Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Modified Separator Coated with a $Ca(OH)_2$-Carbon Framework Derived from Crab Shells for Lithium-Sulfur Batteries

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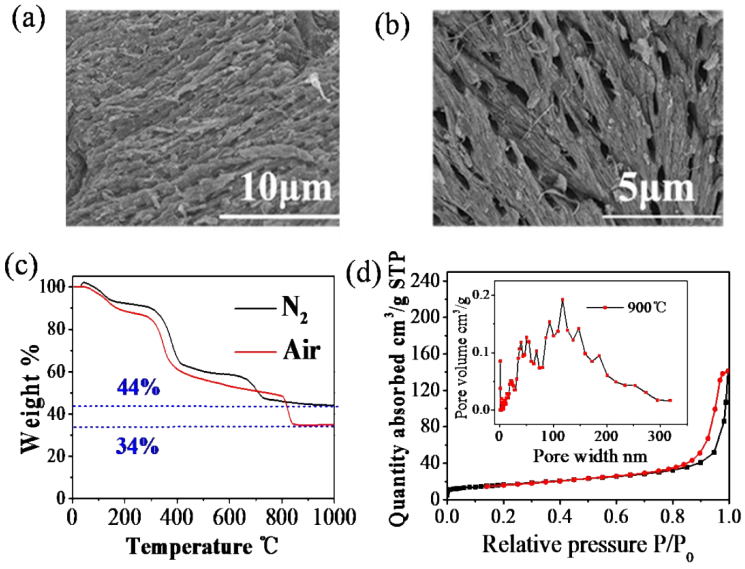


Figure S1 (a,b) SEM image the CaO-carbon framework calcined at 900℃. (c) TG image of crab shells calcined in N_2 atmosphere and air atmosphere, respectively. (d) The nitrogen adsorption–desorption isotherm of the CC900 and the insert is corresponding DFT pore size distribution curve.

