Supporting Information

Strontium ferrite modified separator for adsorption and catalytic conversion of polysulfides for excellent lithium-sulfur batteries

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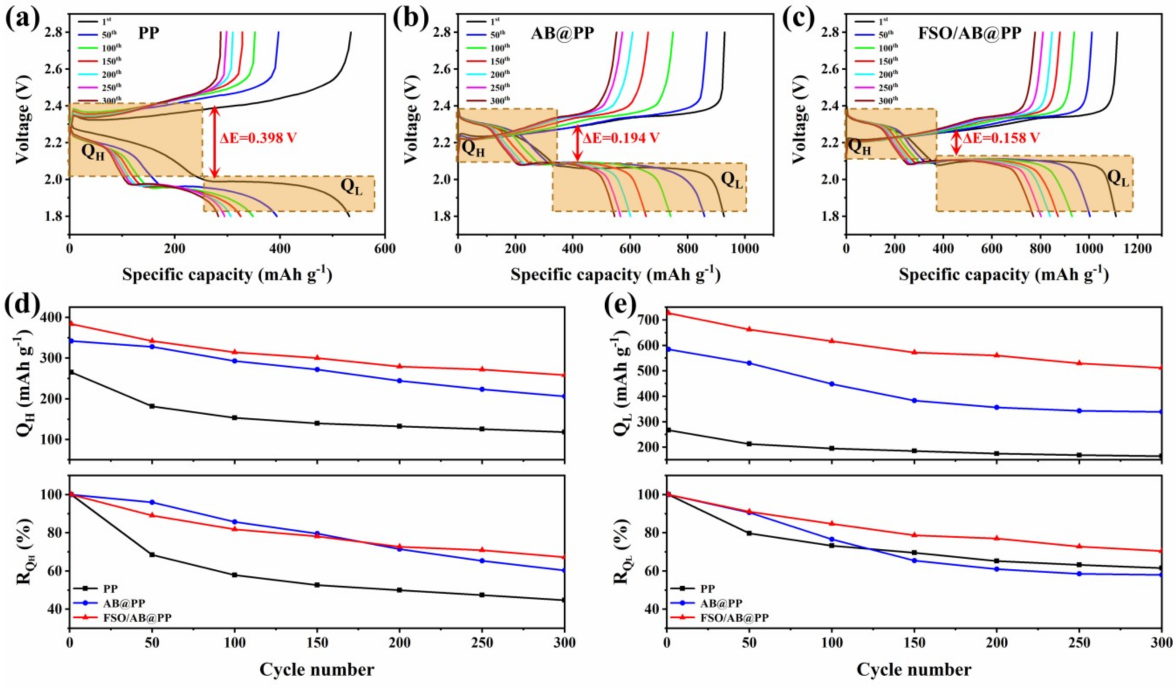

Figure S1. The charge-discharge curves of the cells were assembled with (a) PP, (b) AB@PP and (c) FSO/AB@PP separators at 0.5 C. (d) The capacity decay and capacity retention of the upper discharge platforms (Q_H and R_{QH}, respectively) and (e) the lower discharge platforms (Q_L and R_{QL}, respectively) with different separators.

In Figure S1d, the cell using PP separator shows a low Q_H value (265 mAh g^{-1}) with a retention rate (R_{QH}) of 44.7% after 300 cycles, which means the severe capacity fading. Although the cell using the AB@PP separator has a higher Q_H value of 342 mAh g^{-1}, it retains only 60.3% capacity after 300 cycles. On the contrary, the cell with FSO/AB@PP separator displays the Q_H of 384 mA h g^{-1} and 67.3% retention after 300 cycles. These results clearly indicate that the FSO/AB@PP separator effectively suppresses the shuttle behavior of LiPSs, which is more pronounced in the low platform region. From Figure S1e, the R_{QL} value of AB@PP separator reaches up to 90.7% at 50 cycles, but the capacity loss of the cell is serious as the cycle progresses, and the R_{QL} value after 300 cycles is even lower than that of PP separator. On the contrary, FSO/AB@PP separator maintains the highest R_{QL} of 70.4% after 300 cycles. Compared with the rapid capacity decay of PP and AB@PP separators, there is no significant capacity loss of FSO/AB@PP separator, elucidating that the FSO/AB@PP separator not only successfully restrains the diffusion of LiPSs, but also guarantees the high activity and adequate reaction in terms of insoluble Li_2S/Li_2S_2.

