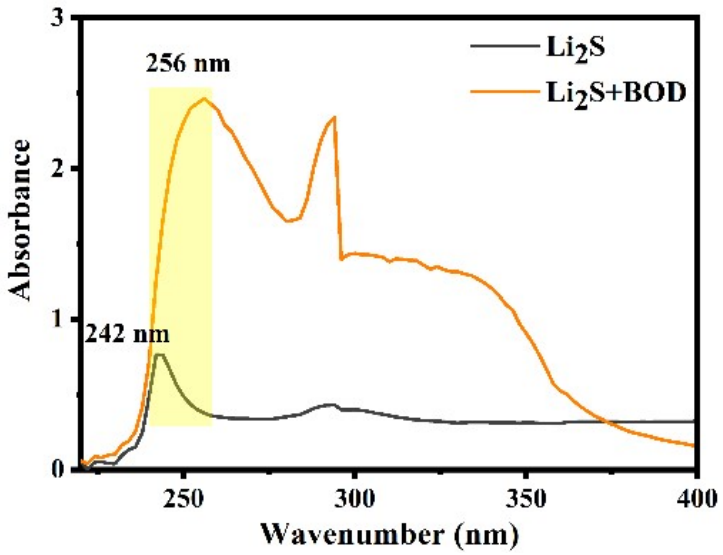

Figure S3. UV-vis spectra of Li_2S solution before and after adding 0.5 wt% BOD electrolyte.

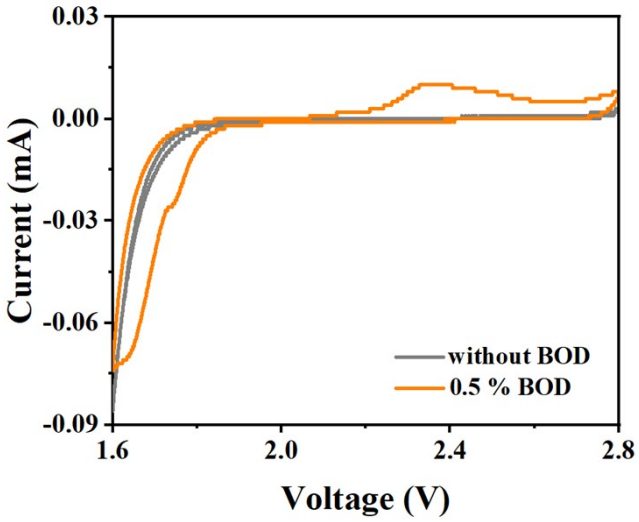

Figure S4. Comparison of CV profiles for the cell with and without 0.5 wt% BOD.

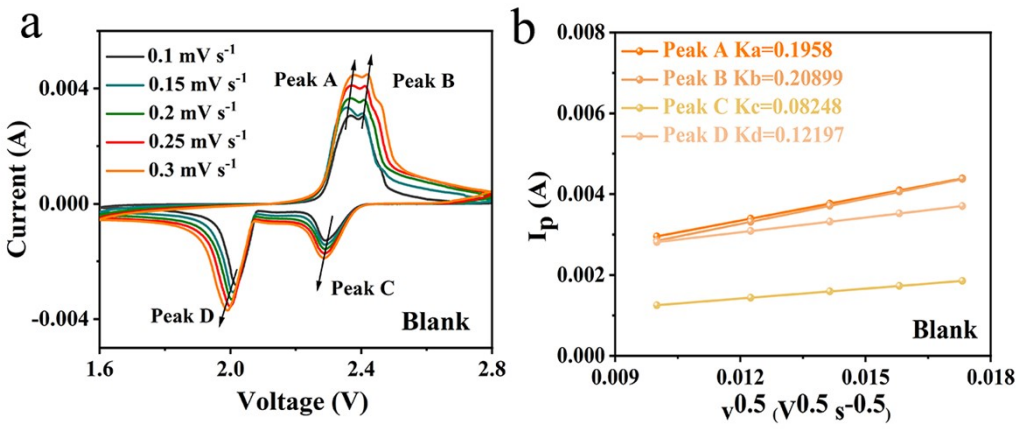

Figure S5. The Li-S battery performance without BOD electrolyte. (a) CV curves at different scanning rates; (b) Linear fits of the peak current and Li^+ diffusion coefficient calculated by the Randles-Sevcik equation.

