From Melt-diffusion to Ion-exchange method: Self-triggered Rich-O Group on the Surface of Acetylene black by Using S-EDA Solution to Boosting the Sulfur Content for Lithium-Sulfur Batteries

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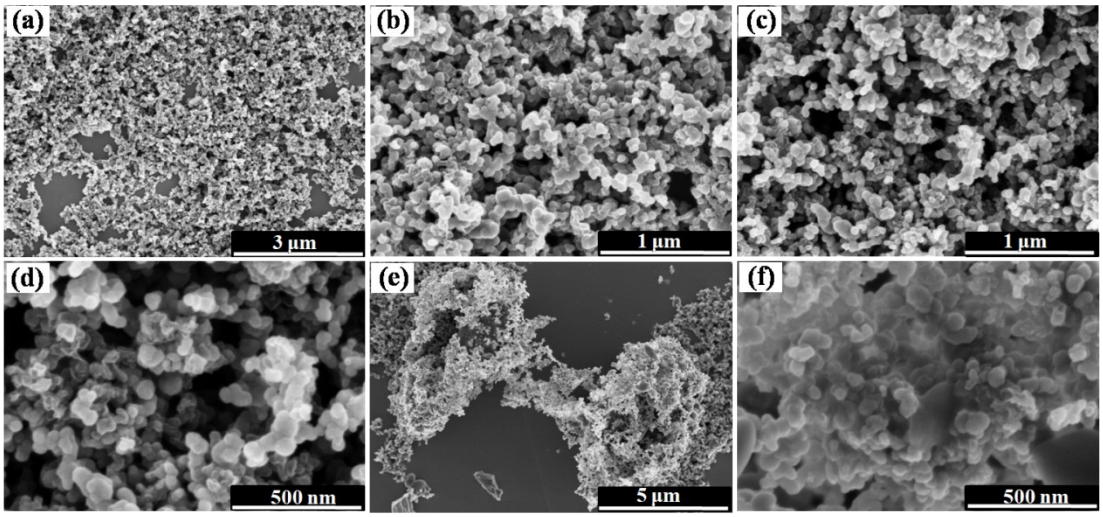

Fig. S1 (a)-(b) SEM of Acetylene black, (c)-(d) SEM of Acetylene black@Mp-S, (e)-(f) SEM of Acetylene black@Re-S.

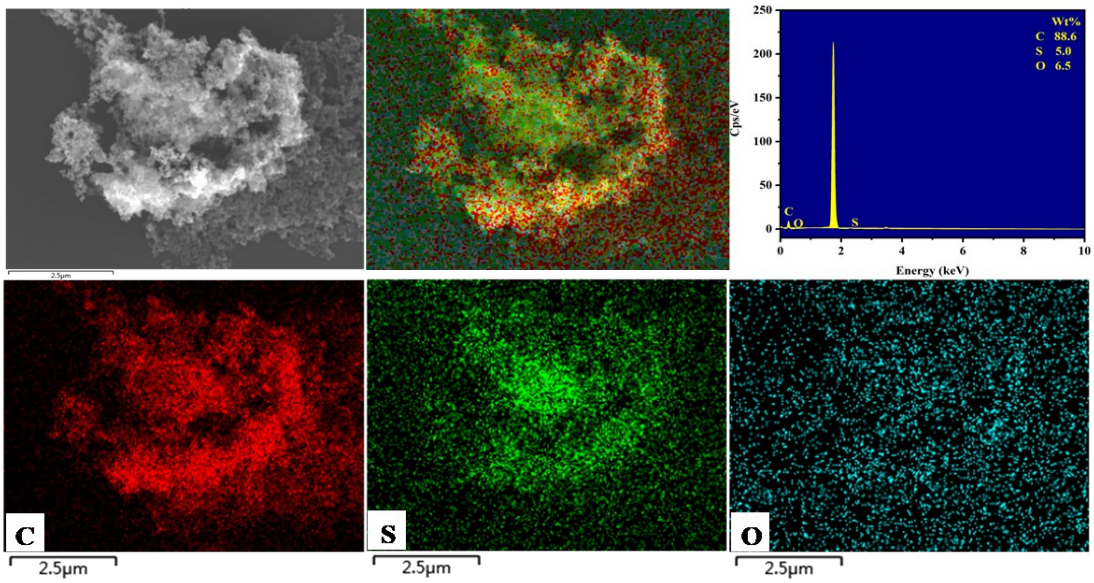

Fig. S2 The elemental mapping and energy dispersive spectroscope (EDS) area analysis of Acetylene black@Re-S.

