

Supporting information

**Synergy of nanoconfinement and surface oxygen in recrystallization of sulfur
melt in carbon nanocapsules and the related Li-S cathode properties**

Qingcong Zeng,^a Da-Wei Wang,^{*,a,b} Kuang-Hsu Wu,^a Yang Li,^a Fernanda Condi de Godoi,^a and Ian R. Gentle^{*,a}

^a School of Chemistry and Molecular Biosciences, The University of Queensland, Brisbane, QLD 4072, Australia.

E-mail: i.gentle@uq.edu.au

^b School of Chemical Engineering, The University of New South Wales, Sydney, NSW 2033, Australia

Email: da-wei.wang@unsw.edu.au

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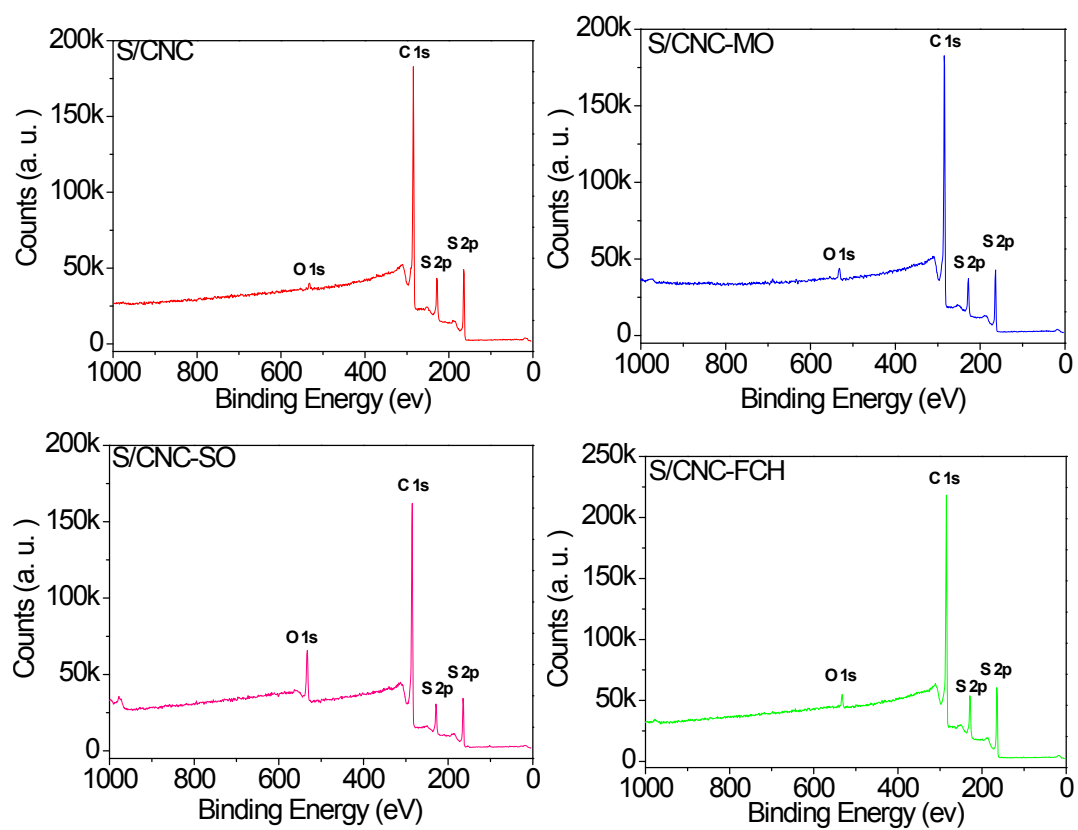