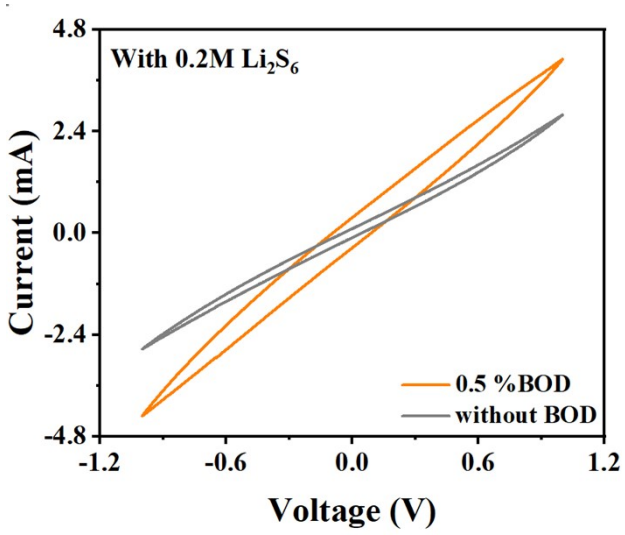

Figure S6. CV profiles in Li_2S_6 symmetric cells with/without BOD at 30 mV s^{-1}.

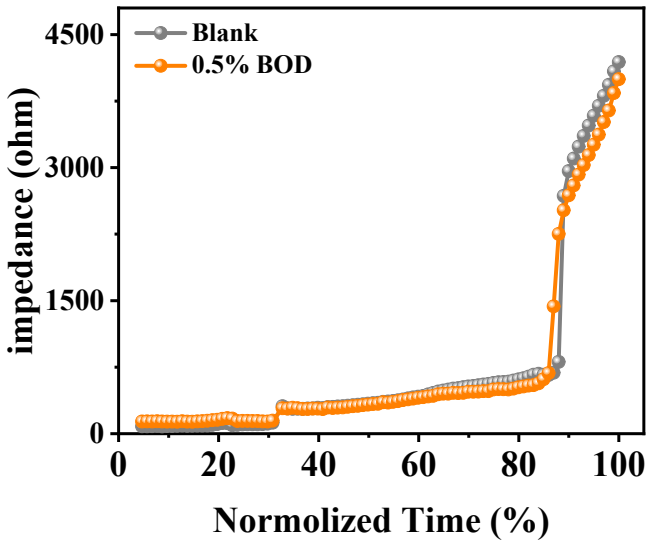

Figure S7. Internal resistance of the cell with and without 0.5 wt% BOD during discharge.