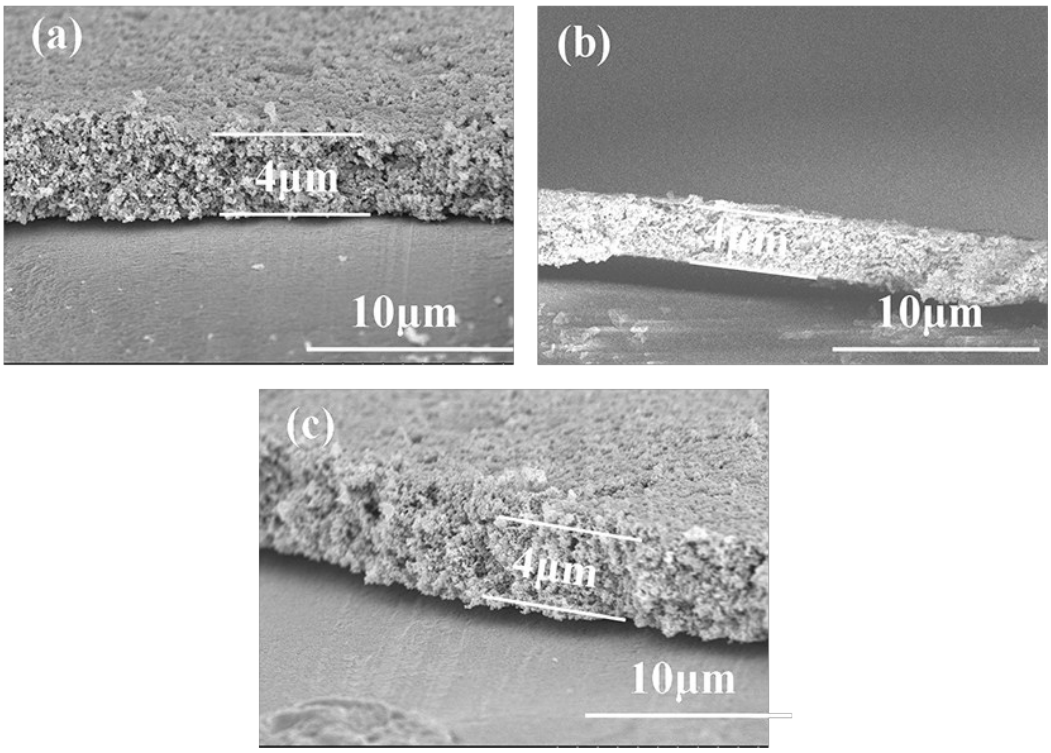


Figure S2 Cross-sectional images of (a) CCF-modified separator, (b) $Ca(OH)_2$-modified separator and (c) AB-modified separator.

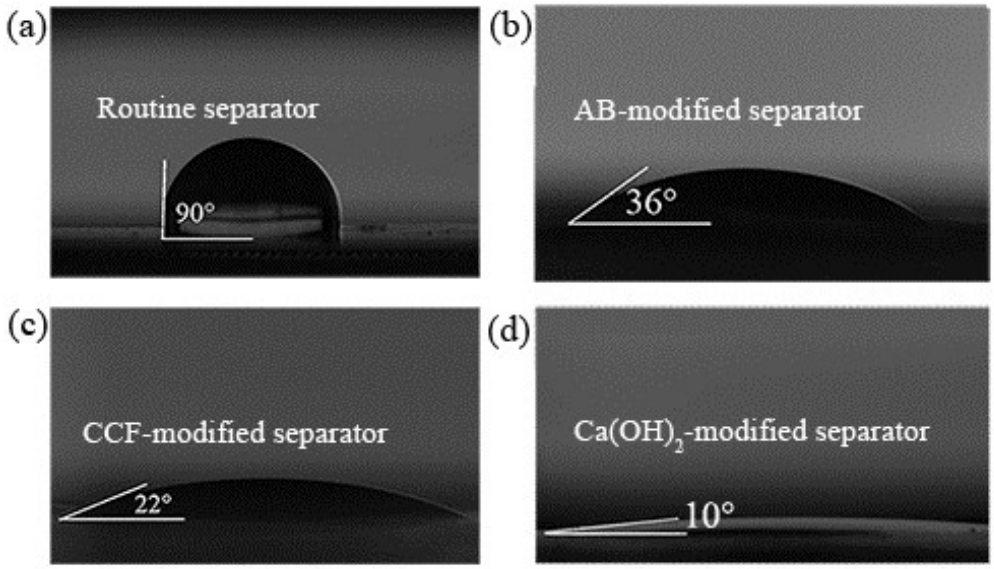


Figure S3 The water contact angle of four types of separators.

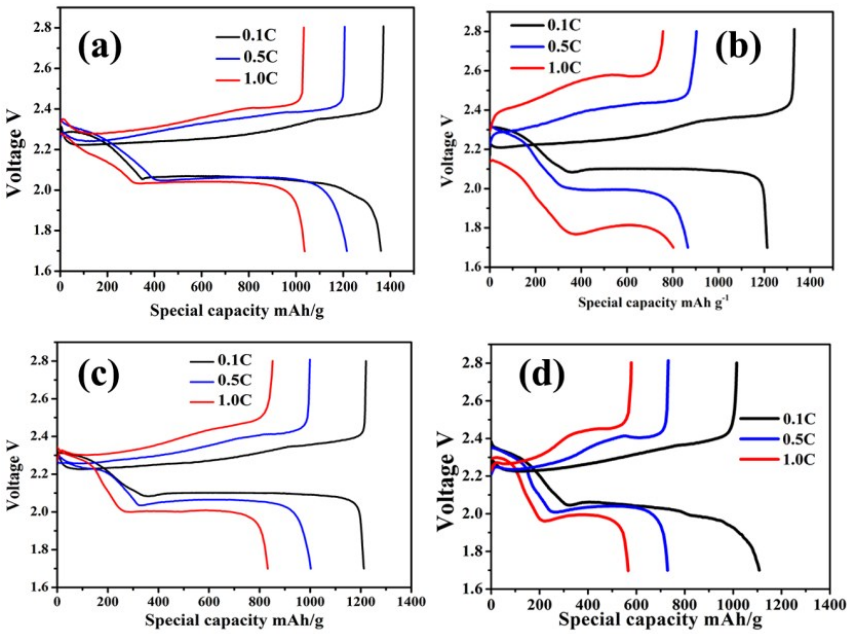
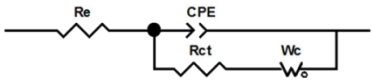


