

*Supporting Information*

**Green synthesis of carbon-supported ultrafine ZnS nanoparticles for superior lithium-ion batteries**

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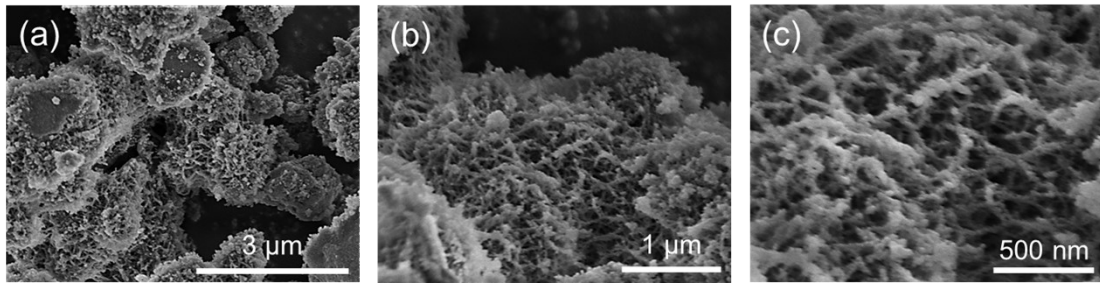


Figure S1. SEM image of ZnS-NC before carbonization.

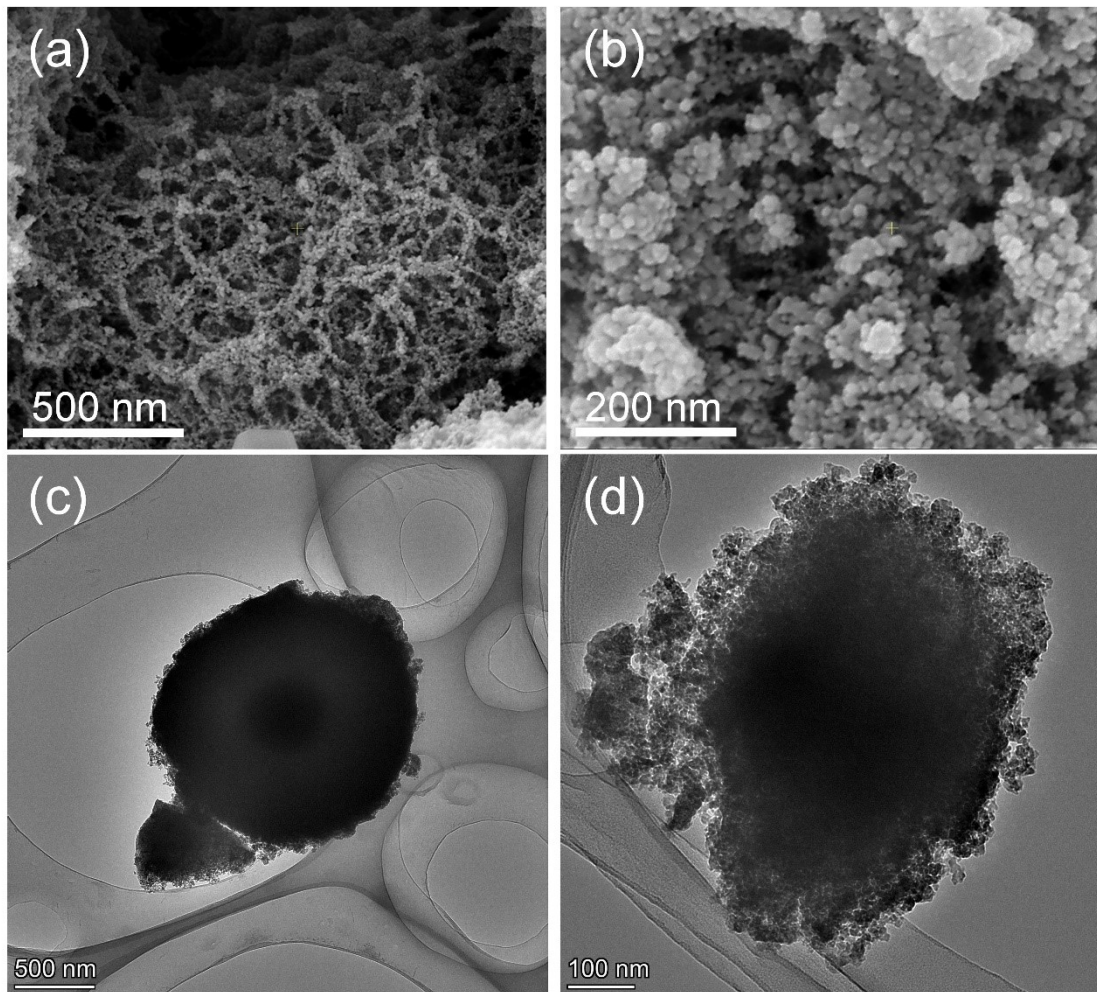


Figure S2. (a-b) SEM images and (c-d) TEM images of ZnS-NC.

