Supplementary Information

Flexible cathode and multifunctional interlayer based on carbonized bacterial cellulose for high-performance lithium–sulfur batteries

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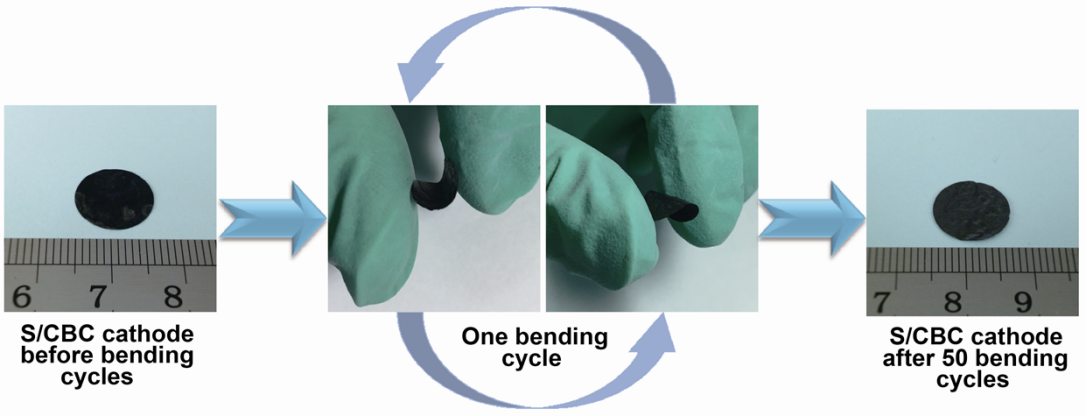

Fig. S1 Bending tests of S/CBC cathode with 81 wt.% sulfur content.

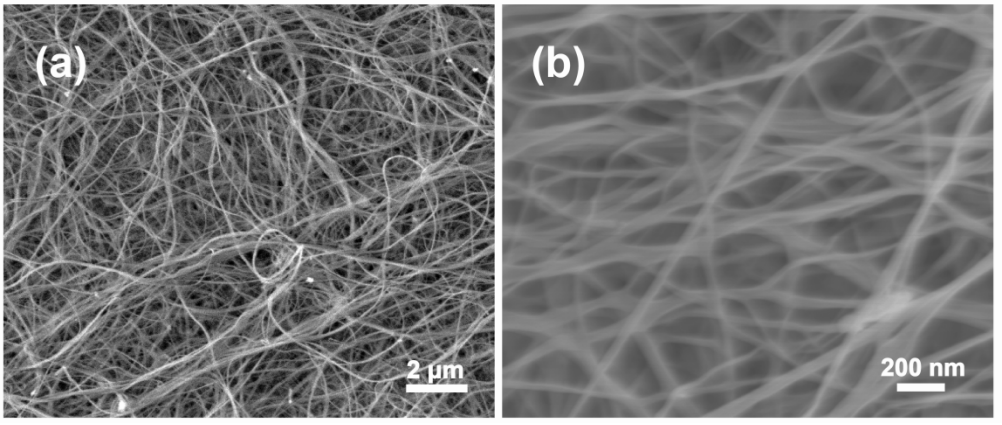

Fig. S2 (a) SEM image of the BC, (b) enlarged SEM image of the BC.

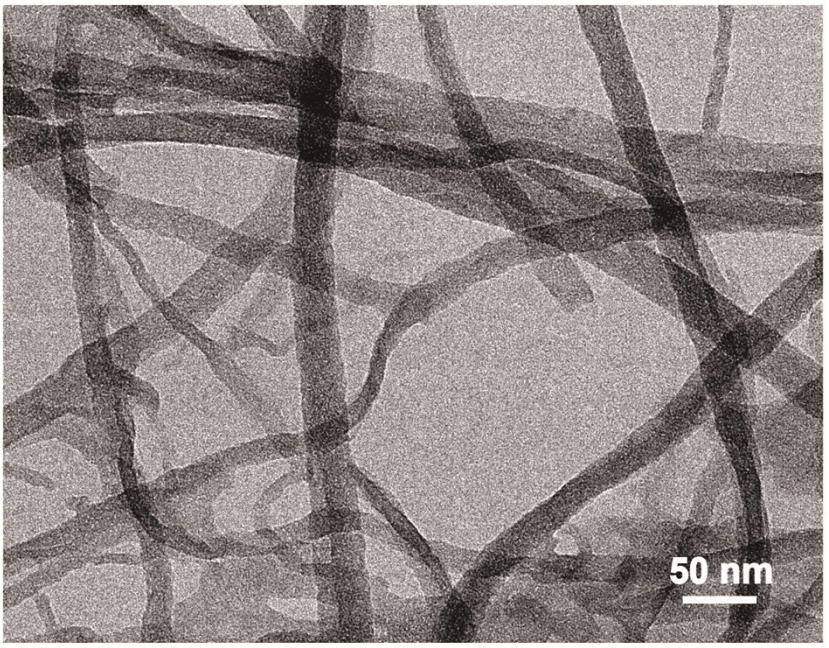

Fig. S3 TEM image of CBC nanofibers.