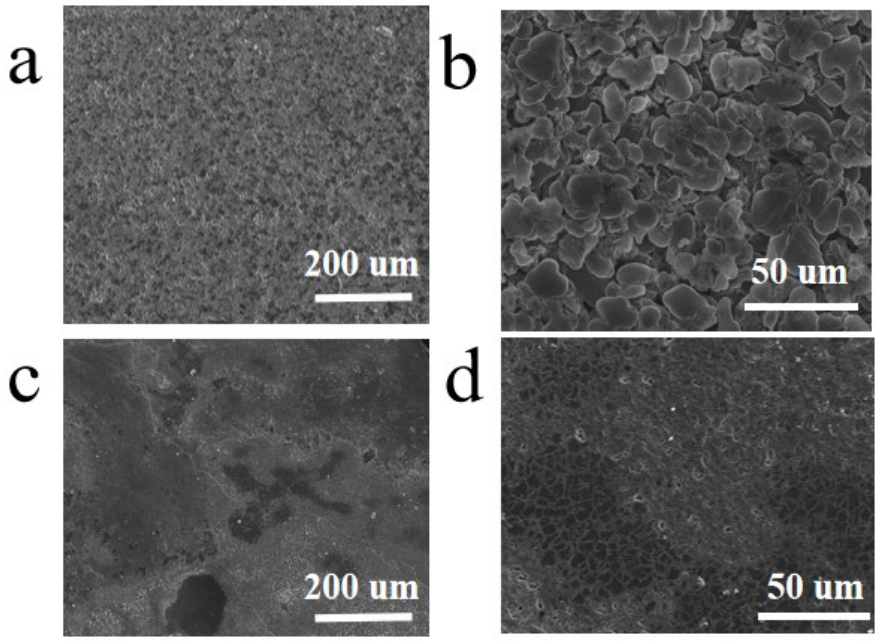

Figure S8. (a-b) SEM photographs of the Li anode after 200 cycles at 0.2 C and -20 ℃; (c-d) SEM images of the Li anode after 140 cycles at 0.2 C with an E/S ratio of 8 μL mg^{-1} and a sulfur loading of 5 mg cm^{-2}.

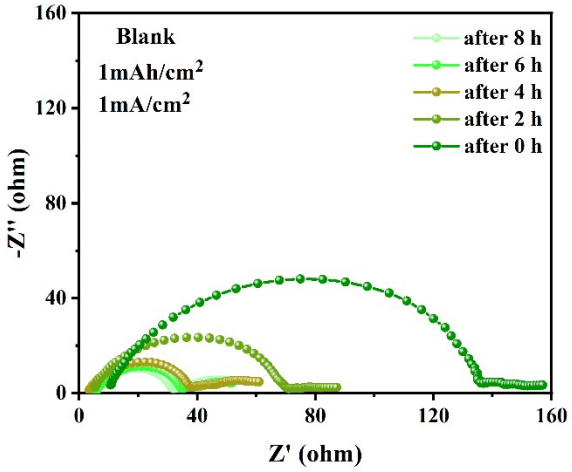

Figure S9 EIS spectra of the bare Li anode in the Li||Li symmetric cells without BOD for plating 0, 2, 4, 6, and 8 h, respectively, under a current density of 1 mA cm^{-2}.

Figure S10. Optical images of Li sheets in the electrolyte with and without 0.5 wt% BOD for 48 h.

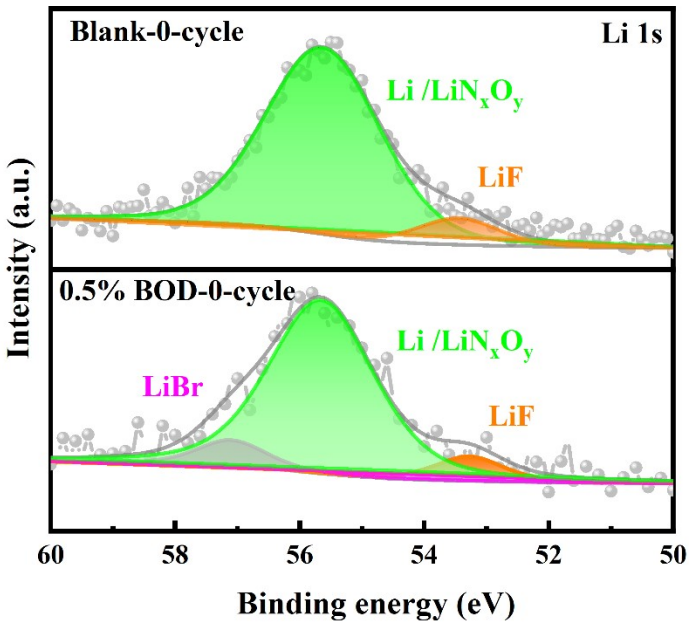

Figure S11. The comparison of Li 1s XPS spectra of Li sheets immersed in blank and 0.5 wt% BOD electrolyte for 48 h and after 200 cycles in 0.5 wt% BOD electrolyte.

