Supporting Information

Cyclized-Polyacrylonitrile Modified Carbon Nanofiber Interlayer Enabling Strong Trapping for Polysulfides in Lithium-Sulfur Battery

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Table S1. Comparison of electrochemical performance of different interlayers.

Interlayer type	Surface area/m^2g^{-1}	Functional Group	Discharge current(mA g^{-1})	Cycle number	Residual reversible capacity (mAh g^{-1})	Degradation rate per cycle	Retention/%	Ref.
Fe3C/carbon nanofiber	62	C-N,C-Fe	200	100	893	0.24%	75.9	[28]
Microporous Carbon Paper	695	none	1675	100	1000	0.15%	85	[23]
p-NP-G	573.7	pyrrolic N,–P–O	1675	500	850	0.09%	55%	[25]
TiO2&Graphene	-	-Ti	3350	1000	630	0.01%	90%	[33]
polypyrrole nanotube	258	-H	837.5	300	712	0.2%	64.6%	[22]
CO2 activated carbonized PAN nanofibers	460	C=O	335	200	910	0.2%	60%	[29]
MWCNT Paper	-	none	838	100	855	0.41%	59.1%	[24]
Porous Carbonized graphene-embedded fungus film	200	Pyrrolic N C=O	1675	300	698	0.128%	61.33%	[40]
CP@CNF	80	C=N	502.5	200	710	0.127%	74.6	Current study

Table S2. Simulated resistance parameters of cell with CNF/PCNF interlayers.

BatteryType / Cycle Number	CNF Interlayer			CP@CNF Interlayer		
	$R_b(\Omega)$	R_{sei} (Ω)	R_{ct} (Ω)	R_b (Ω)	R_{sei} (Ω)	R_{ct} (Ω)
Fresh Cell	3.32	-	62.85	2.251	-	70.24
After 2 Cycles	9.886	4.328	17.78	7.125	6.213	11.10
After 100 Cycles	10.66	17.04	17.94	7.823	6.739	11.58

Table S3. Surfur content of both sides of CNF interlayers and PCNF interlayers

Sulfur content (%)	CNF interlayer	CP@CNF interlayer
Sulfur cathode side	7.80	2.23
Separator side	4.44	1.90

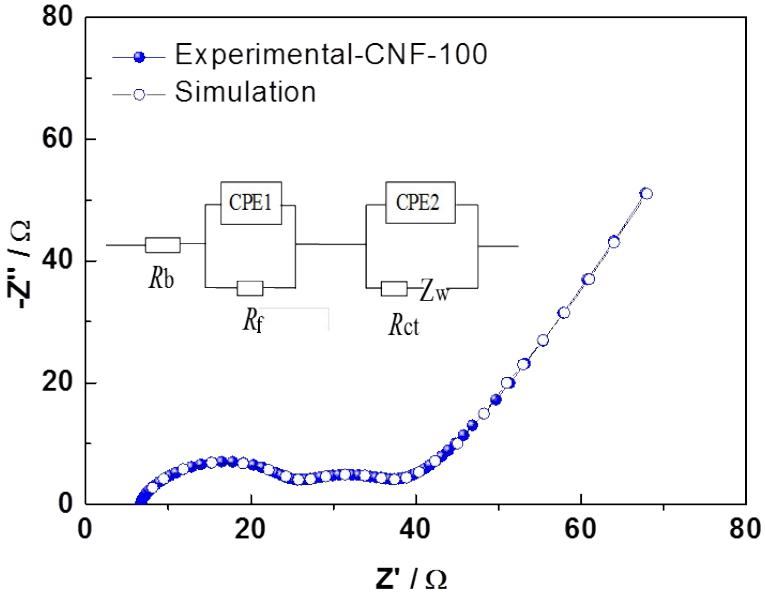

Figure S1. Experimental and simulated EIS curves of the cell with CNF interlayer after 100 cycles using an equivalent circuit by Z-view software.