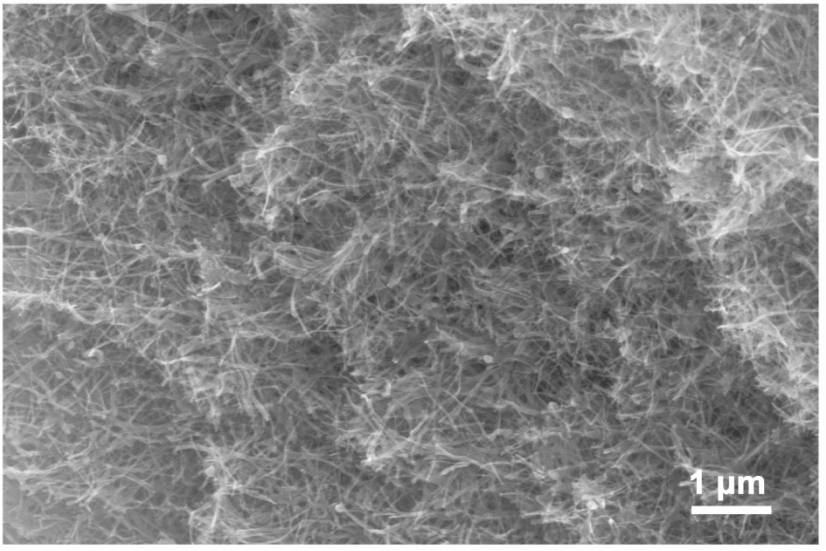

Fig. S4 SEM image of the cross section of CBC membrane.

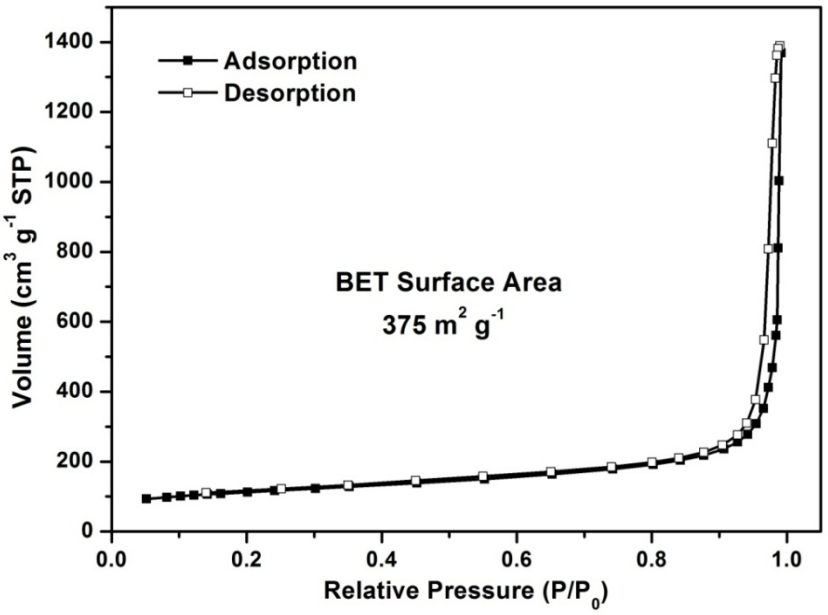

Fig. S5 N_2 adsorption/desorption isotherms of CBC.