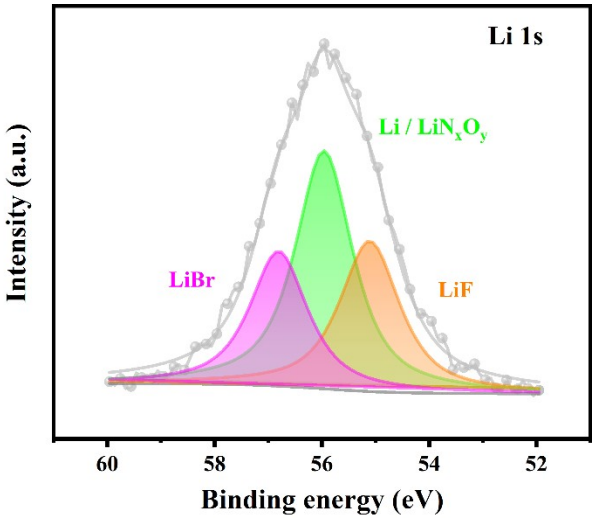

Figure S12. Li 1s XPS spectrum of the cell with 0.5 wt% BOD electrolyte after 200 cycles.

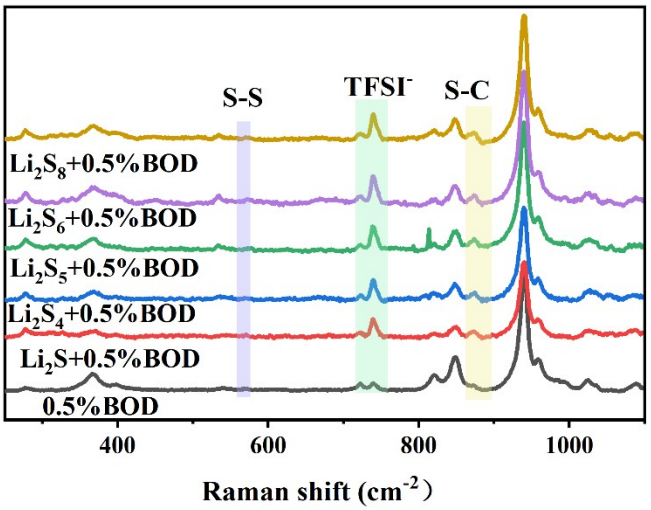

Figure S13. Raman spectra of 0.5% BOD in various of Li_2S_n (n=1, 4, 5, 6, 8) with a volume ratio of 1:1.

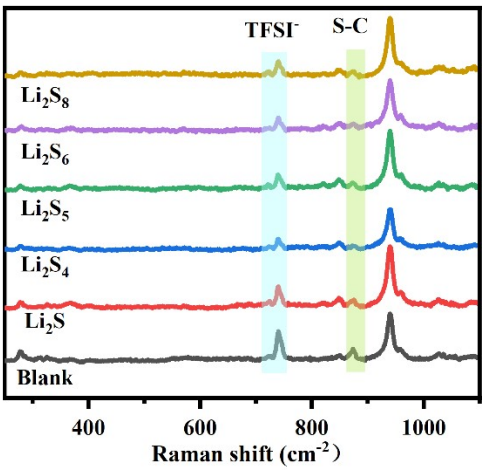

Figure S14. Raman spectra of the bare Li_2S_n (n=1, 4, 5, 6, 8) solution.