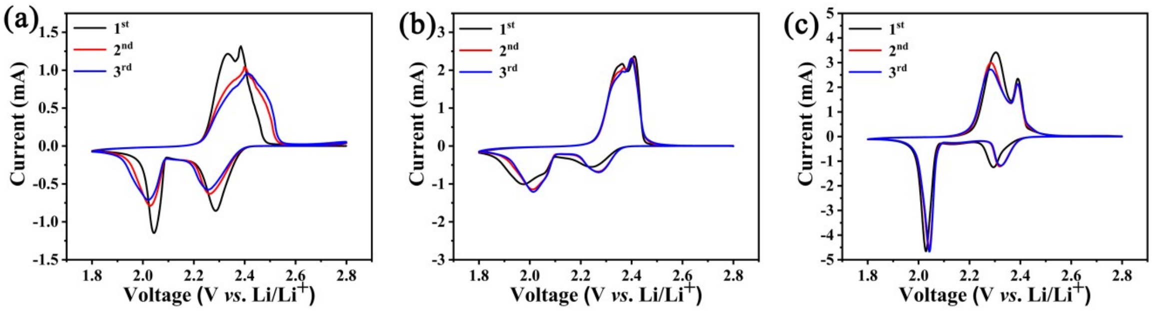

Figure S2.CV curves of the cells with (a) PP, (b) AB@PP and (c) FSO/AB@PP separators.

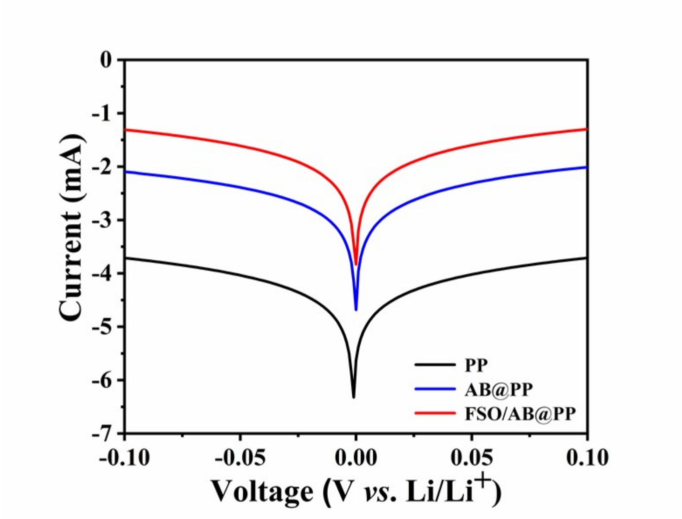

Figure S3. Tafel plots of the cells with different separators.

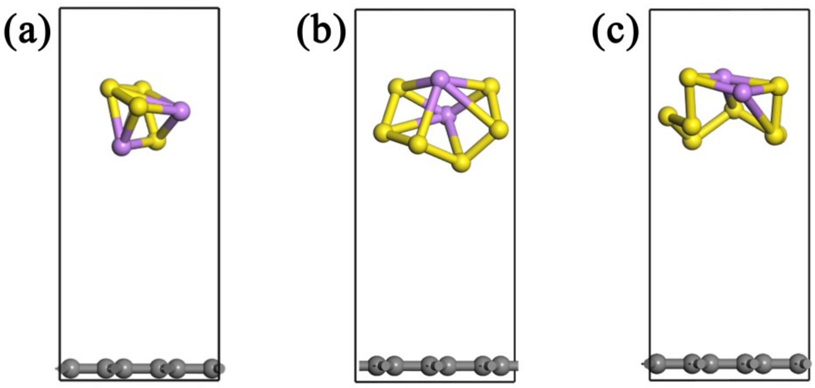

Figure S4. Optimized geometries of AB with (a) Li_2S_4, (b) Li_2S_6, and (c) Li_2S_8.

Table S1. List of R_s, R_{ct} and R_{surf} of cells with different separators before and after cycling.

Sample	Before cycling			After 50 cycles		
	R_s (Ω)	R_{surf} (Ω)	R_{ct} (Ω)	R_s (Ω)	R_{surf} (Ω)	R_{ct} (Ω)
PP	1.516	3.148	33.30	2.836	15.96	15.65
AB@PP	1.864	3.206	29.51	2.350	3.590	4.830
FSO/AB@PP	1.919	0.952	9.496	2.214	2.547	2.769

Table S2. Li^+ diffusion coefficient values of the cells with different separators.

Sample	Li^+ diffusion coefficient (D_{Li+}) (cm^2 s^{-1})		
	A (cathodic peak)	B (cathodic peak)	C (anodic peak)
PP	1.54×10^{-8}	7.26×10^{-9}	5.64×10^{-9}
AB@PP	5.29×10^{-8}	1.08×10^{-8}	1.65×10^{-8}
FSO/AB@PP	3.13×10^{-7}	2.51×10^{-7}	6.59×10^{-8}