Supporting information

Iron single atom catalyst anchored on nitrogen-rich MOF derived carbon nanocage to accelerate polysulfide redox conversion for lithium sulfur batteries

Cunguo Wang,[a] Hewei Song,[a,b] Congcong Yu,[b,c] Zaka Ullah,[d] Zhixing Guan,[b] Rongrong Chu,[a,b] Yingfei Zhang,[b] Liyi Zhao,[b] Qi Li,*[,b] and Liwei Liu,*[,b]

[a] Key Laboratory of Rubber-plastics, Qingdao University of Science and Technology, Qingdao, 266042, China

[b] Suzhou Institute of Nano-Tech and Nano-Bionics, Chinese Academy of Sciences (CAS), Suzhou, 215123, China.

[c] College of Chemistry, Chemical Engineering and Materials Science, Soochow University, Suzhou, 215123, China.

[d] Centre of Excellence in Solid State Physics, University of the Punjab, Lahore, 54590, Pakistan.

Corresponding Email: qli2013@sinano.ac.cn or lwliu2007@sinano.ac.cn.

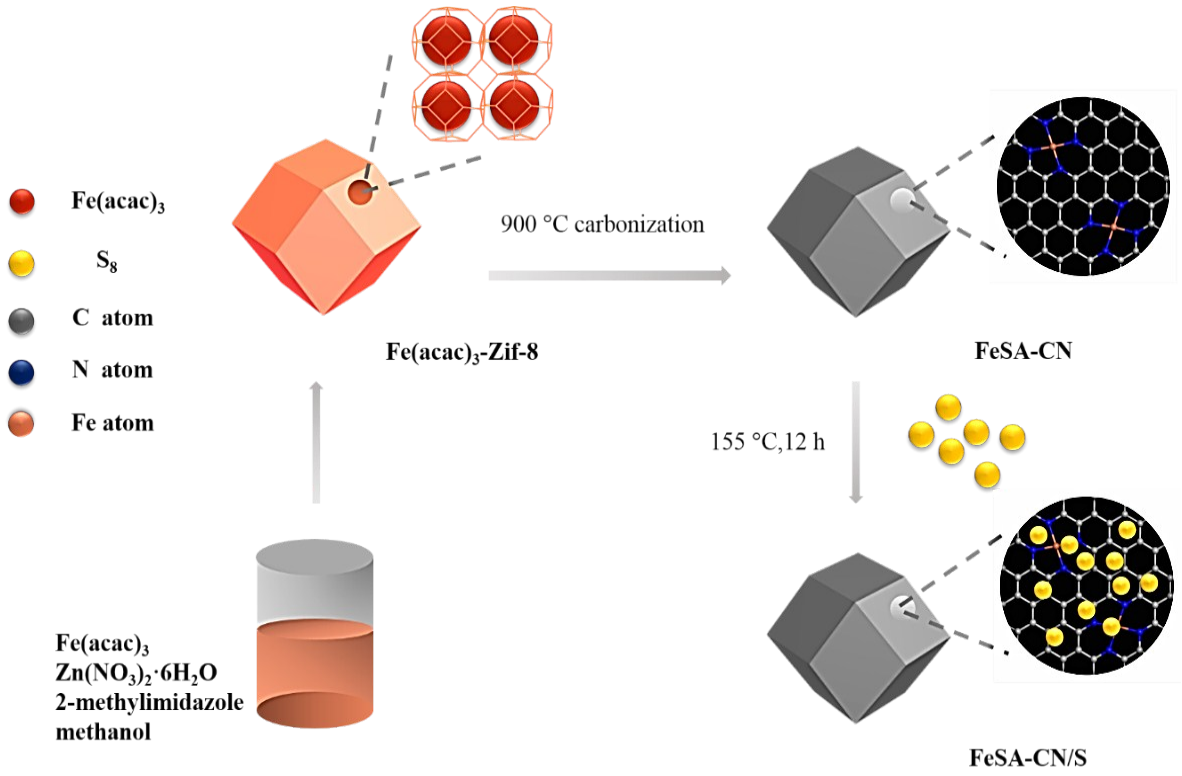

Figure S1. Schematic for synthesis of FeSA-CN/S.