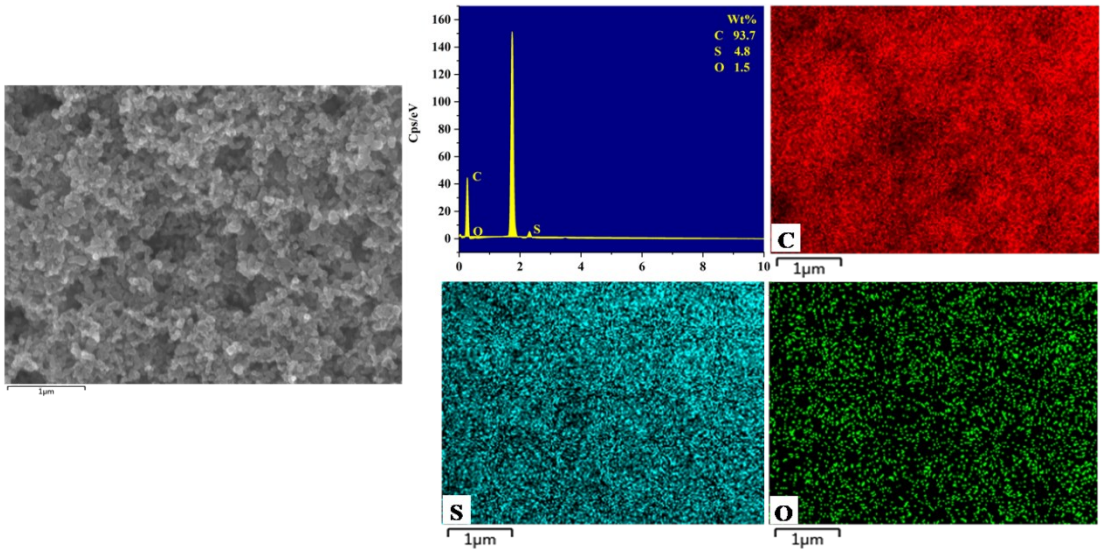

Fig. S3 The elemental mapping and energy dispersive spectroscope (EDS) area analysis of Acetylene black@Mp-S.

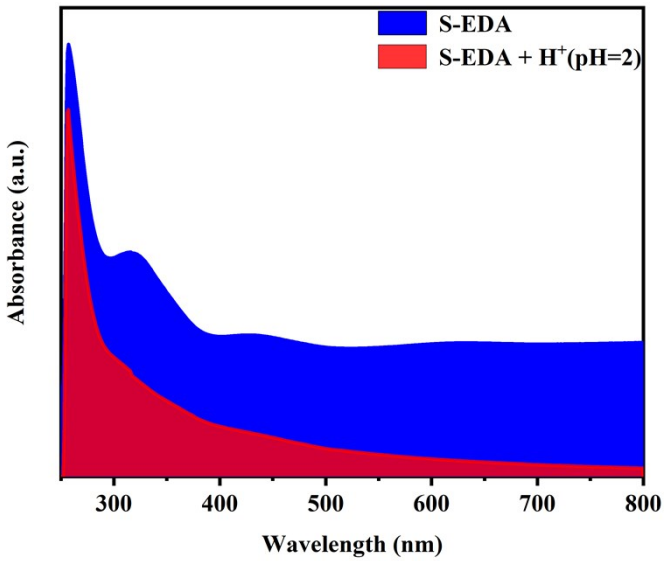

Fig. S4 UV-vis spectrum of the S–EDA solution and S–EDA + H^+ (pH=2) solution.