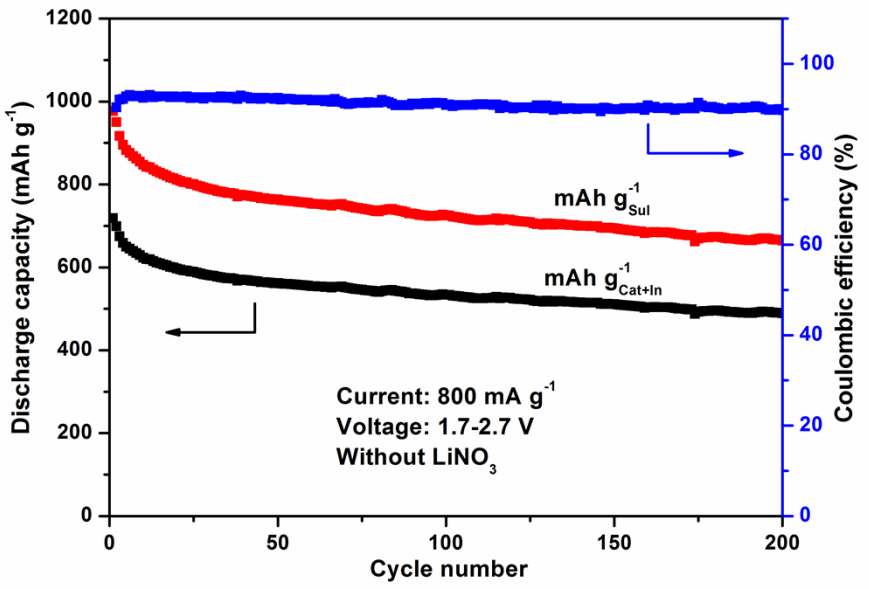

Fig. S6 Cycling performances of S@CBC-In when $LiNO_3$ additive is absent in the electrolyte.

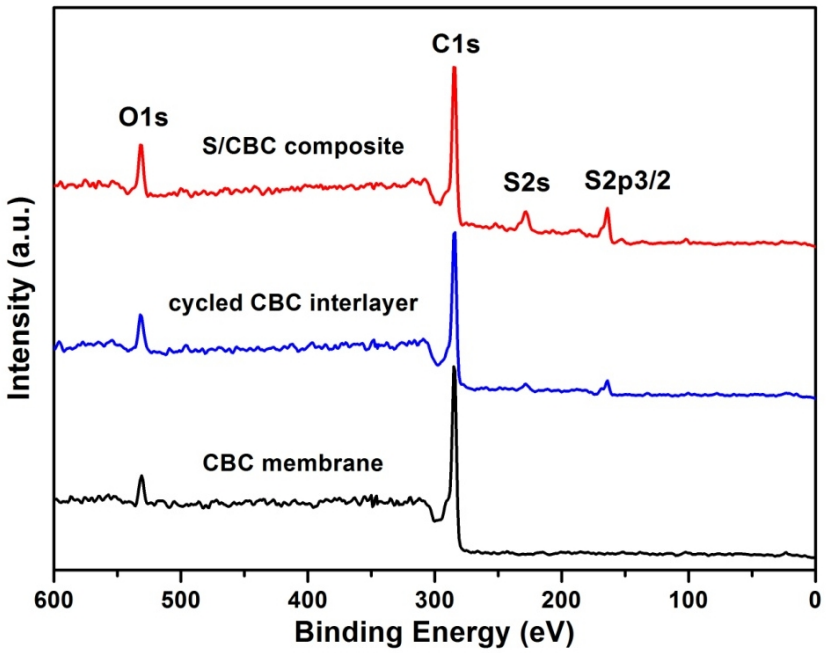

Fig. S7 XPS spectra of as-prepared S/CBC composite, CBC interlayer after 300 cycles at 800 mA g^{-1}, and pristine CBC membrane.

Fig. S7 shows the X-ray photoelectron spectroscopy (XPS) spectra of S/CBC composite before assembling into the battery, CBC interlayer after 300 cycles, and pristine CBC membrane. The presence of sulfur in S/CBC composite and cycled CBC interlayer can be confirmed through the identification of S2s and S2p3/2 binding.[1] However, the sulfur content (according to the peak area) in S/CBC composite is much lower than that of TGA results (Fig. 3c). It is attributed to the significant sublimation of surface sulfur when exposed to high-energy X-ray beam and the ultrahigh vacuum chamber of XPS apparatus.[2] For cycled CBC interlayer, the existence of sulfur signal indicates its role in acting as a fresh collector for sulfur species. In addition, all the samples exhibit a strong C1s peak and weak O1s peak, suggesting a dominant carbonaceous material with little oxygen groups.

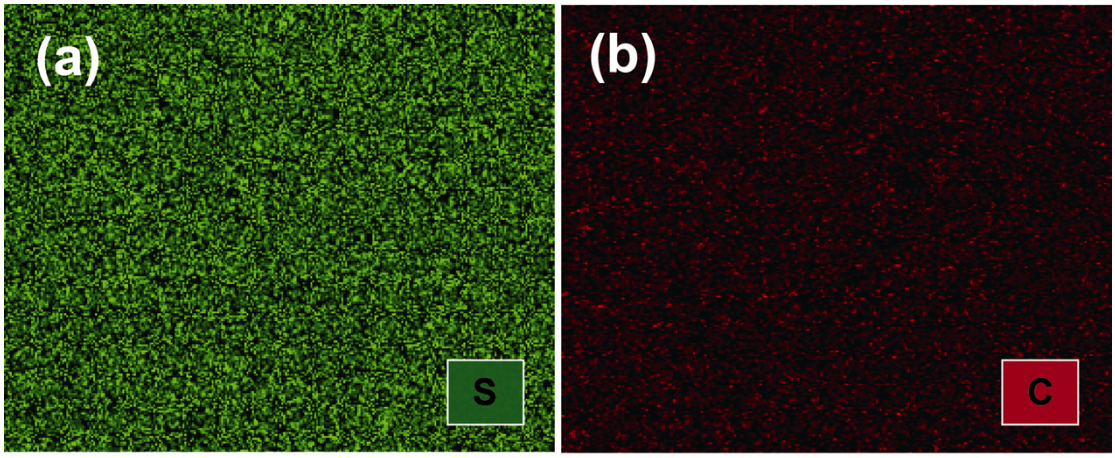

Fig. S8 The corresponding EDS mapping of (a) S and (b) C for the region shown in Figure 7d.