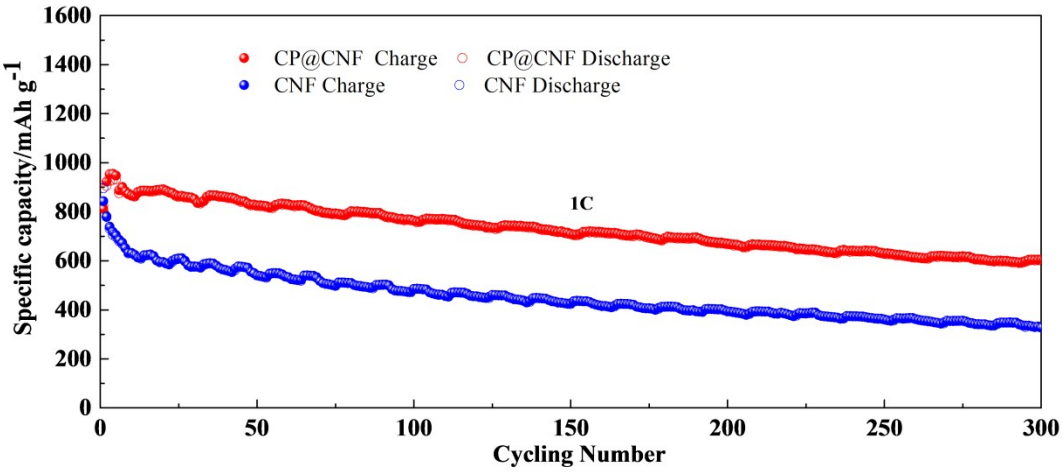

Figure S2. Cycling performances of cells with sulfur loading around 2 mg cm^{-2}, at current of 1C, using CNF and CP@CNF as interlayers.

In order to increasing the sulfur loading, the bare sulfur electrodes mentioned in Figure S2 are consist of 65 wt% sulfur, 26.7 wt% carbon black (Super P) and 8.3 wt% polyvinylidene fluoride (PVDF). And the mass loading of sulfur in the obtained cathode is around 2 mg cm^{-2}.

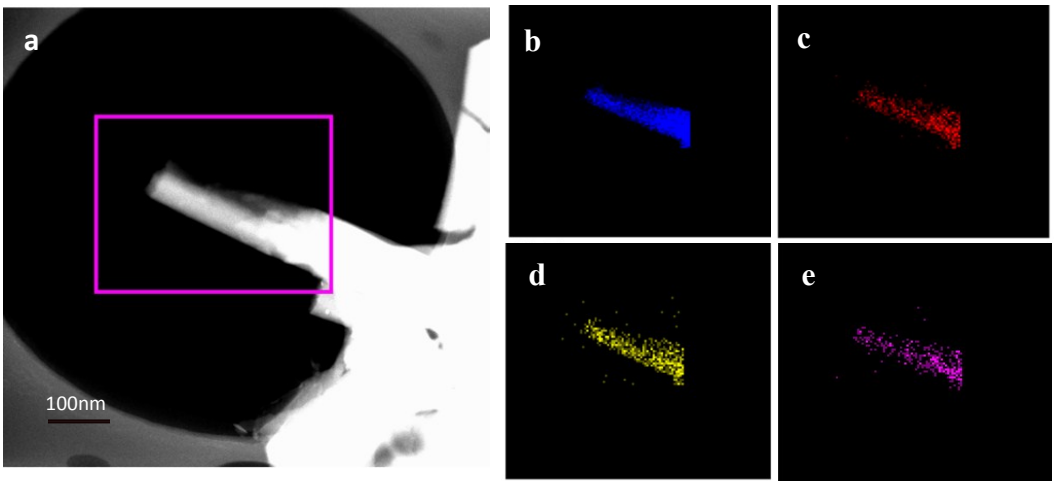

Figure S3. (a) The HAADF-STEM (High-angle annular dark-field scanning transmission electron microscopy) image of CP@CNF interlayer after 100 cycles and EDS mapping (b)C, (c)O, (d)S and (e)N.