Figure S1 XPS survey spectra of S/C composites

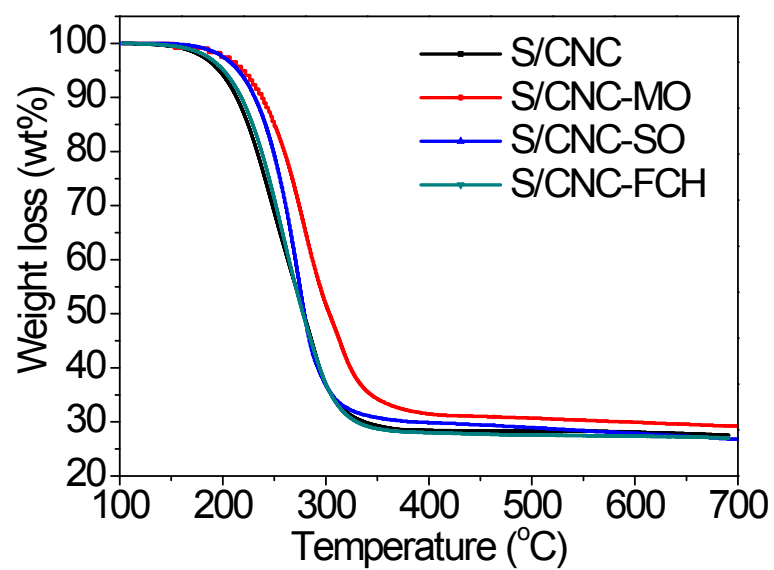


Figure S2. TGA curve of the S/C composites, ranging from 100 °C to 700 °C at 5 °C min⁻¹ in nitrogen

