

Electronic Supplementary Material

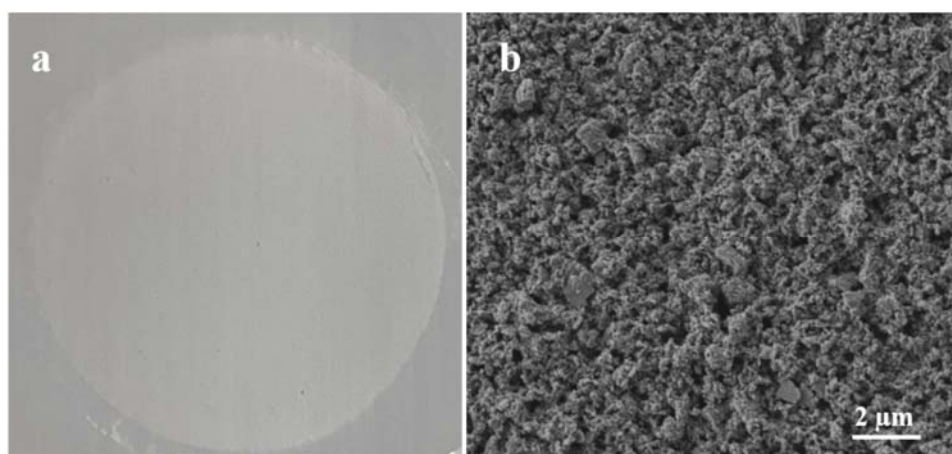


Fig. S1 Image of functional separator.

(a) Optical image; (b) SEM image.

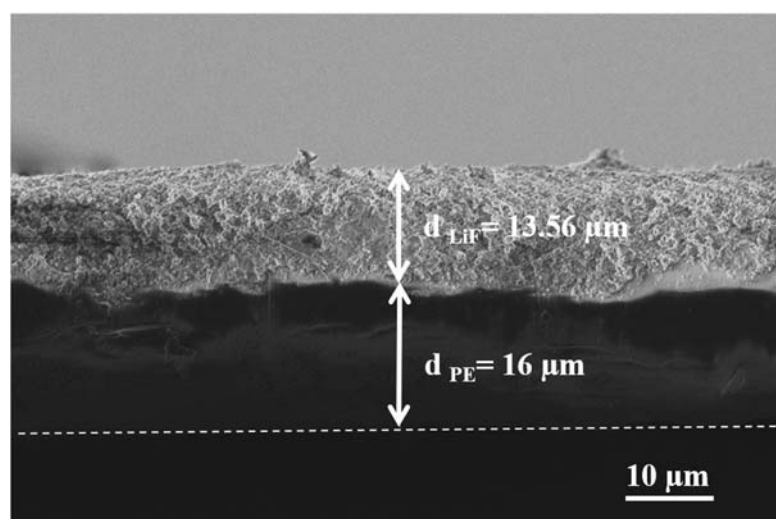


Fig. S2 Cross section SEM image of functional separator.

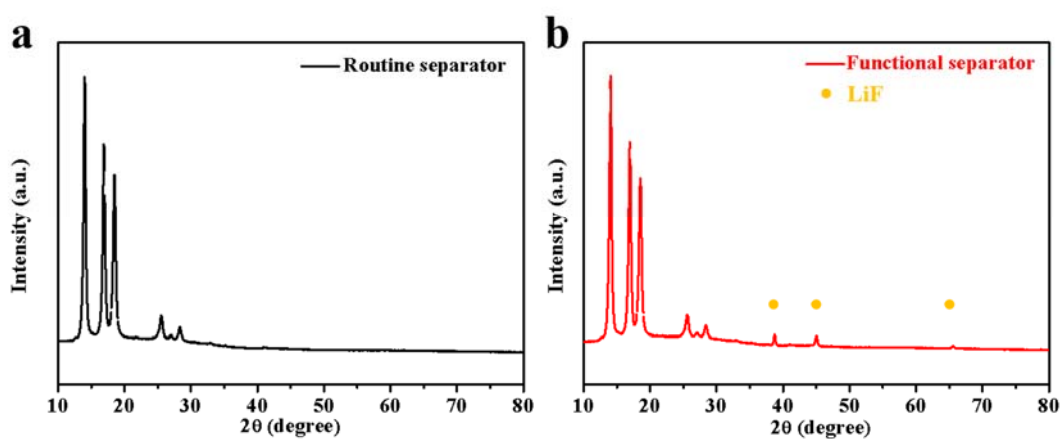


Fig. S3 XRD plots.

