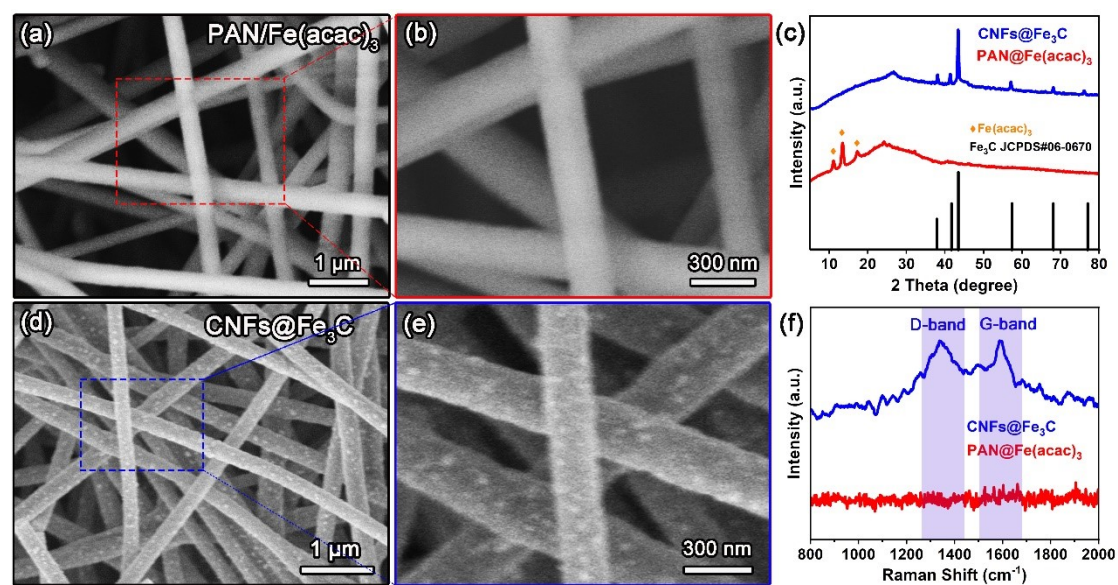


## Self-Supporting Poly (3,4-ethylenedioxythiophene) and Fe<sub>3</sub>C Co-Decorated Electrospun Carbon Nanofibers as Li<sub>2</sub>S Supporter for Lithium Sulfur Batteries

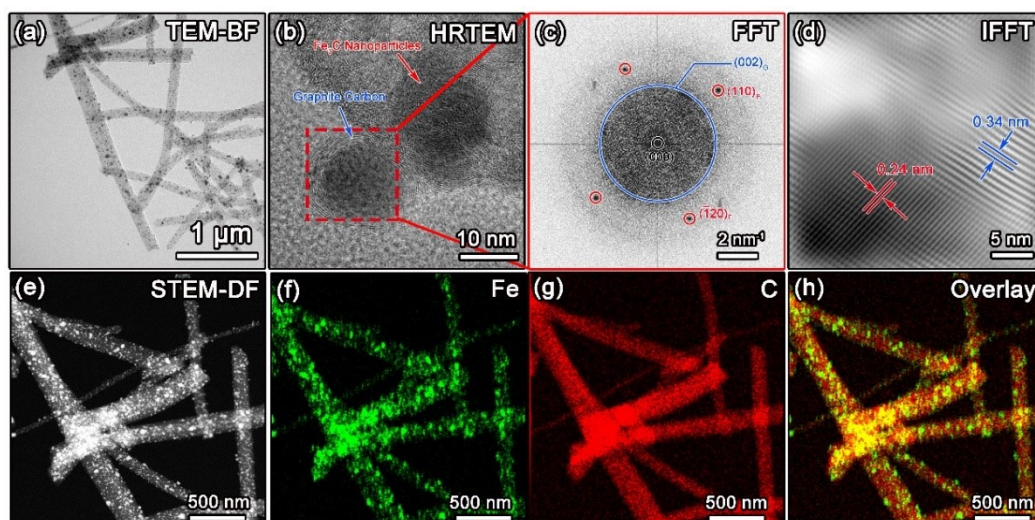
Na Yang,<sup>a</sup> Yuanxiao Ji,<sup>a</sup> Jiyuan Zhang,<sup>a</sup> Jiarui Xue,<sup>a</sup> Weiye Zhang,<sup>a</sup> Xuexia He,<sup>a</sup> Qi Li,<sup>a</sup> Zhibin Lei<sup>a,\*</sup>, Zonghuai Liu<sup>a</sup> and Jie Sun<sup>a,\*</sup>