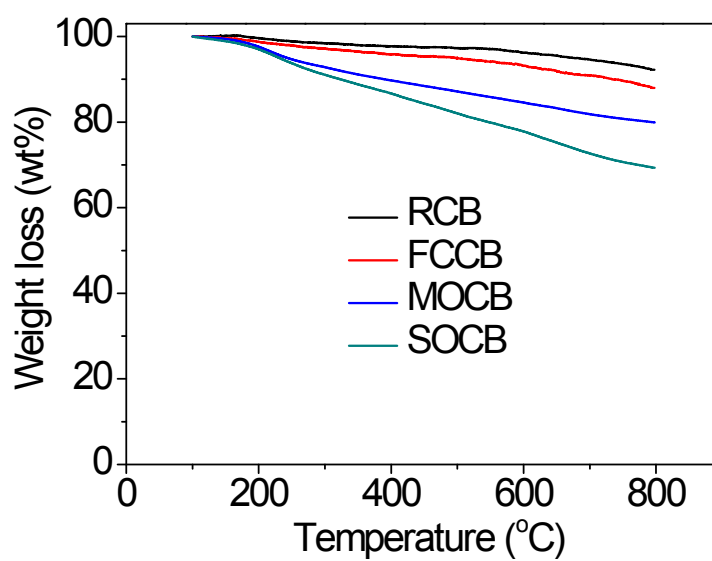


Figure S3. Thermal stability of S/CNCs

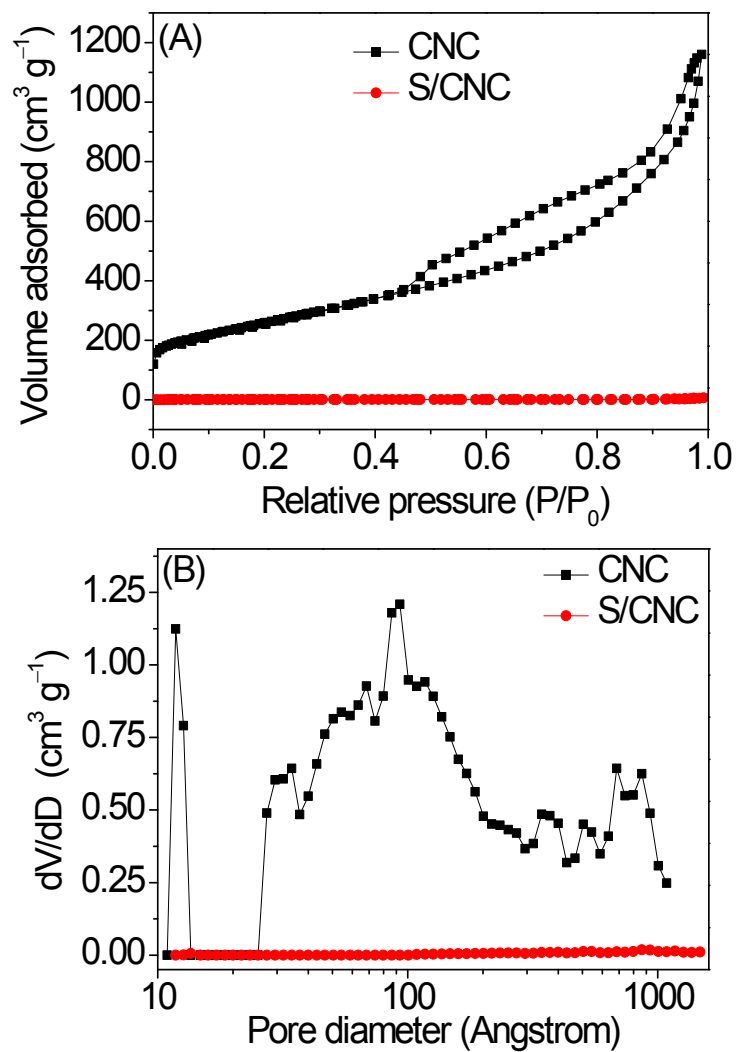


Figure S4 (A) Nitrogen adsorption-desorption isotherms and (B) pore size distribution of pure CNC and S/CNC composite