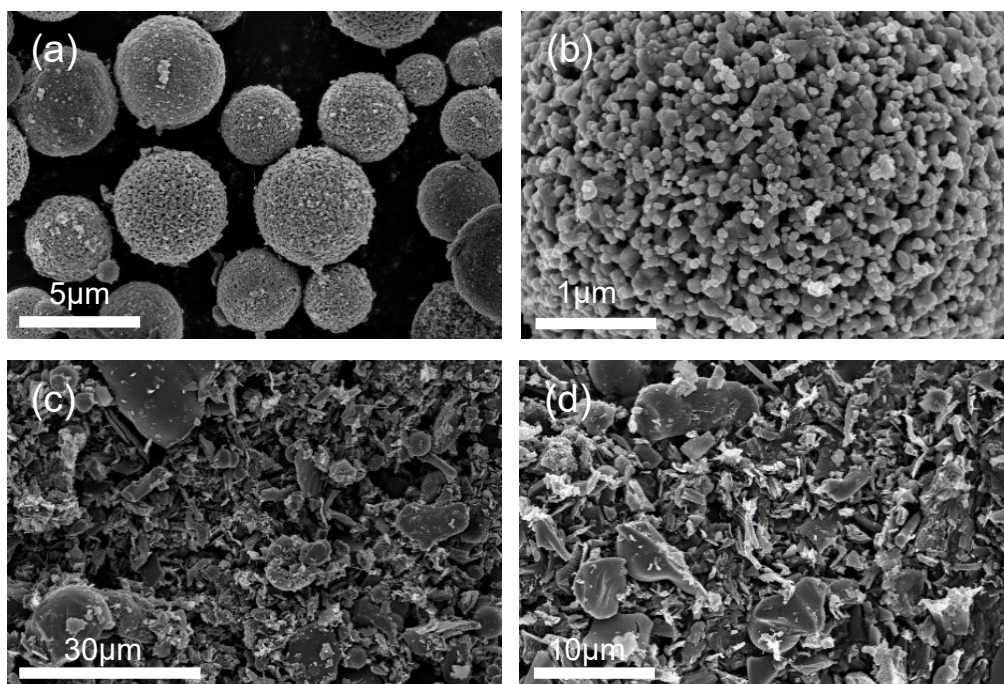


Figure S3. SEM images of (a,b) p-ZnS and (c,d) NC.

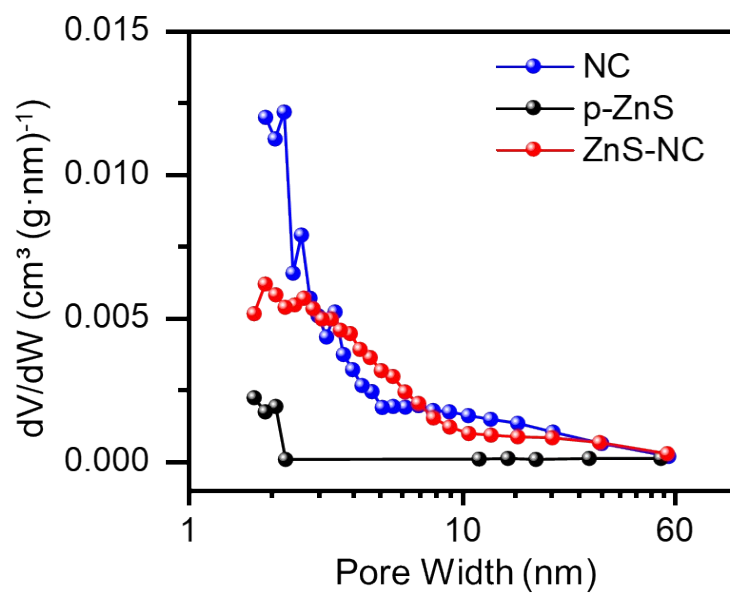


Figure S4. Pore size distribution curves of p-ZnS, NC and ZnS-NC.

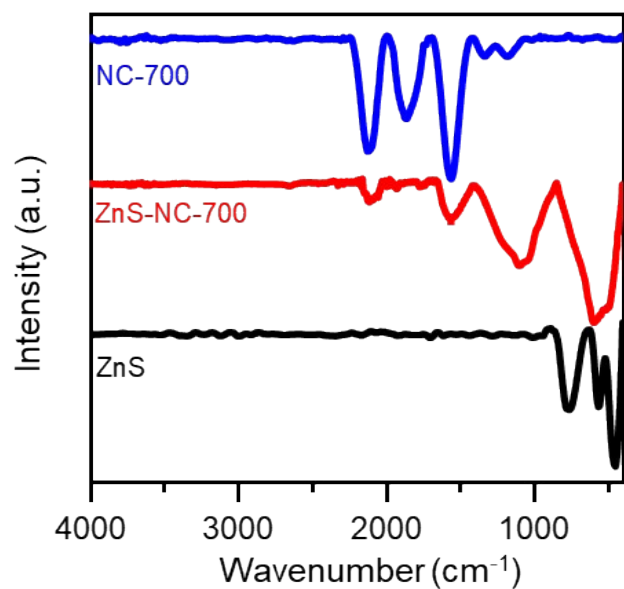


Figure S5. FT-IR spectrum of p-ZnS, NC and ZnS-NC.