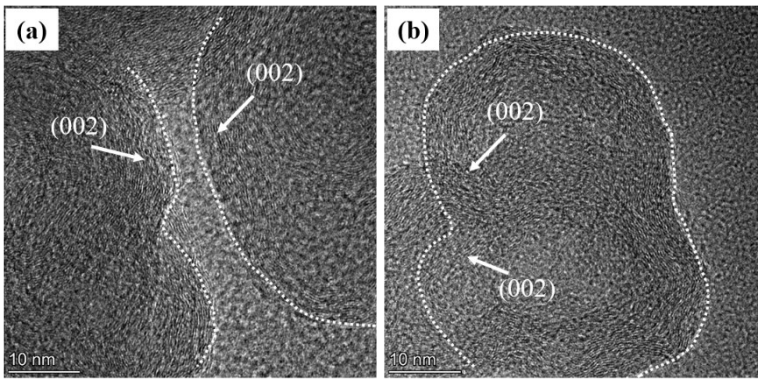

Fig. S5 HR-TEM images. HR-TEM images. (a) Acetylene black@Mp-S, (b) Acetylene black@Re-S.

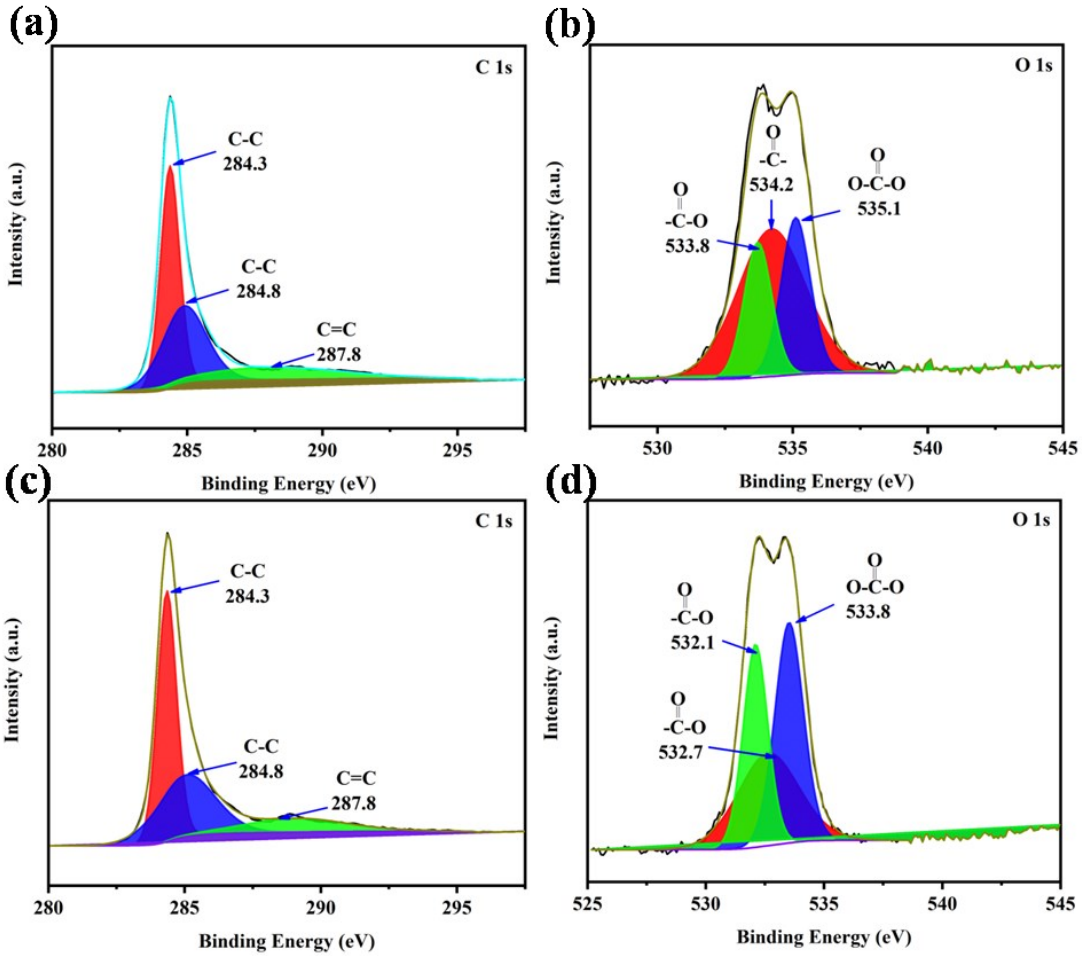

Fig. S6 XPS spectrum of Acetylene black before (a), (b) and after (c), (d) disposing with EDA solution.