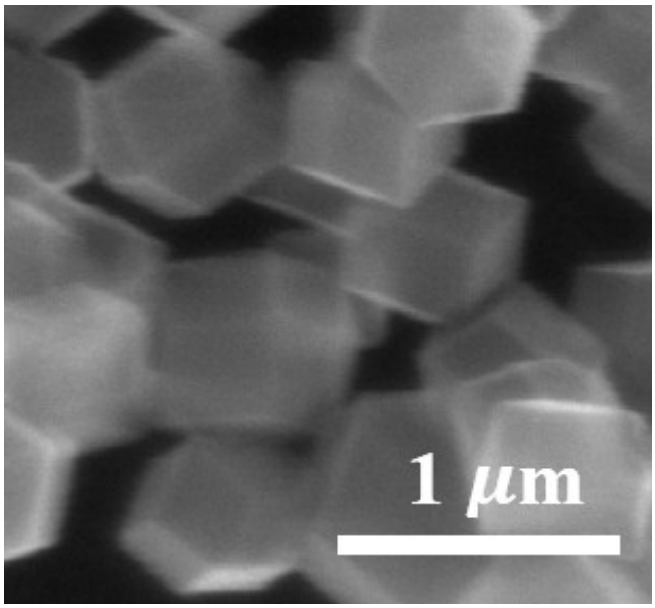

Figure S2. Scanning electron microscope image of CN.

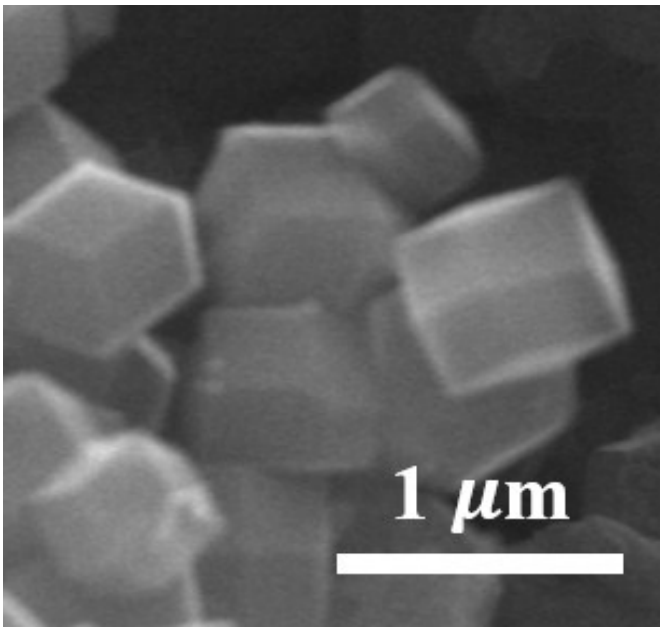

Figure S3. Scanning electron microscope spectrum of CN/S.