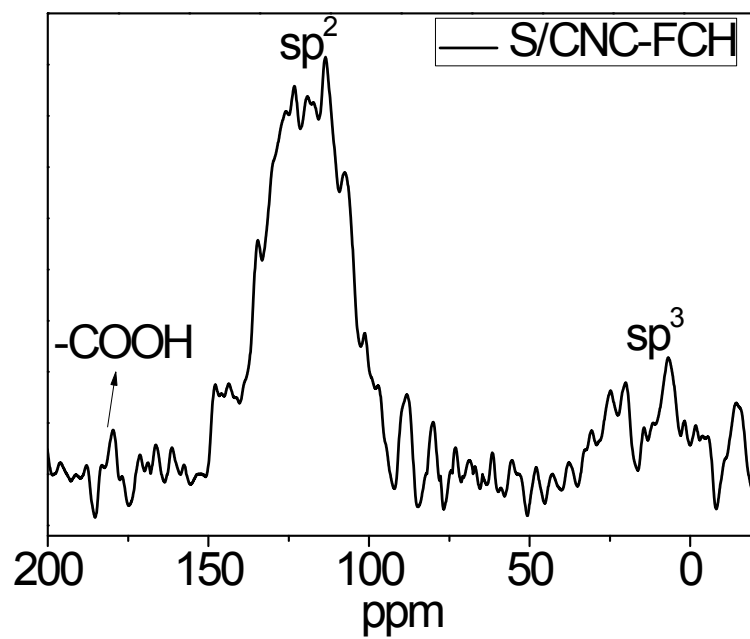


Figure S5 ^{13}C solid state NMR spectrum of S/CNC-FCH

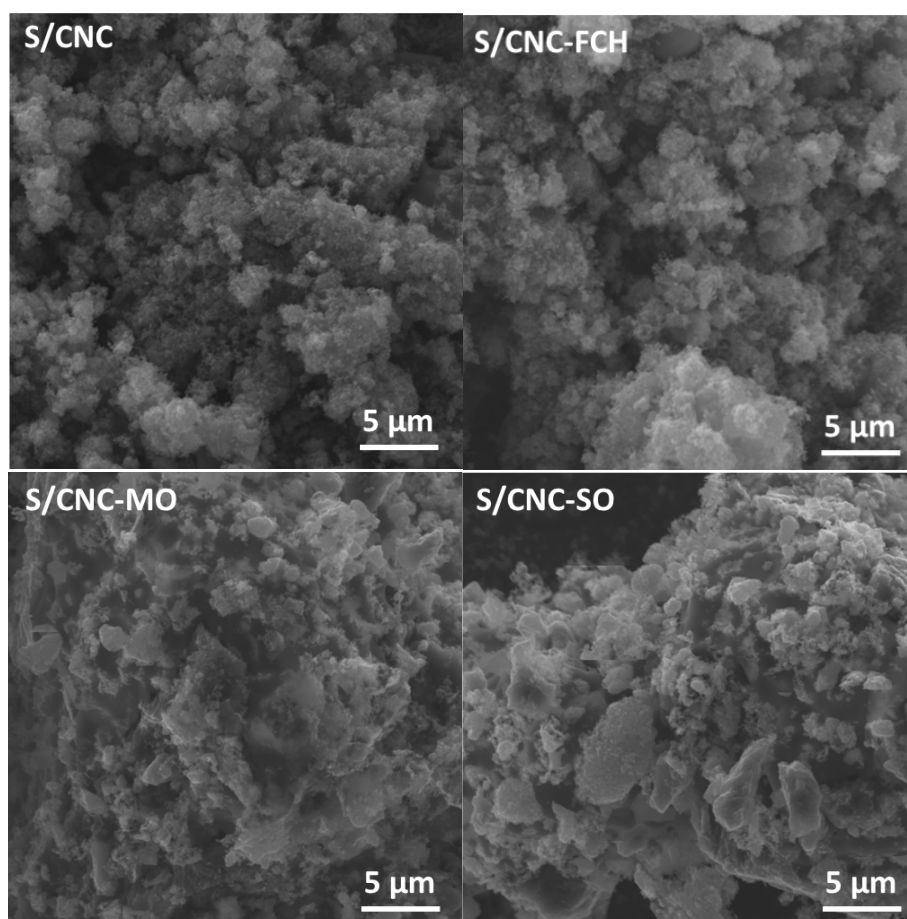


Figure S6. SEM images of S/CNCs

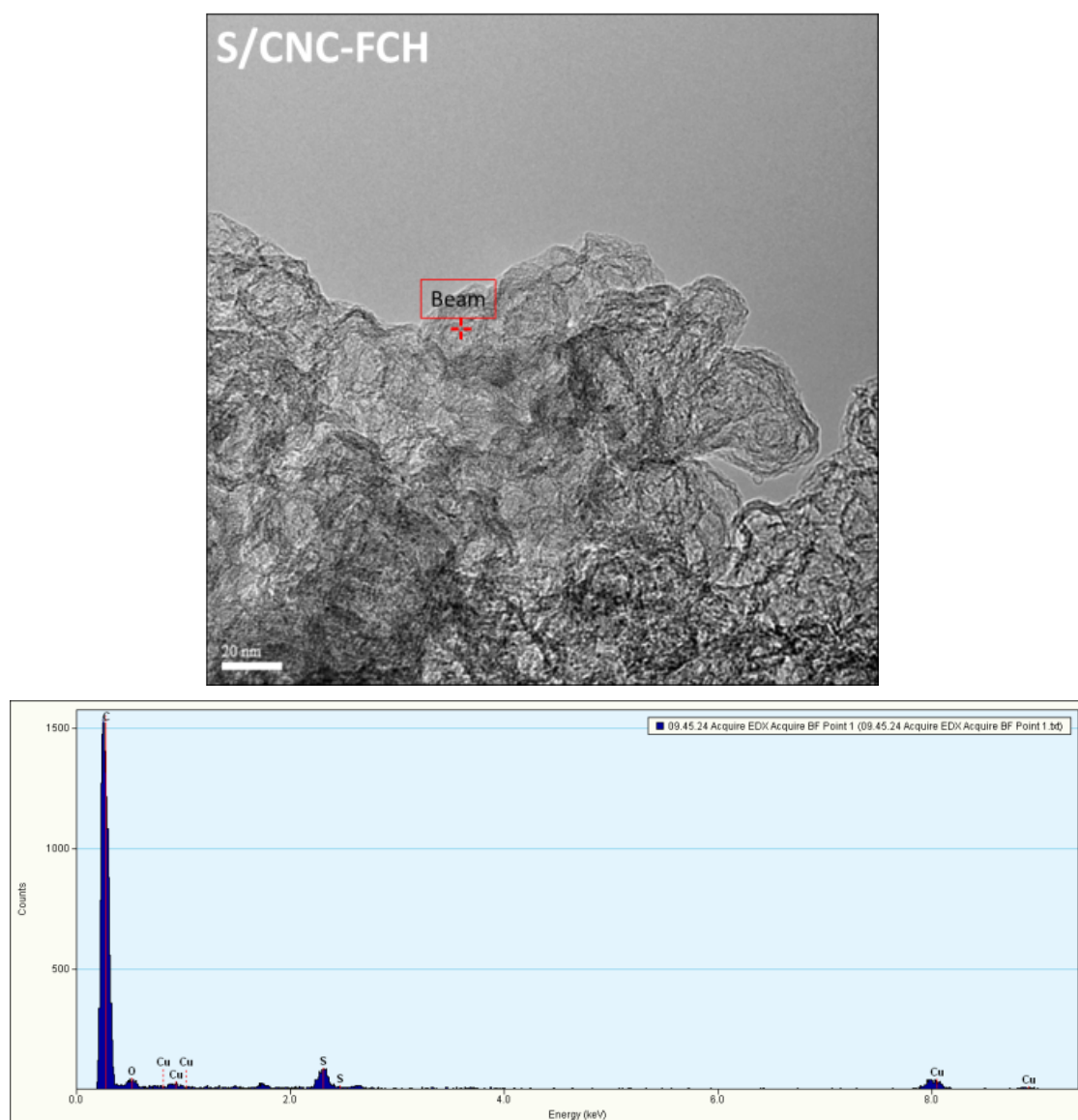
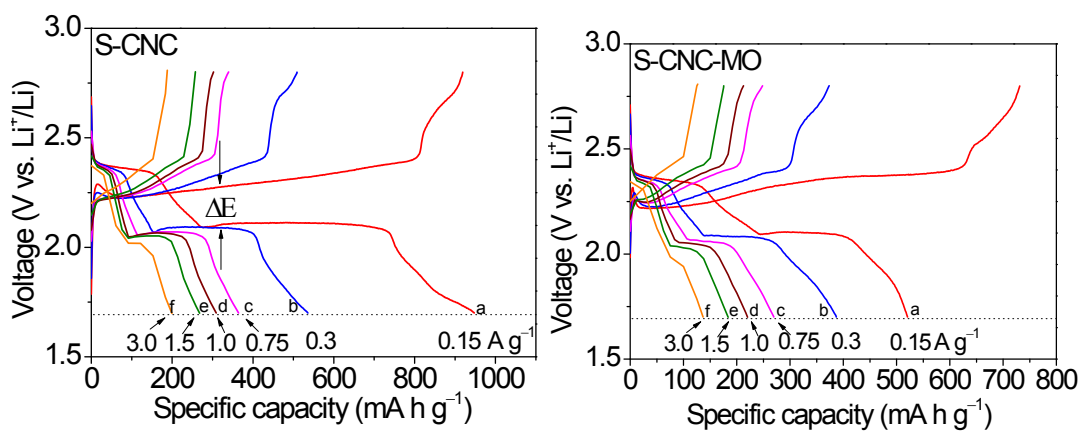


