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# Supplemental material

## The electrochemical behavior of nitrogen-doped carbon nanofibers derived from a polyacrylonitrile precursor in lithium sulfur batteries

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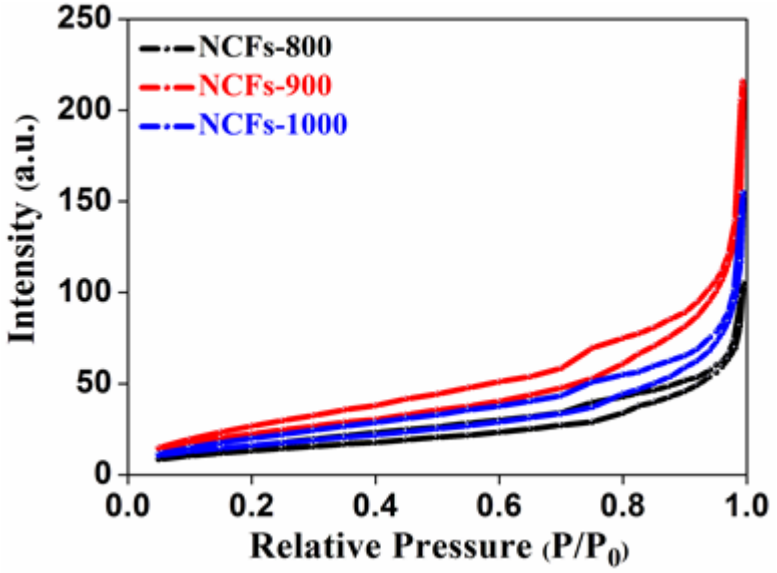


Figure S1 $N_2$ adsorption-desoprtion analysis of NCFs-800, NCFs-900 and NCFs-1000

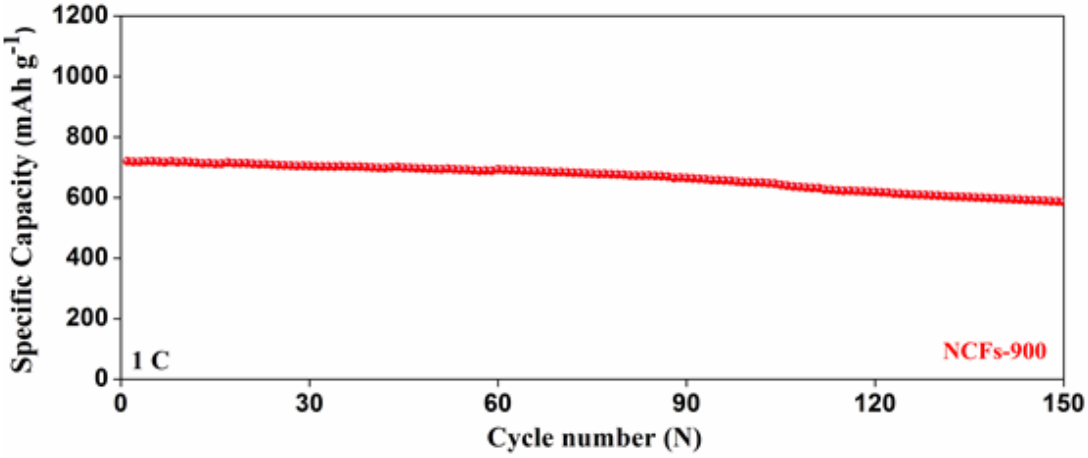


Figure S2 Cycling performance of NCFs-900@$Li_2S_6$ composite electrode at 1 C

According to the Equation S1: $D_{Li+} = \frac{R^2T^2}{2A^2N^4F^2C^2\sigma^2}$ , the R and T represent the gas constant (8.314 J $mol^{-1}$ $K^{-1}$) and the thermodynamics temperature (298.5 K), A represents the practical surface area of the electrode (1.13 $cm^2$), N represents the electron number corresponding to the reaction of the lithium ions (N = 2), F represents the Faraday constant (9.65 × $10^4$ C $mol^{-1}$), C represents the molar concentration of lithium ions (1.29 mol $cm^{-3}$). The σ represents Warburg diffusion coefficient calculated according to the following Equation S2: $Z_{re} = R_s + R_{ct} + \sigma\omega^{-0.5}$