(a) Routine separator; (b) functional separator.

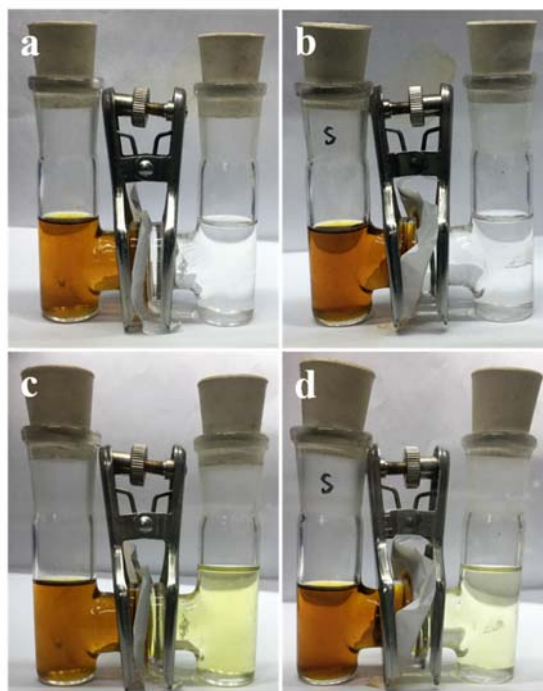


Fig. S4 Polysulfides permeation experiments.

(a) With routine separator before polysulfides diffusion; (b) with functional separator before polysulfides diffusion; (c) with routine separator after polysulfides diffusion for 40 min; (d) with functional separator after polysulfides diffusion for 40 min.

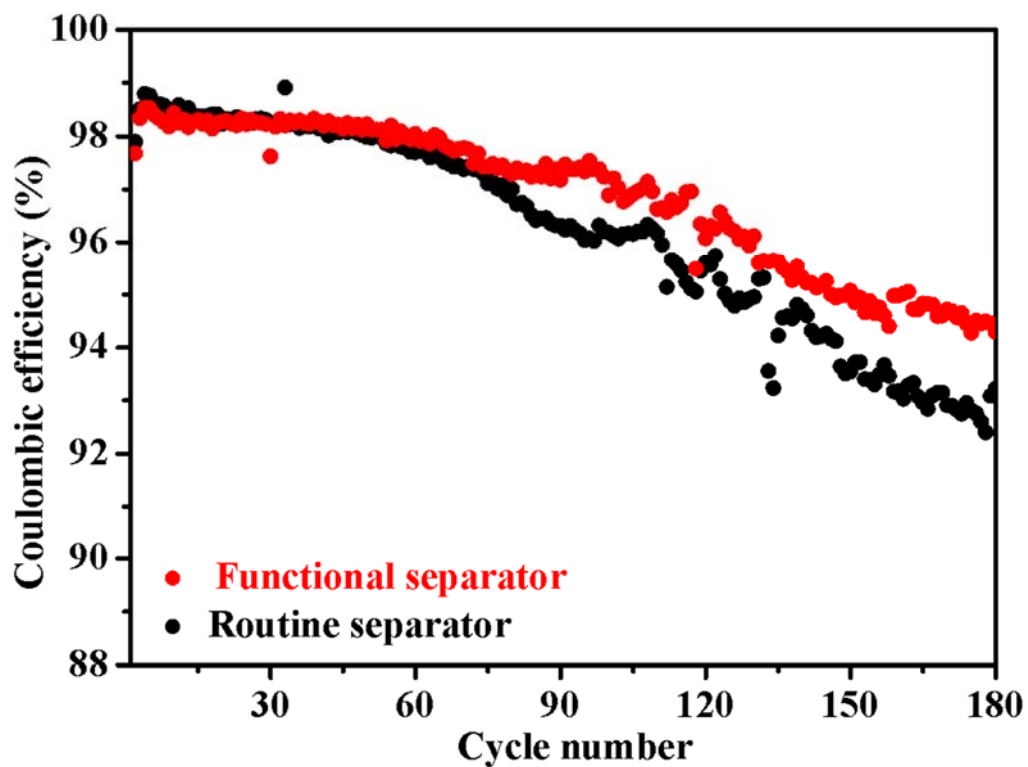


Fig. S5 Coulombic Efficiency (CE) of cell with functional separator and routine separator.

