

Functional Separator with a Nitrogen/Oxygen-Rich Interlayer for Enhancing Performance of Li-S Batteries

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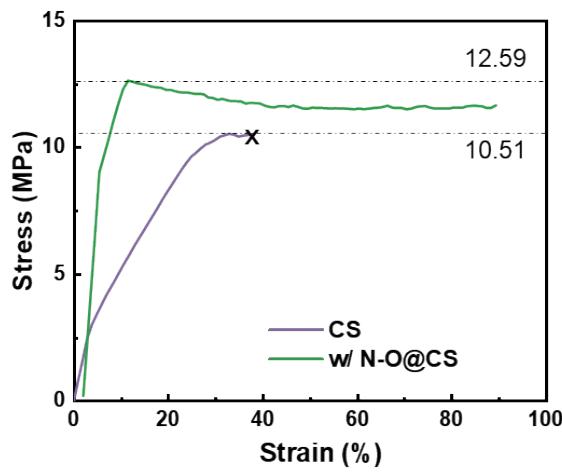


Figure S1. Tensile stress-strain curves of CS separator and N-O@CS-modified separator.

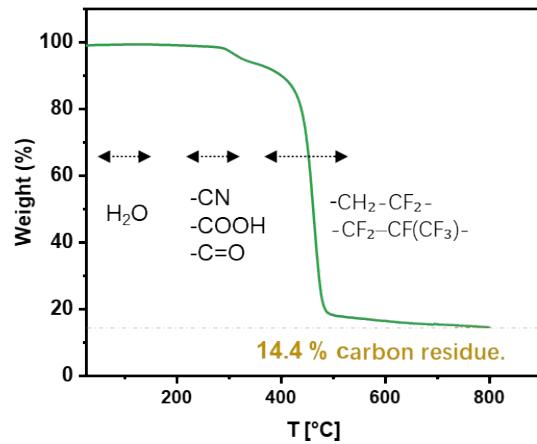


Figure S2. TGA curves showing thermal stability of N-O@CS-modified separator from 25 to 800 °C.

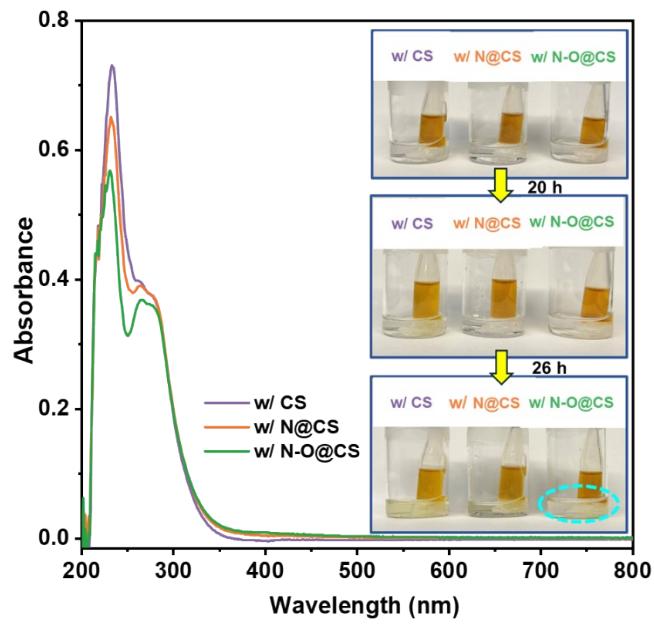


Figure S3. UV-vis absorbance spectra from Li₂S₈ diffusion tests using CS, N@CS, and N-O@CS separators, with corresponding diffusion photographs shown as insets.