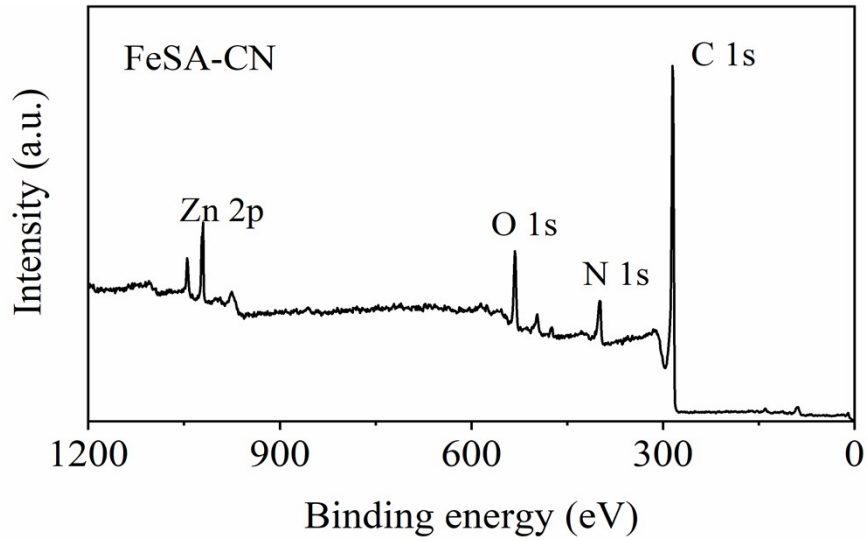

Figure S4. X ray photoelectron spectrum of FeSA-CN.

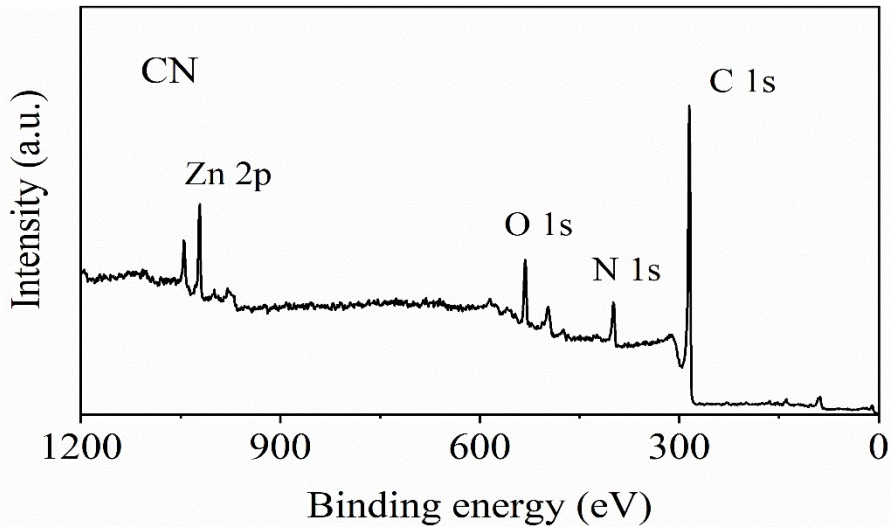

Figure S5. X ray photoelectron spectrum of CN.

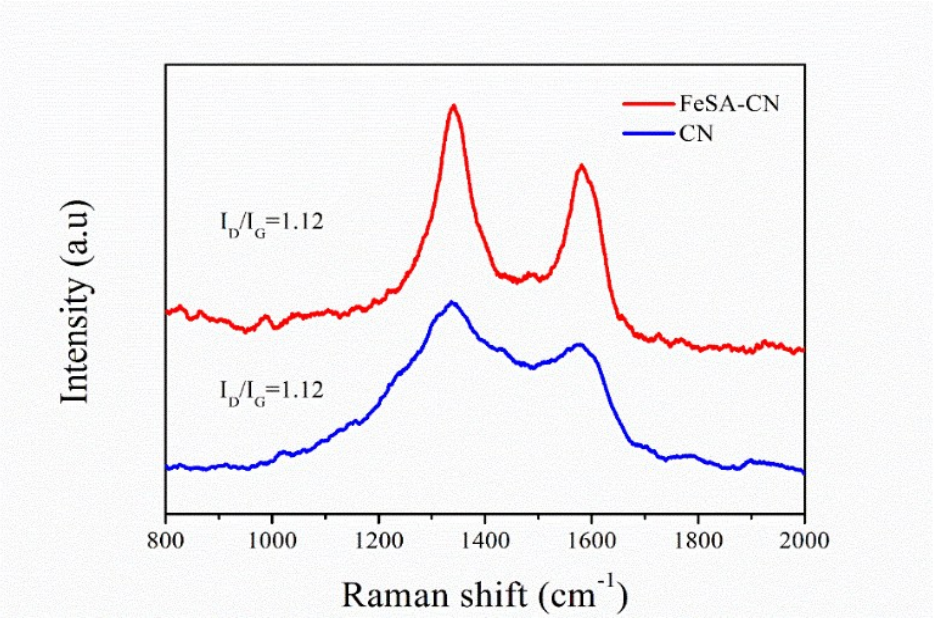

Figure S6. Raman spectra of FeSA-CN and CN.