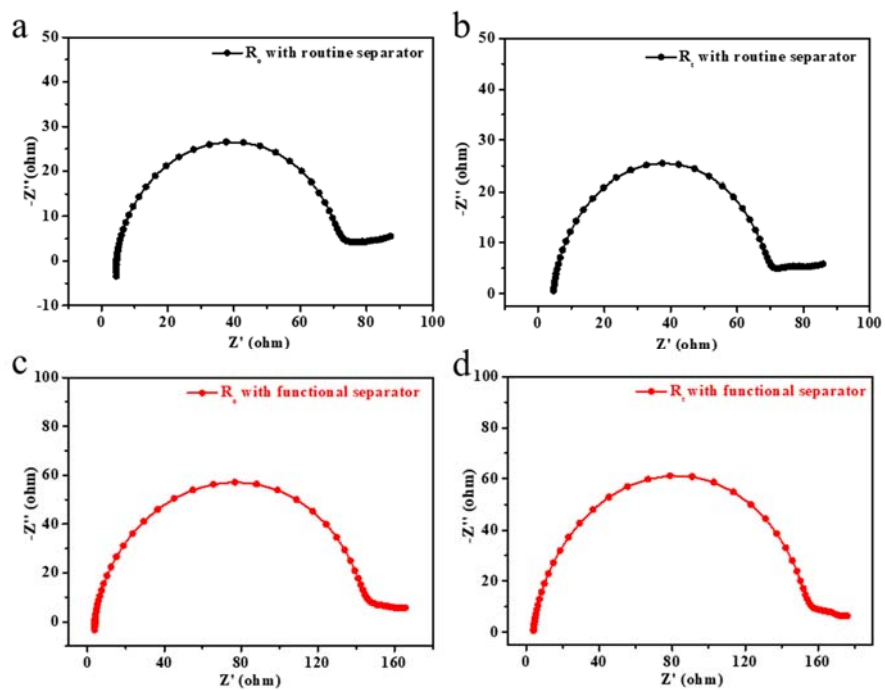


Fig. S6 Nyquist plots of symmetry cell in transference number test.

- (a) Initial state with routine separator; (b) steady-state with routine separator; (c) initial state with functional separator; (d) steady-state with functional separator.

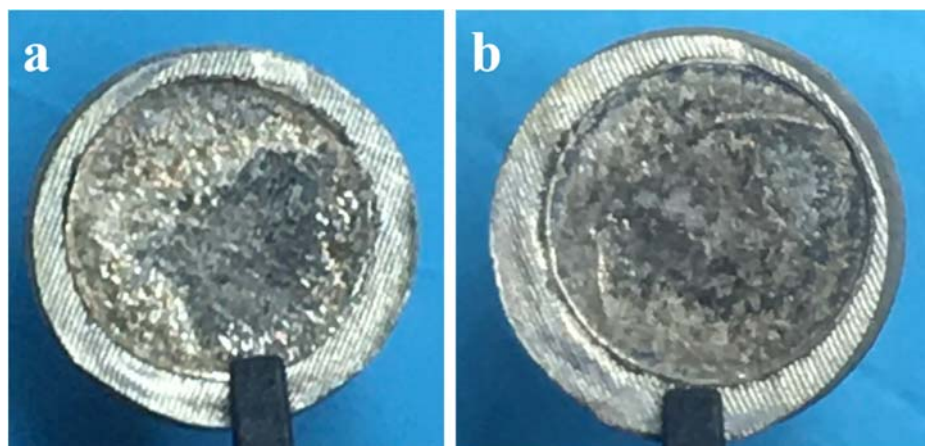


Fig. S7 Optical images of the lithium anode after 200 cycles.