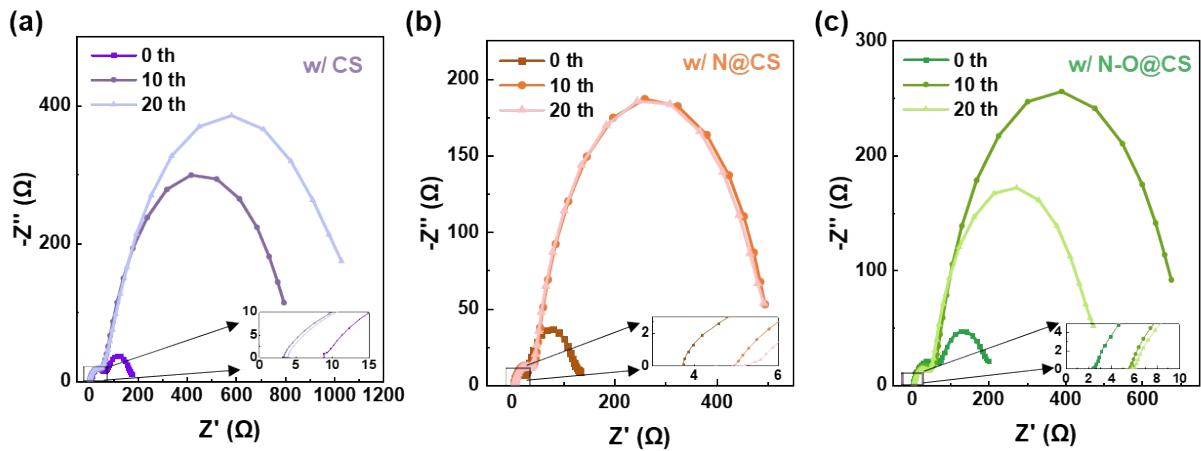


Figure S4. Nyquist plots from EIS measurements for Li-S cells with (a) CS separator, (b) N@CS separator and (c) N-O@CS separator at cycles of 0, 10 and 20.

Table S1. Fitting circuit model and parameters obtained from electrochemical impedance spectroscopy (EIS) for Li-S cells with different separators.

Samples	R _b (Ω)			R _{SEI} (Ω)			R _{ct} (Ω)		
	0 th	10 th	20 th	0 th	10 th	20 th	0 th	10 th	20 th
w/ CS	8.81	3.32	4.12	51.99	51.35	52.92	117.13	737.58	967.92
w/ N@CS	3.71	4.91	5.62	26.07	32.09	39.60	107.31	461.16	453.91
w/ N-O@CS	2.34	5.09	5.59	59.36	47.10	39.37	140.3	425.45	127.75

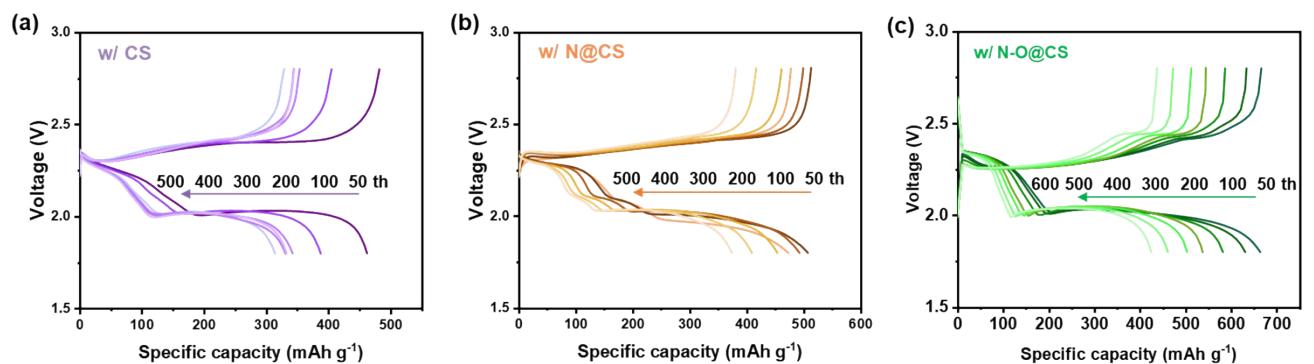


Figure S5. Voltage profiles of Li-S cells with (a) CS separator, (b) N@CS-modified separator and (c) N-O@CS-modified separator at selected cycles.