Figure S7. EDX result of S/CNC-FCH demonstrating the existence of sulfur in hollow structure of CNC-FCH



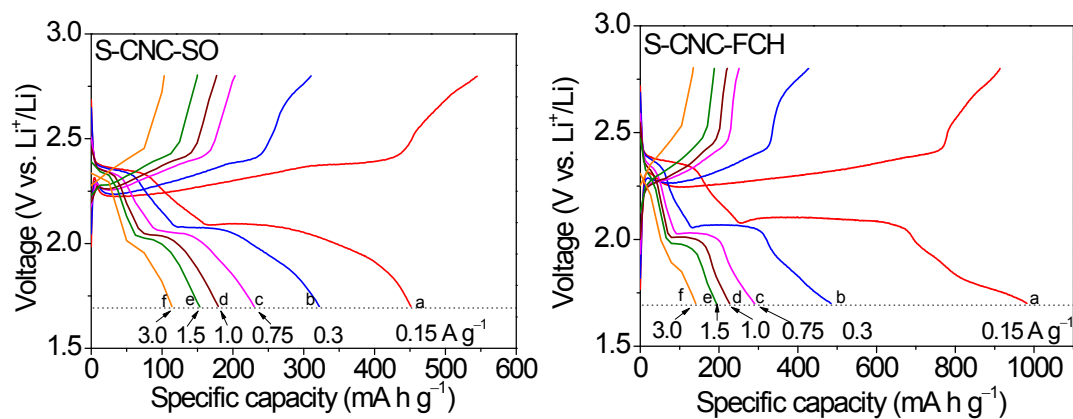


Figure S8. Galvanostatic charge-discharge profiles of S/CNCs at different current densities within a potential window of 1.7–2.8 V vs. Li^+/Li^0 .