Table S1. The proportion of C and O binding species.

Sample	C-C	C=C	-C-O	-C-	O-C-O
Acetylene black	81.1%	18.9%	24.7%	54.9%	20.4%
Acetylene black-EDA	79.1%	20.9%	70.3%	0	29.7%

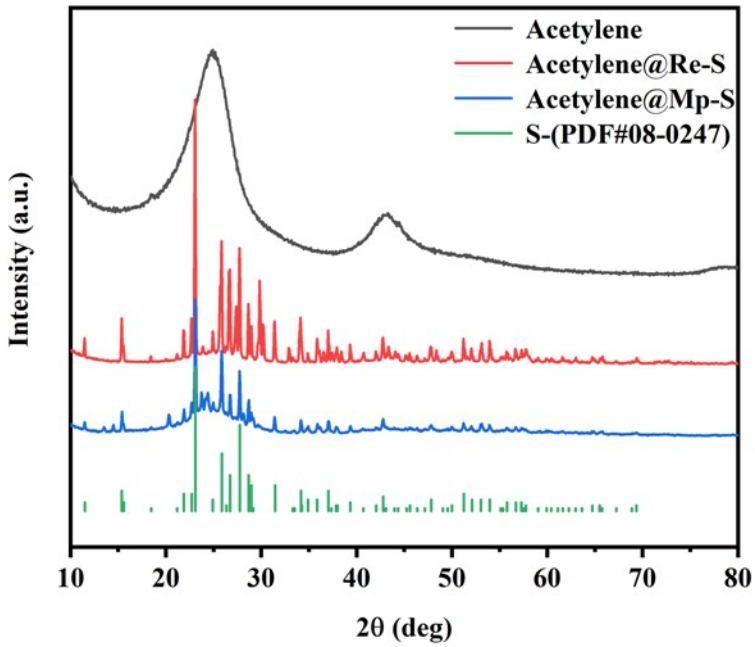

Fig. S7 XRD patterns of Acetylene black, Acetylene black@Re-S, Acetylene black@Mp-S, and pristine S.

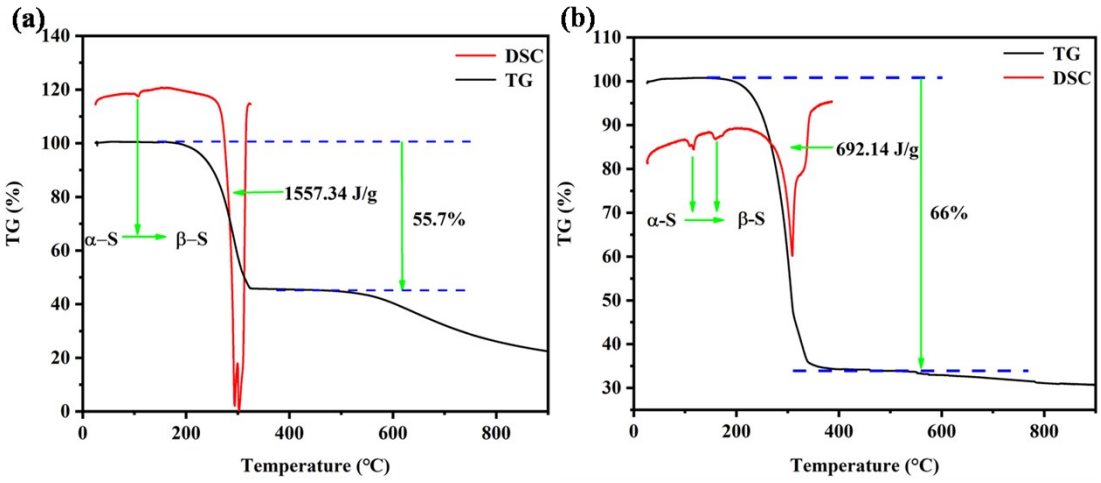

Fig. S8 (a) TG and DSC curves of Acetylene black@Mp-S. (b) TG and DSC curves of Acetylene black@Re-S.