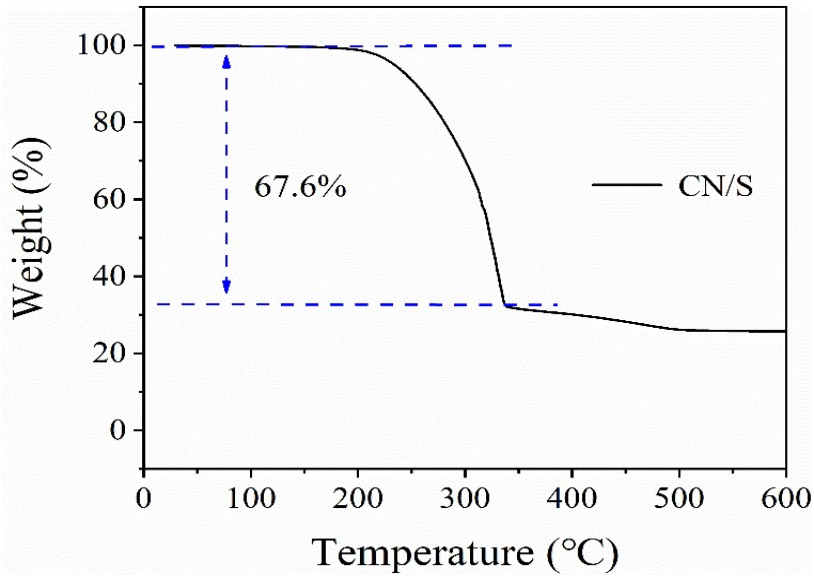

Figure S7. TGA curve of CN/S composite.

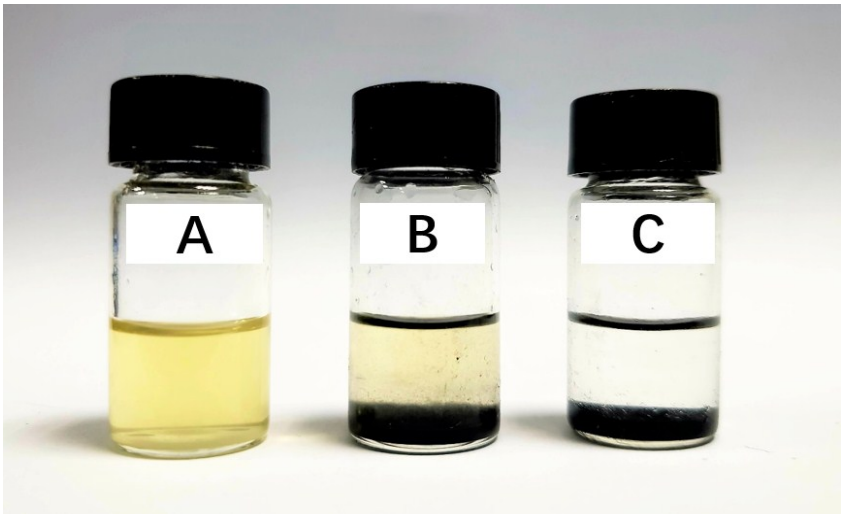

Figure S8. LiPSs adsorption performance measurement. Blank Li_2S_4 solution (A), after the addition of CN (B) and FeSA-CN (C).