As shown from Fig. S8, the signal intensity of S is much stronger than that of C, which demonstrates that a large amount of S species accumulated on the surface of S@CBC cathode.

Table S1. All the R_{ct} values measured for S@CBC-In and S@CBC during the 300 cycles at a current density of 800 mA g^{-1}.

Cycle / R_{ct} / Sample	1	3	5	10	20	30	40	50	60
S@CBC-In	9.96	7.29	6.42	6.90	7.10	7.44	8.36	8.43	9.26
S@CBC	17.94	14.71	11.97	9.20	10.70	11.57	13.25	14.30	15.14

80	100	120	140	160	180	200	250	300
10.30	11.33	11.86	12.96	13.80	14.40	14.82	15.79	16.10
17.44	19.16	19.98	21.14	22.30	23.01	23.38	23.80	24.15

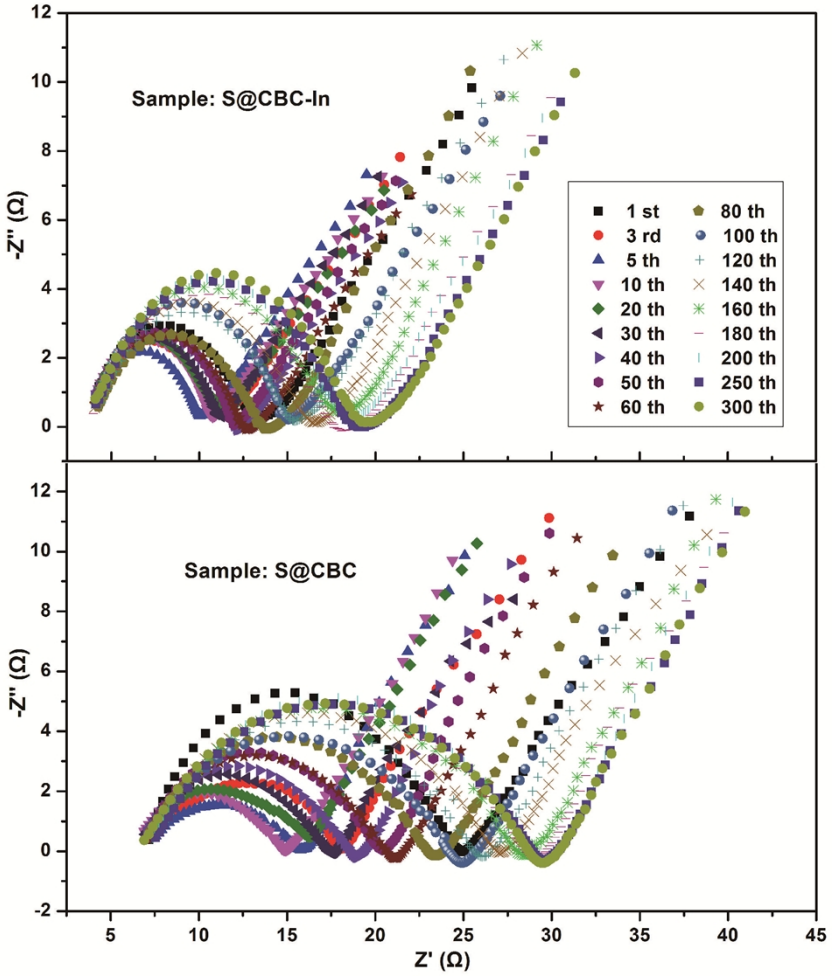

Fig. S9 All the measured EIS plots of the batteries S@CBC-In and S@CBC after charging to 2.7 V at 800 mA g^{-1}.

Reference

1 B. Wang, Y. Wen, D. Ye, H. Yu, B. Sun, G. Wang, D. Hulicova-Jurcakova and L. Wang, *Chem. Eur. J.*, 2014, **20**, 5224-5230.

2 Q. Zeng, D. W. Wang, K. H. Wu, Y. Li, F. C. de Godoi and I. R. Gentle, *J. Mater. Chem. A*, 2014, **2**, 6439-6447.