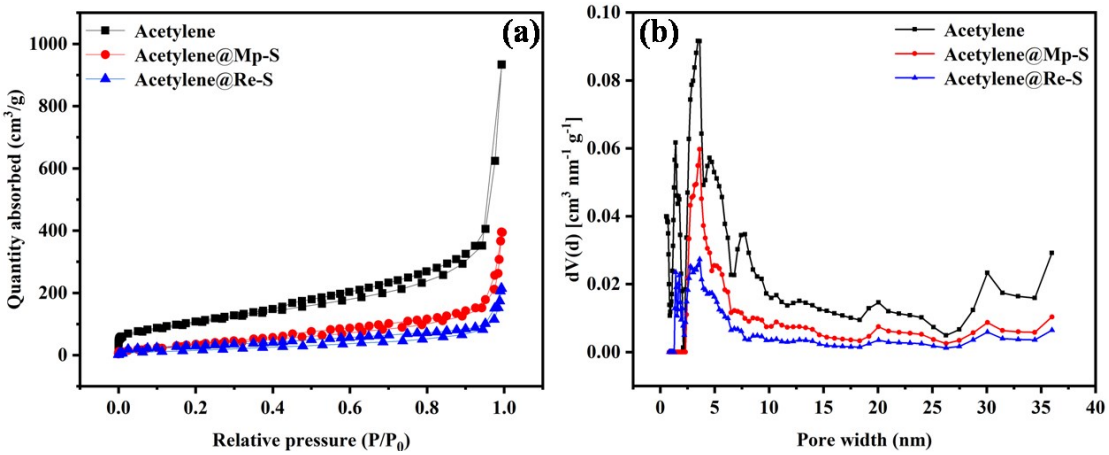

Fig. S9 (a) Nitrogen adsorption-desorption isotherms, and (b) pore size distribution obtained using DFT method of Acetylene black, Acetylene black@Mp-S, and Acetylene black@Re-S.

Table S2. The specific surface area and pore volume of Acetylene black, Acetylene black@Mp-S, and Acetylene black@Re-S were measured by Brunauer−Emmett−Teller theory with the P/P_0 range from 0.00001 to 0.1.

Sample	Specific surface area [m^2 g^{-1}]		Pore	Micropore
	BET	DFT	volume[cm^3 g^{-1}]	content [%]
Acetylene black	377.6	285.9	0.739	0
Acetylene black@Mp-S	144.7	90.0	0.316	0
Acetylene black@Re-S	66.3	64.5	0.183	0

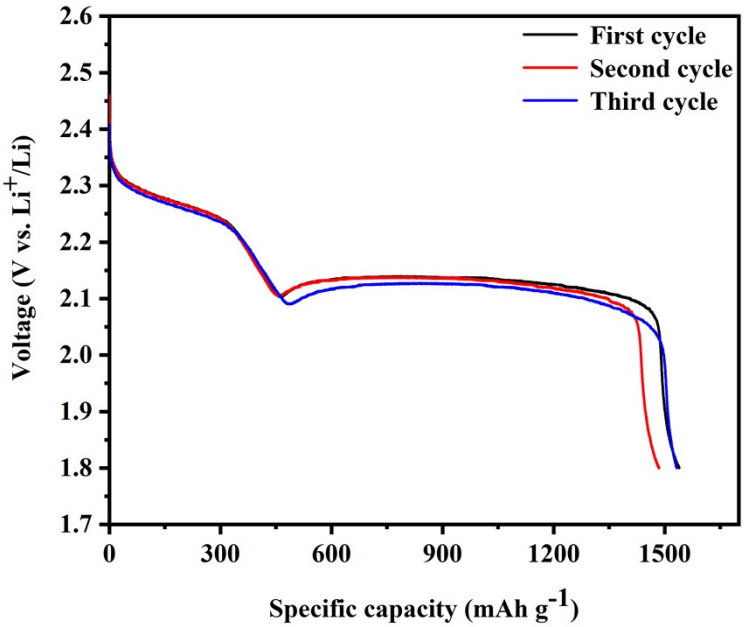

Fig. S10 Galvanostatic discharge curve of Acetylene black@Re-S with conductive agent.