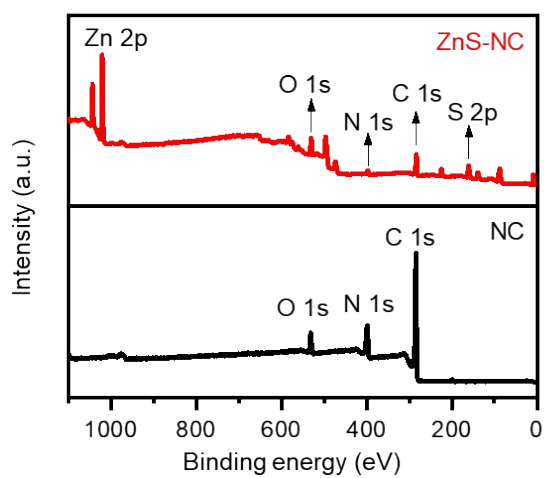
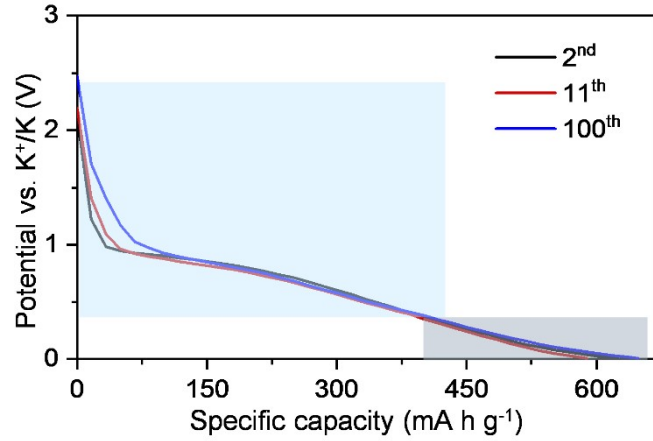


Figure S6. XPS surveys of the ZnS-NC and NC.

Table S1. The content of nitrogen species in ZnS-NC and NC.

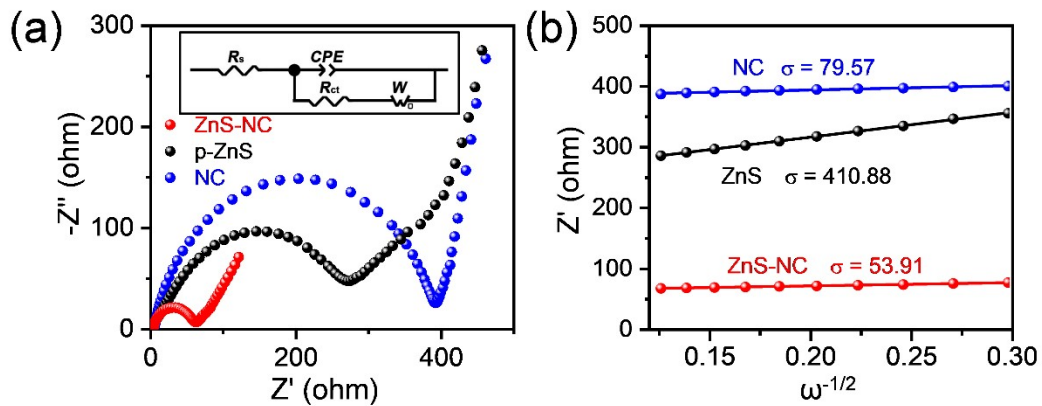
Sample	Graphitic N (%)	Pyrrolic N (%)	Pyridine N (%)
ZnS-NC	28.6	8.8	62.6
NC	25.0	37.8	37.2



**Figure S7.** The galvanostatic discharge profiles of ZnS-NC at the 2<sup>nd</sup>, 11<sup>th</sup> and 100<sup>th</sup> cycles at 1.0 A g<sup>-1</sup>.

Table S2. The specific capacity increments of ZnS-NC electrode in different voltage ranges.

Voltage range (V)	Specific capacity (mA h g <sup>-1</sup> )				
	2 <sup>nd</sup>	11 <sup>th</sup>	100 <sup>th</sup>	$\Delta C_{11-2}$	$\Delta C_{100-11}$
0.3-0.005	190	171	214	-19	43
3.0-0.3	434	417	434	-32	17
Full range	624	588	648	-70	60



**Figure S8.** (a) Nyquist plots of three electrodes and the inserted simulated equivalent circuit. (b) The real impedance part ( $Z'$ ) versus the reciprocal square root of angular frequency ( $\omega^{-1/2}$ ) of the p-ZnS, NC and ZnS-NC electrodes.

Table S3. The fitted  $R_s$  and  $R_{ct}$  values from EIS spectra for different electrodes.

Sample	$R_s$ ( $\Omega$ )	$R_{ct}$ ( $\Omega$ )
ZnS-NC	3	54
p-ZnS	3	314
NC	5	390