- (a) With functional separator; (b) with routine separator.

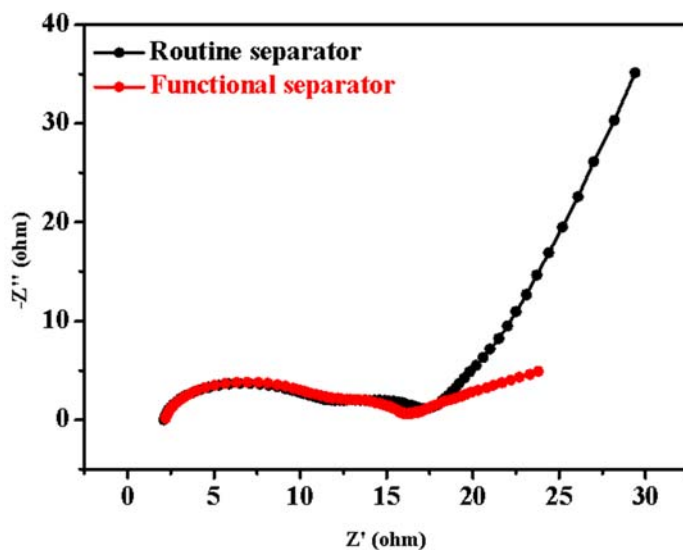


Fig. S8 Nyquist plots of Li-S batteries after 5 cycles with functional separator and routine separator.

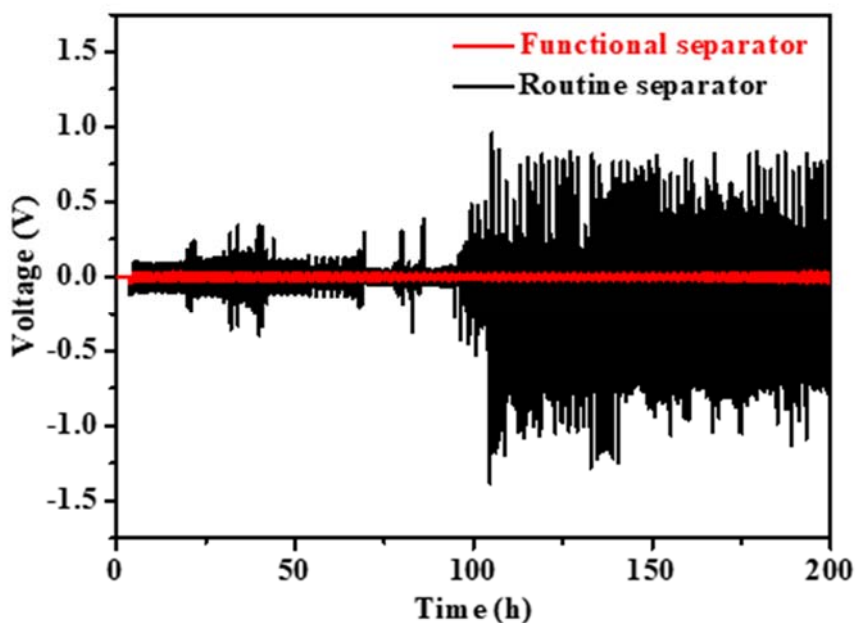


Fig. S9 Voltage profiles of Li-Li symmetry cells with functional separator and routine separator at a current density of 1 mA·cm⁻² and an a real capacity of 1 mAh·cm⁻².

Table S1 Peak current data of reduction reactions with functional separator or routine separator at different scan rates

Scan rate/(mV·s ⁻¹)	0.05	0.08	0.15
I_{R1} for functional separator/mA	1.02	1.42	2.17
I_{R1} for routine separator/mA	0.87	1.17	1.76
I_{R2} for functional separator/mA	2.35	2.85	3.88
I_{R2} for routine separator/mA	1.71	2.01	2.49

Table S2 Slope values of $I_{R1}/v^{0.5}$ and $I_{R2}/v^{0.5}$ with functional separator or routine separator

	Slope values of fitting line	
	R_1	R_2
Functional separator	2.245	2.999
Routine separator	1.741	1.554