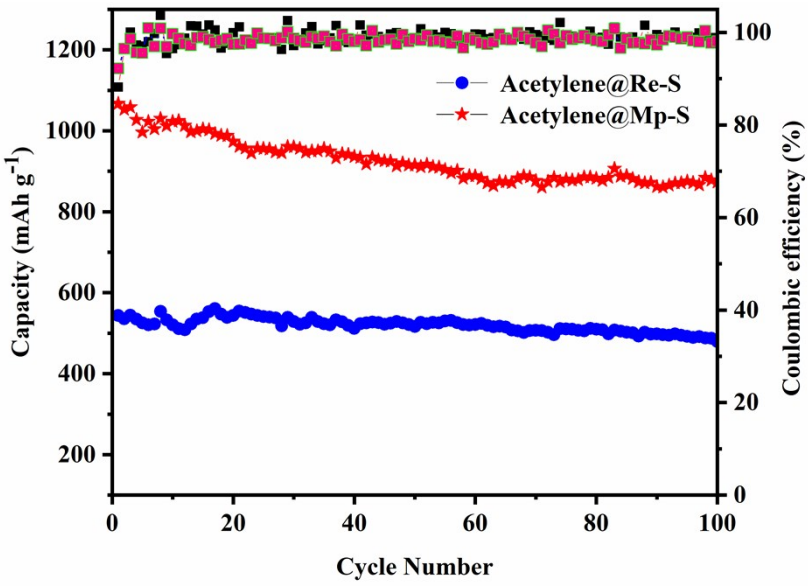

Fig. S11 Long-term cycling performance of Acetylene black@Mp-S, and Acetylene black@Re-S.

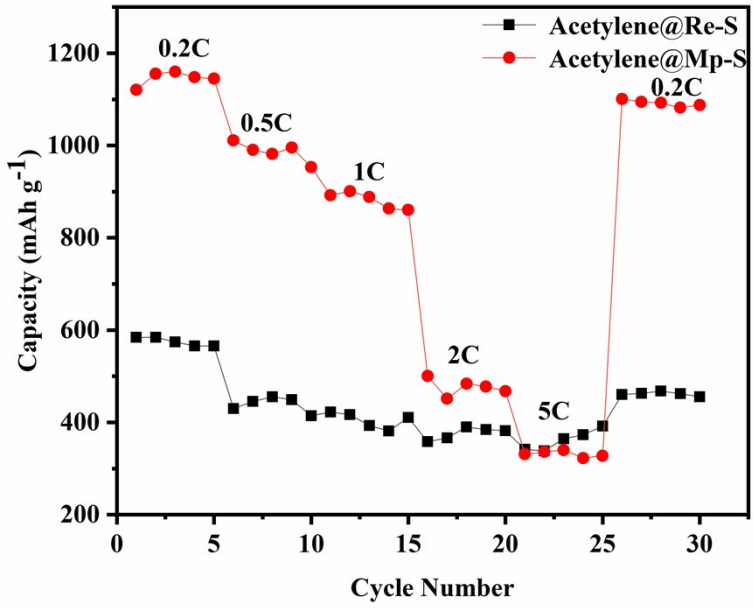

Fig. S12 Rate performance of pristine Acetylene black@Mp-S, and Acetylene black@Re-S.

