Supporting Information


A Comprehensive Approach toward Stable Lithium–Sulfur Batteries with High Volumetric Energy Density

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Figure S1. (a) \( \text{N}_2 \) adsorption/desorption isotherm of the NG-CN. (b) XRD patterns of GO, reduced GO (rGO), \( g\text{-C}_3\text{N}_4 \) and NG-CN.

Figure S2. (a) TGA curve of the NG-CN sulfur composite with 77 wt\% of sulfur with a ramp rate of 10 °C/min under \( \text{N}_2 \) flow. (b) SEM EDS mapping of the NG-CN sulfur composite (elements: O, S, N).
Figure S3. (a) XPS survey spectrum of NG-CN. (b) Summary of atomic components (at %) of the NG-CN measured from XPS and EDS spectra. (c) SEM EDS mapping of the NG-CN material (elements: C, N, O)

Figure S4. (a) The most stable geometry of Li$_2$S, Li$_2$S$_2$ and Li$_2$S$_4$ molecules, simulated by first-principles calculations. (b,c) The fully relaxed configuration of (b) Li$_2$S and (c) Li$_2$S$_4$ binding on double-layer graphene.
Figure S5. (a) Nyquist plot of the Li-S cell prepared with NG-CN/CMC-CA cathodes with 5.2 mg/cm² sulfur loading at a fully charged state, after 1st cycle (green), 5th cycle (black), 20th cycle (blue) and 40th cycle (red). (b) voltage profiles of the Li-S cell prepared with the NG-CN/CMC-CA cathodes using a 14.9 mg/cm² sulfur loading on cycles 1 → 10 as labelled.