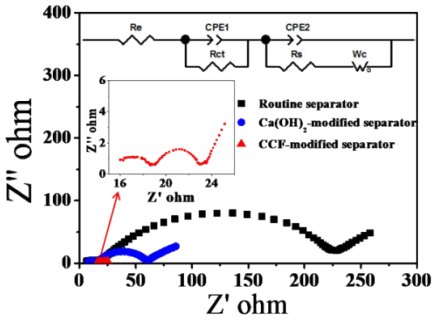
Figure S4 Discharge–charge voltage profiles at different current rates of Li-S batteries with (a) CCF-modified separator, (b) $Ca(OH)_2$-modified separator, (c) AB-modified separator and (d) routine separator.

(a)



Separator	Re (Ω)	Rct(Ω)
CCF-modified separator	4.9	203
$Ca(OH)_2$-modified separator	4.3	756
Routine separator	4.7	815

(b)



Separator	Rct(Ω)	Rs(Ω)
CCF-modified separator	17	23
$Ca(OH)_2$-modified separator	16	62
Routine separator	17	227

Figure S5 Equivalent circuit used to fit the EIS diagrams of different separators (a) before and (b) after cycled for 10times, and the results of the fit for the modified separators studied.

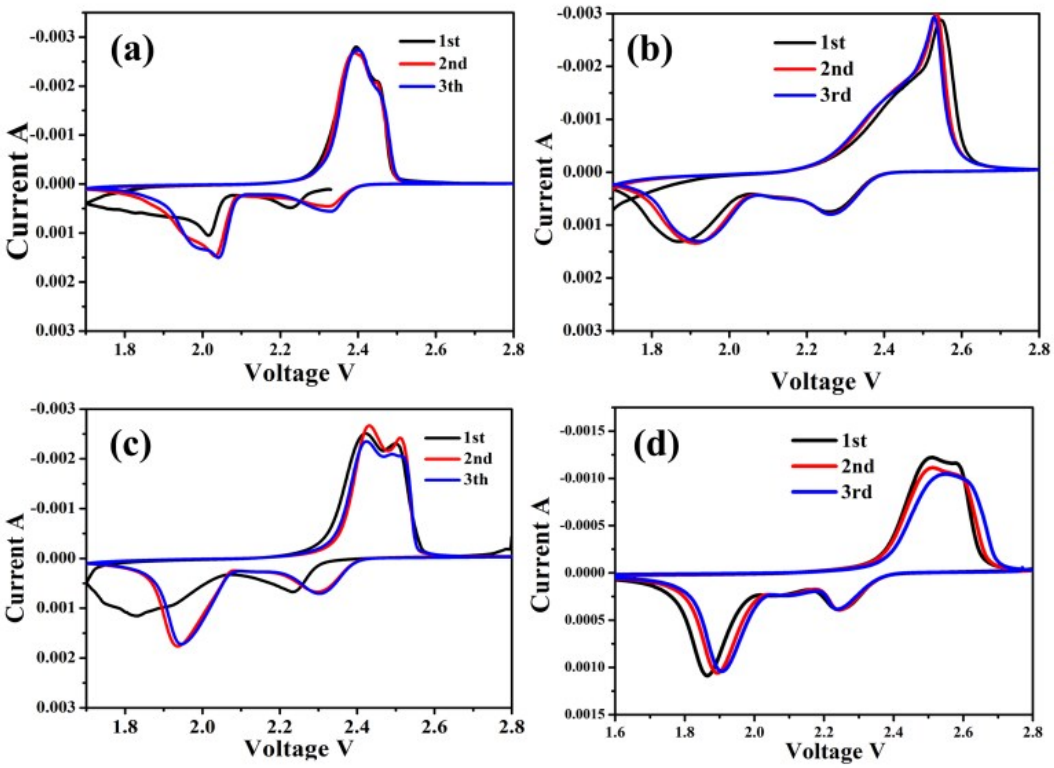


Figure S6 The CV curves of batteries with (a) CCF-modified separator, (b) $Ca(OH)_2$-modified separator, (c) AB-modified separator and (d) routine separator at first 3cycles

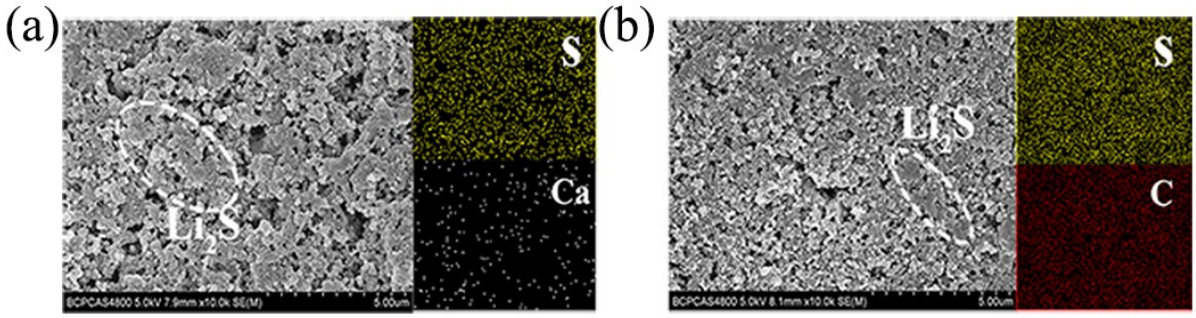


Figure S7 SEM images of (a) the CCF-modified and (b) the AB-modified separators after being discharged 100 times; the inset image shows the EDS mapping of elements in the separator after cycling.