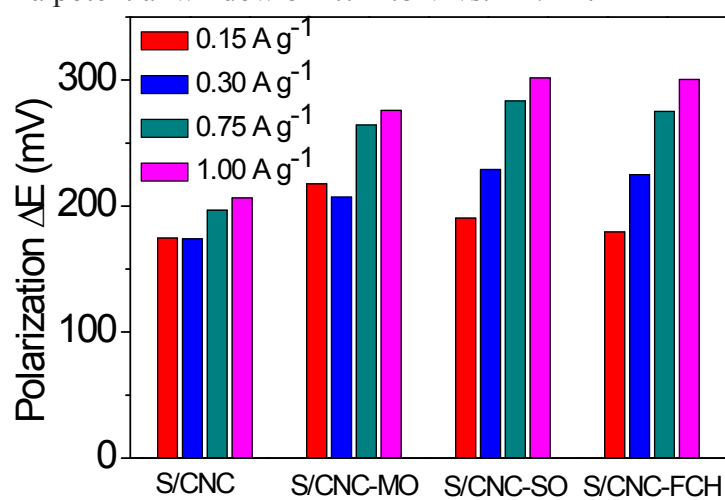


Figure S9. Comparison of the potential difference between the charge and discharge plateaus at different current densities.

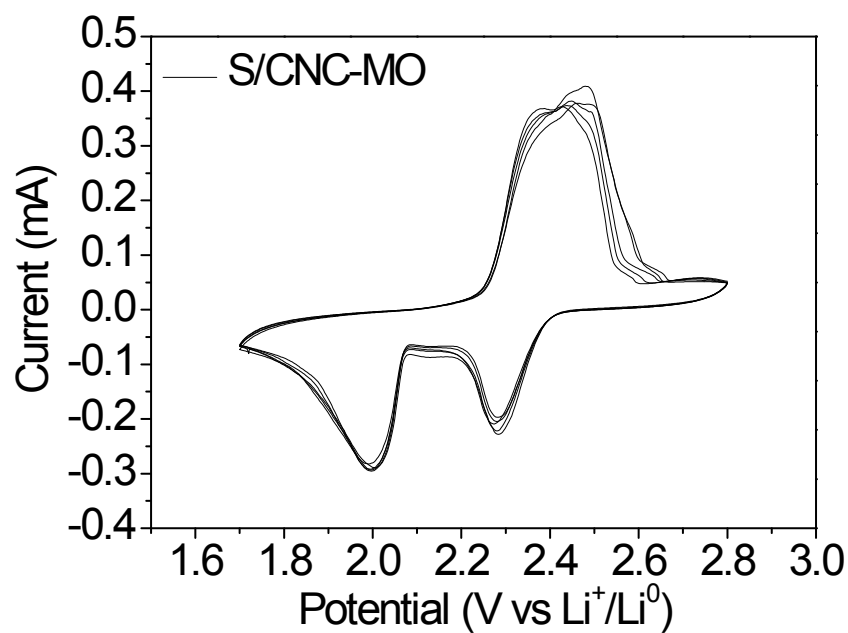


Figure S10 CV profile of S/CNC-MO

Table S1. Elements atomic percentages and oxygen to carbon atomic ratios in sulfur carbon composites from XPS results

Sample	S/CNC	S/CNC-MO	S/CNC-SO	S/CNC-FCH
O (atom %)	0.95	1.70	7.81	1.92
C (atom %)	88.75	90.36	85.12	87.55
S (atom %)	10.30	7.94	7.07	10.53
O/C	1.07	1.88	9.16	2.19

Table S2. Elemental analysis results of S/CNCs

Sample	Carbon	Sulfur	Hydrogen	Oxygen (Difference value)
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S/CNC	30.3%	68.8%	0.9%	0%
S/CNC-MO	25.9%	71.7%	0.64%	1.76%
S/CNC-SO	23.9%	71.5%	0.83%	3.77%
S/CNC-FCH	26.7%	70.5%	0.95%	1.85%