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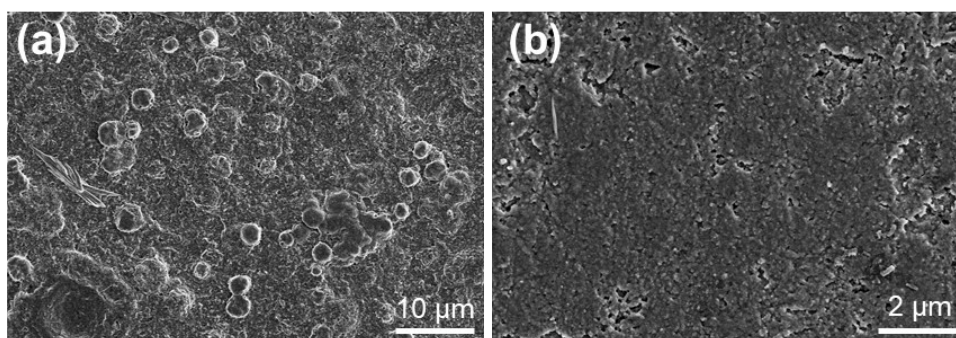
### Supporting Information



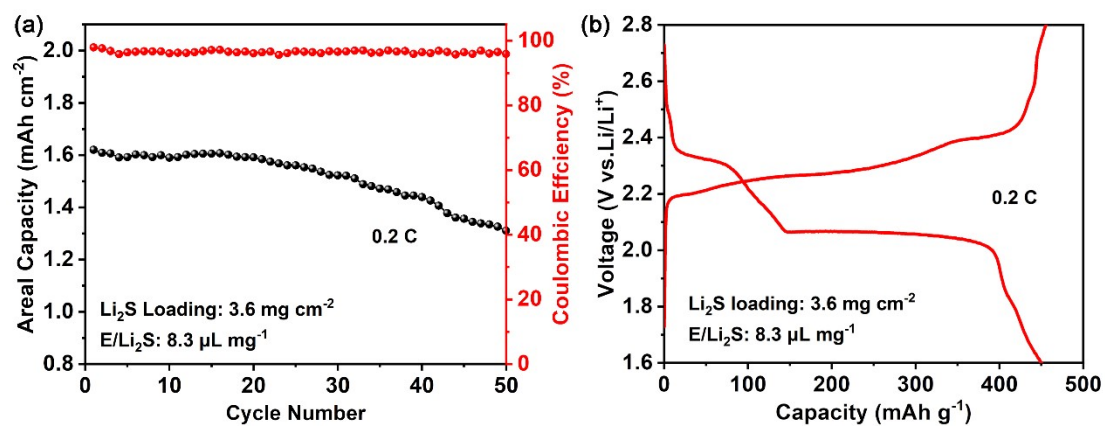
**Figure S1** The phase structure and morphology characterization results of PAN/Fe(acac)<sub>3</sub> and CNFs@Fe<sub>3</sub>C composite nanofiber membranes: (a, b) SEM images of PAN/Fe(acac)<sub>3</sub>, (c) XRD pattern, (d, e) SEM images of CNFs@Fe<sub>3</sub>C, (f) Raman spectra.



**Figure S2** TEM characterization results of CNFs@Fe<sub>3</sub>C nanofiber membranes: (a) TEM-BF image, (b) HRTEM image, (c) Corresponding FFT figure, (d) IFFT figure, (e) STEM-DF image, (f-h) EDX mapping results of the distribution of Fe, C and overlay mapping.



**Figure S3** SEM images of the P@CNFs@Fe<sub>3</sub>C-16%-Li<sub>2</sub>S cathode after 1000 cycles under different magnifications (a, b).



**Figure S4** The cyclic performance (a) and corresponding galvanostatic charge-discharge curve (b) of P@CNFs@Fe<sub>3</sub>C-16% cathode under high Li<sub>2</sub>S loading amount and low E/Li<sub>2</sub>S ratio.

**Table S1** Electrochemical performance comparison of the recent reported Li<sub>2</sub>S-based cathode in Li-S batteries

Cathode Materials	Cyclic Performance (mAh g <sup>-1</sup> )	Li <sub>2</sub> S loading amount (mg cm <sup>-2</sup> )	References
Li <sub>2</sub> S@C	411 (0.1C, 50 cycles)	0.54	1
MWCNT-Li <sub>2</sub> S	550 (0.1C, 100 cycles)	1	2
Li <sub>2</sub> S/CNT/C-N/O	671 (0.1C, 200 cycles)	~2	3
Li <sub>2</sub> S-rGO	315 (0.1C, 100 cycles)	0.96	4
ML-Ti <sub>3</sub> C <sub>2</sub> /Li <sub>2</sub> S	450 (0.2C 100 cycles)	0.8	5
Li <sub>2</sub> S/FWNTs@rGO NBF	868 (0.2C, 300 cycles)	1.0-1.5	6
Li <sub>2</sub> S-ZnS@NC	640 (0.2C, 100 cycles)	2	7
Li <sub>2</sub> S-PPy	785 (0.2C, 400 cycles)	~1	8
Li <sub>2</sub> S-PAN	665 (0.5C, 250 cycles)	2.5	9
Nano-Li <sub>2</sub> S/rGO	898 (0.5C, 145 cycles)	0.8-1.5	10
P@CNFs@Fe <sub>3</sub> C	580 (0.1C, 100 cycles)	1.2	This work

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