Table S1 Impedance parameters of NCFs@$Li_2S_6$ electrodes

| Electrodes | $R_s$ (Ω) | $R_{ct}$ (Ω) | $D_{Li}^+$ ($cm^2$ $s^{-1}$) |
|---|---|---|---|
| NCFs-800@$Li_2S_6$ | 3.03 | 27.28 | $8.36\times10^{-10}$ |
| NCFs-900@$Li_2S_6$ | 3.07 | 23.53 | $4.08\times10^{-9}$ |
| NCFs-1000@$Li_2S_6$ | 3.57 | 20.02 | $3.11\times10^{-10}$ |

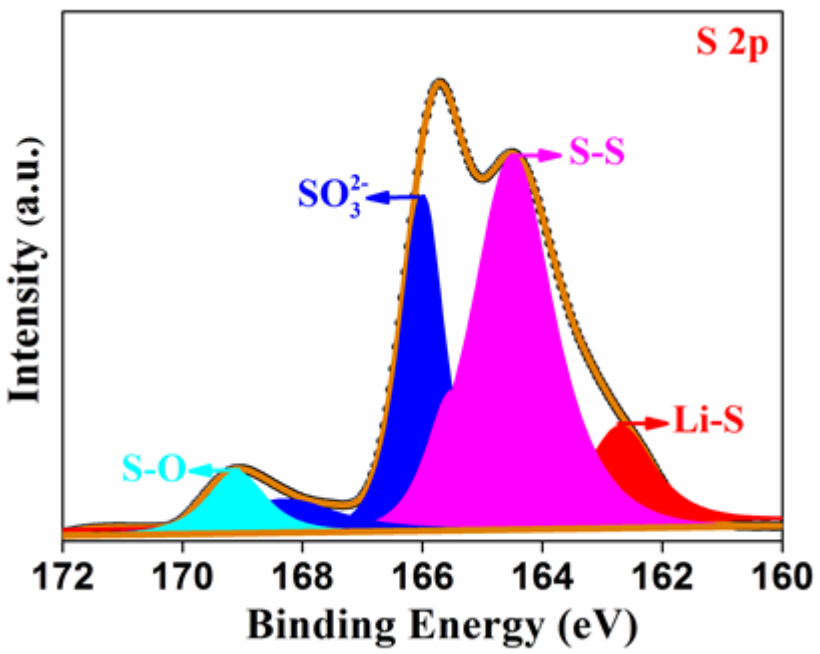


Figure S3 High resolution S2p spectrum of after cycled NCFs-900@$Li_2S_6$ electrode

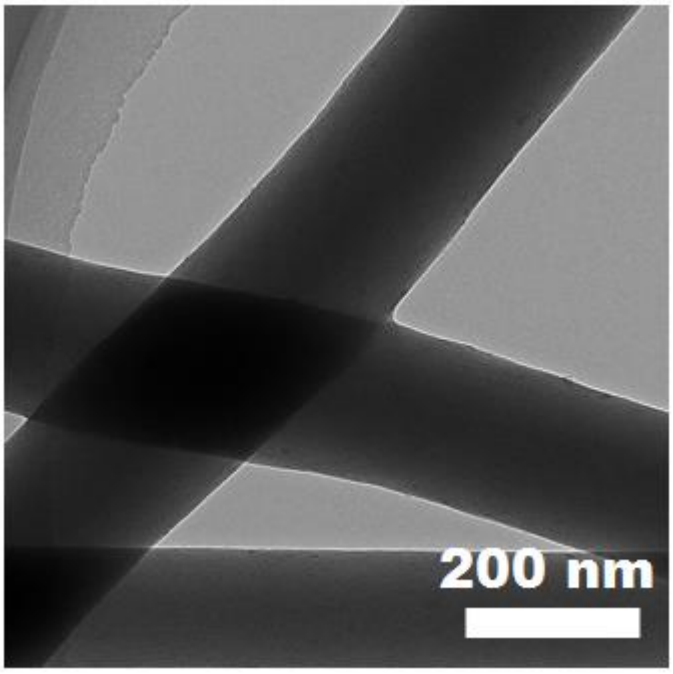


Figure S4 TEM image of pristine NCFs-900