Table S1 Comparison of the Li-S batteries with different modified separators, with results from this work and from the literature.

Modified separator	S contant (wt%)	S loading (mg cm^{-2})	Coating weight (mg cm^{-2})	S contant with coating layer (wt%)	Initial capacity (mAh g^{-1})	Cycle Numbers	Reversible capacity (mAh g^{-1})	Current density	Ref.
Super P	60	1.2	0.2	55	1389	200	828	0.2C	26
MWCNT	70	2.0	0.17	65	1324	300	621	0.2C	27
GO	63	1.3	0.12	60	920	100	708	0.1C	28
PANiNF/MWCNT	60	1.4	0.01	60	1020	100	709	0.2C	29
PEDOT/PSS	64	1.0	0.07	61	901	500	596	0.5C	30
Nafion	50	0.5	0.7	29	906	500	312	1.0C	31
MOF@GO	70	1.6	0.3	62	1207	1500	855	1.0C	S1
MesoNC	50	1.6	0.5	43	1028	500	658	0.5C	S2
ACNF-filter	70	2.1	0.35	63	1300	200	819	0.2C	S3
MPC/PEG	70	2.0	0.15	65	1307	500	596	0.2C	S4
$Ca(OH)_2$-carbon framework/AB	63	1.5	0.3	57	1215	200	912	0.5C	This work
$Ca(OH)_2$-carbon framework/AB	63	1.5	0.3	57	965	200	770	1.0C	This work

References

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