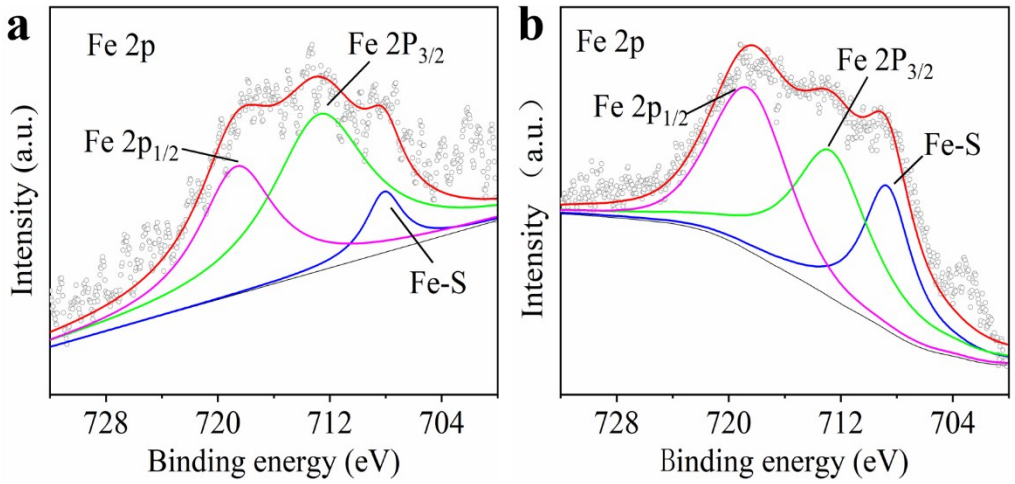

Figure S9. Fe 2p spectra of FeSA-CN/S electrode after fully charged (a) and during the charge process (b).

The sharp peak located at 708.5 eV is attributed to the Fe-S binding, which is closely associated with the change of Fe $2p_{1/2}$ (719.5 eV). And the change of these different component Fe vividly demonstrates the periodic connection between FeSA and S^{x-} during charge/discharge process.

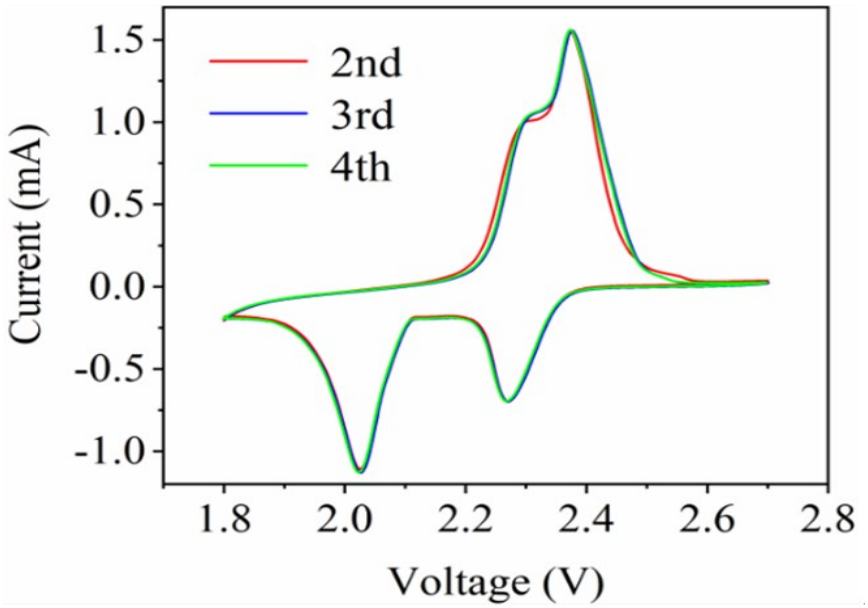

Figure S10. CV curves of FeSA-CN/S electrode at the scan rate of 0.1 mV s^{-1}.