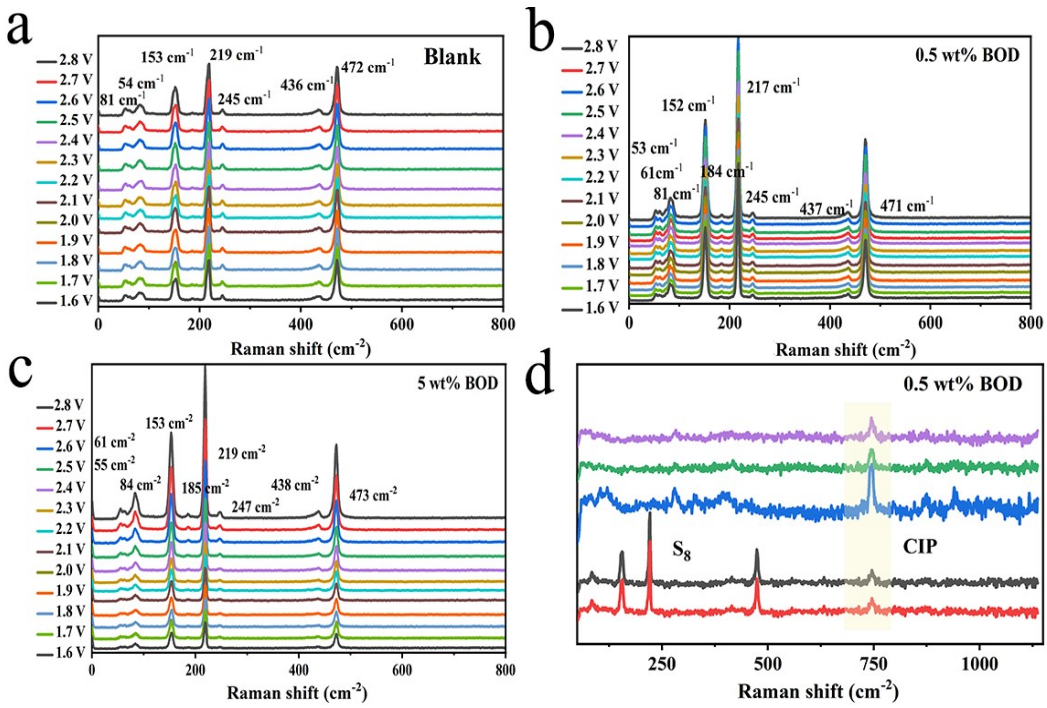

Figure S15. *In-situ* Raman spectra of the cell with (a) blank, (b) 0.5 wt%, and (c) 5 wt% BOD electrolyte. (d) Raman spectra of 0.5 wt% BOD in Li_2S_n (n=1, 4, 5, 6, 8) solution for studying the solvation structure.

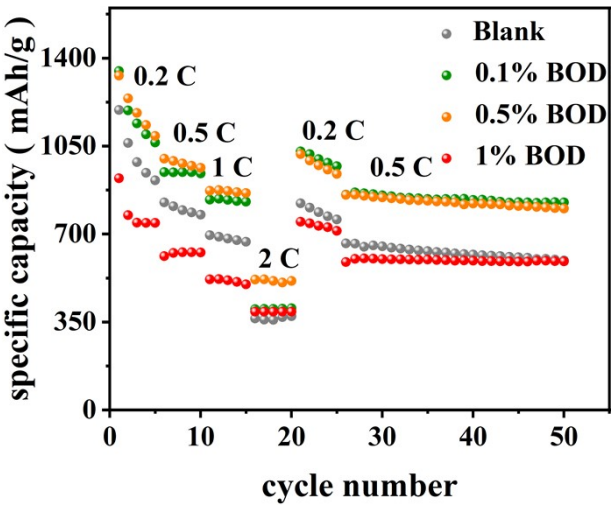

Figure S16. Rate performances (0.2, 0.5, 1, 2C) of the Li-S batteries with standard and 0.1 wt%, 0.5 wt%, and 1 wt% BOD electrolyte.

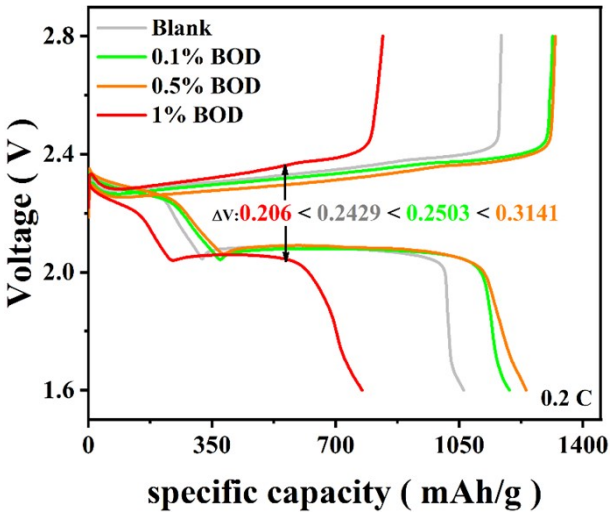

Figure S17. Voltage-capacity curves of the Li-S batteries with blank, 0.1 wt%, 0.5 wt%, and 1 wt% BOD at 0.2 C.