Table S2. Comparison of charge/discharge midpoint voltage differences (ΔV) among samples.

Samples	Q_{start} (mAh g $^{-1}$)	Q_{end} (mAh g $^{-1}$)	Q_{mid} (mAh g $^{-1}$)	V_{mid} (ΔV)
CS	160.56	328.62	244.59	0.381
N@CS	152.26	457.25	304.76	0.383
N-O@CS	195.83	604.56	400.20	0.323

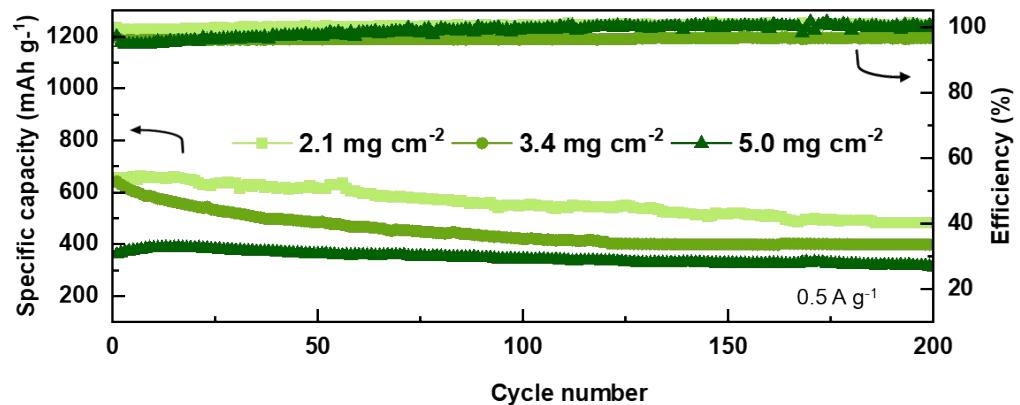


Figure S6. Electrochemical performance of the Li-S batteries with N-O@CS separator under elevated sulfur loadings.

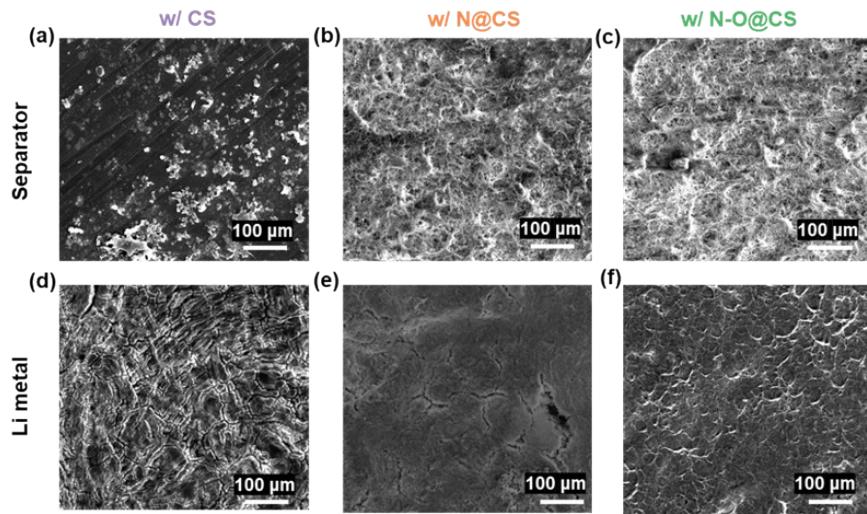


Figure S7. SEM images of separators and corresponding Li metal anodes after 200 cycles at 0.5 A g^{-1} . Surface morphologies of (a, d) CS, (b, e) N@CS, and (c, f) N-O@CS separators with their paired Li metal anodes.