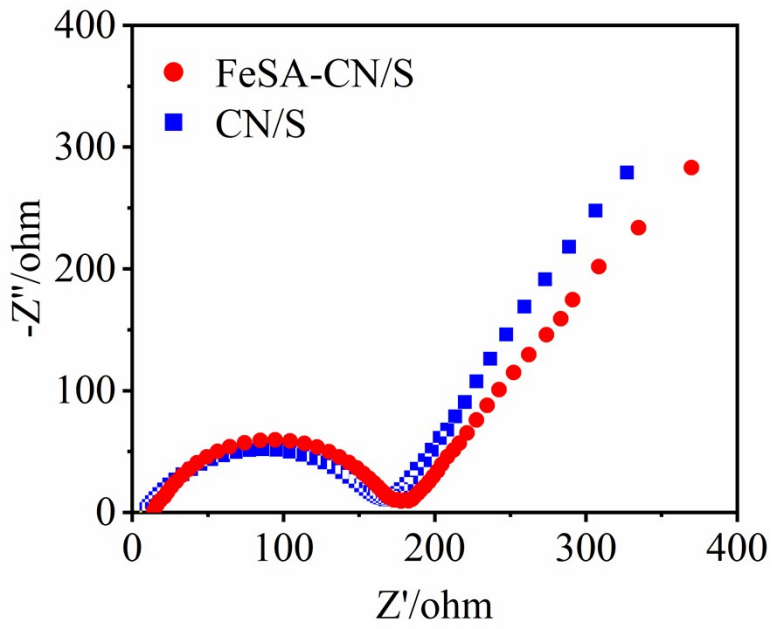

Figure S11. Nquist plots of FeSA-CN/S and CN/S electrodes before cycling.

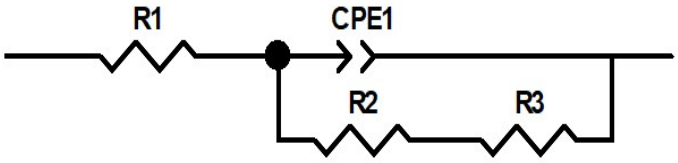

Figure S12. Equivalent circuit for electrochemical impedance spectra of FeSA-CN/S electrode.

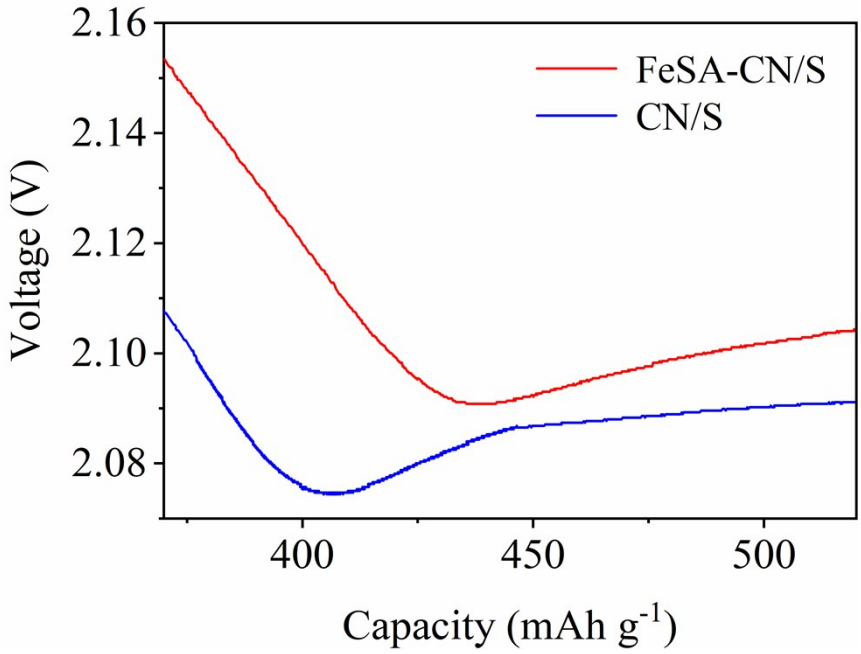

Figure S13. Initial period at second charge plateau of FeSA-CN/S and CN/S electrodes.