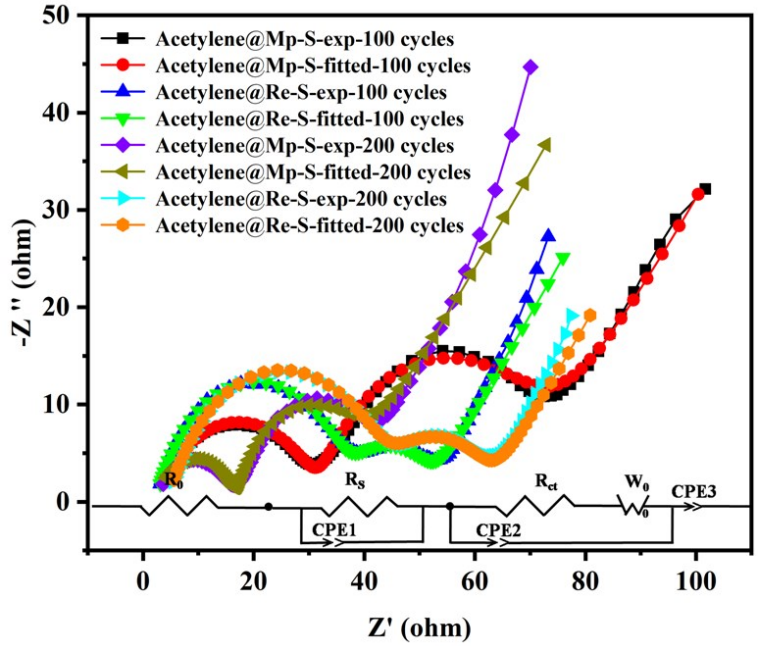

Fig. S13 Electrochemical impedance spectroscopy was tested after 100 and 200 cycles for Acetylene black@Mp-S and Acetylene black@Re-S.

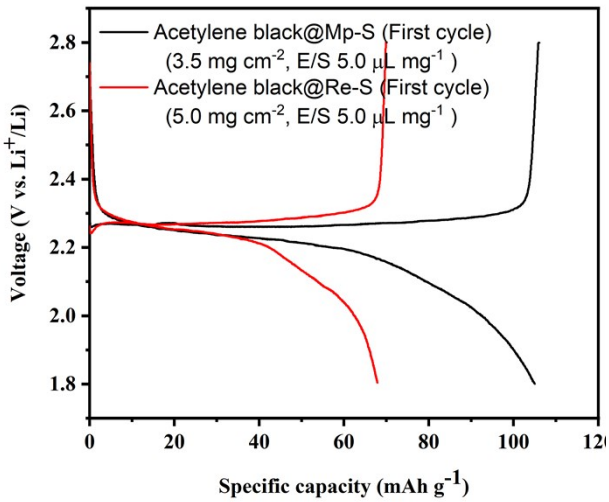

Fig. S14 High areal S loading and low E/S ratio measurement for both of Acetylene black@Mp-S, Acetylene black@Re-S.

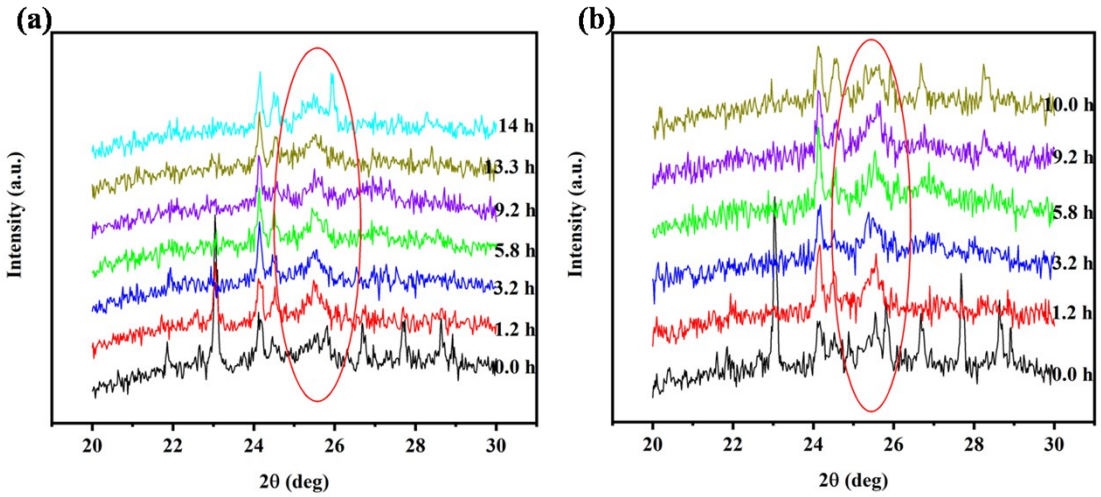

Fig. S15 The peaks of polysulfides in a red ring of 25.56°. (a) Acetylene black@Mp-S cathode, (b) Acetylene black@Re-S cathode.