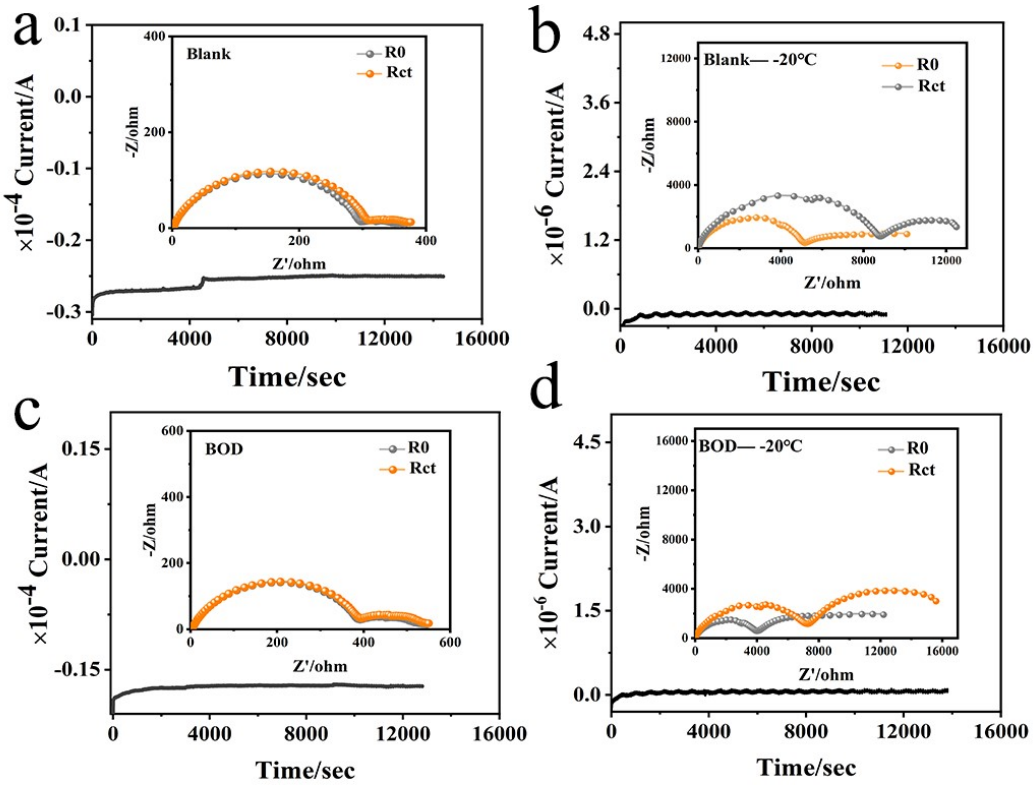

Figure S18. Chronoamperometric responses of Li||Li symmetric cells with a 10 mV bias voltage at 25 ℃ and -20 ℃.

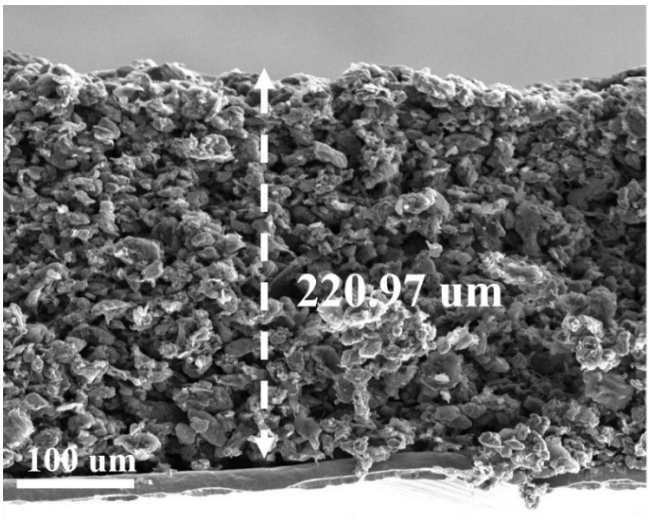

Figure S19. SEM images of the thick sulfur cathode with sulfur loading of 5mg cm^{-2}.