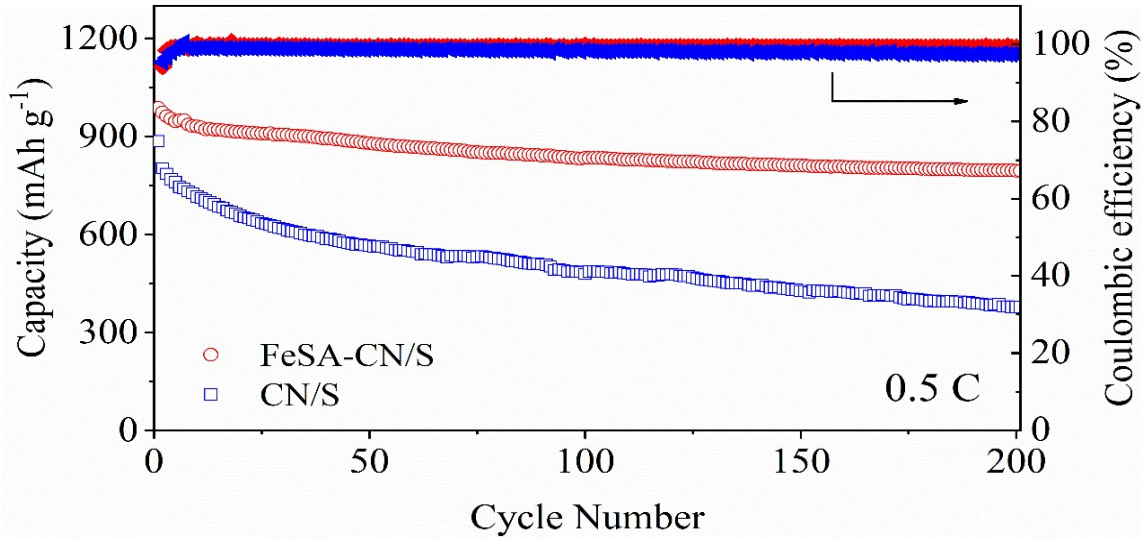

Figure S14. Cycling performance of FeSA-CN/S and CN/S at 0.5 C.

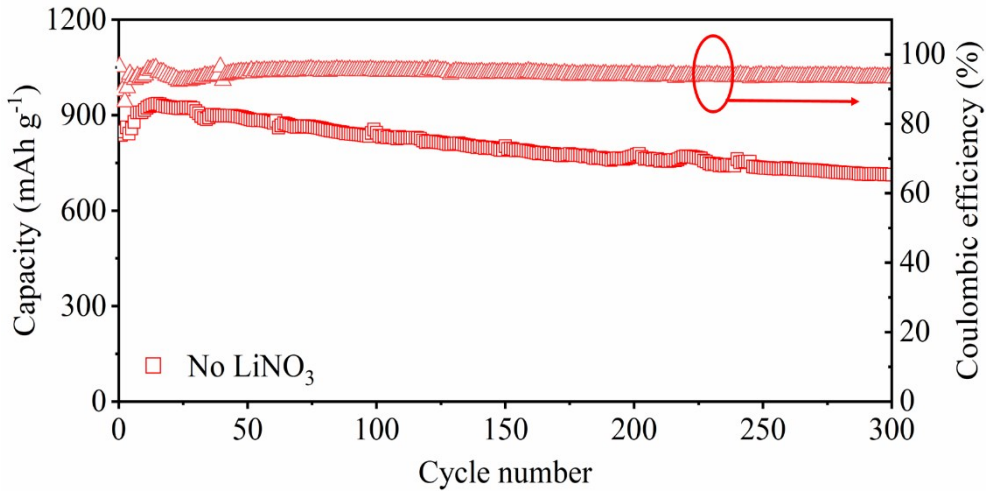

Figure S15. The cycling stability of FeSA-CN/S electrode at 0.5 C in the electrolyte without $LiNO_3$ additive.

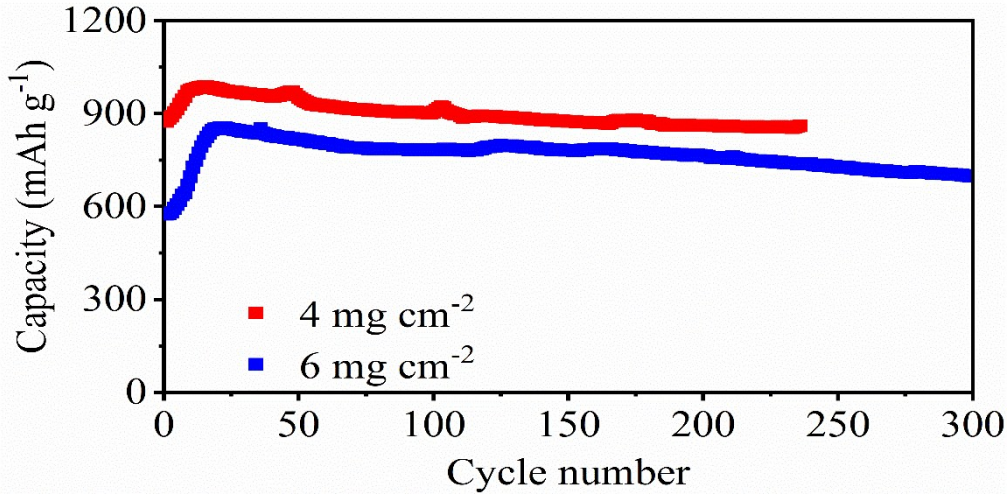

Figure S16. The cycling performance of FeSA-CN/S electrode with sulfur loading of 4 and 6 mg cm^{-2} at the current density of 3.2 mA cm^{-2}.

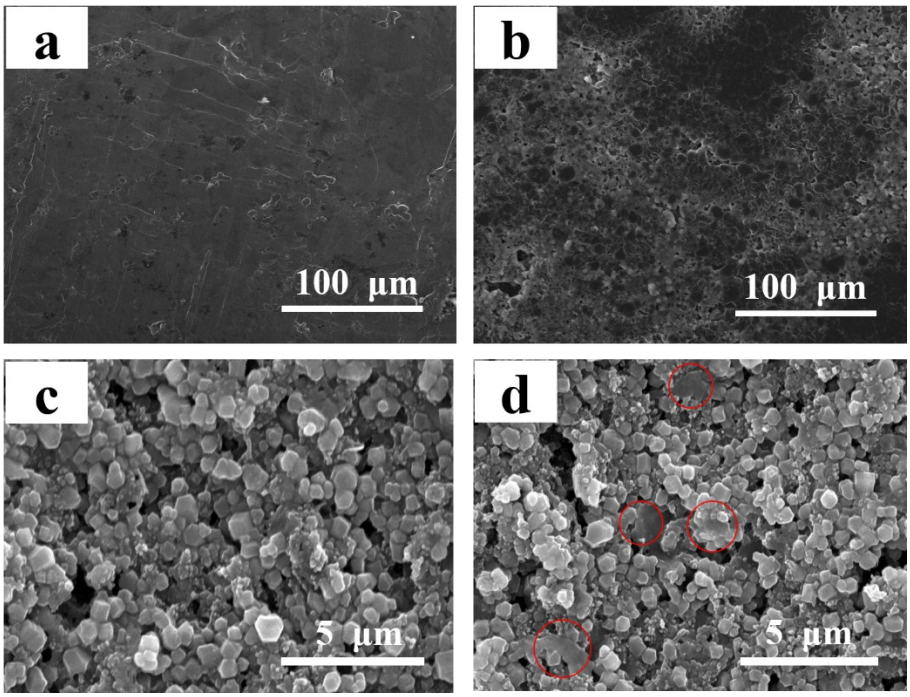

Figure S17. SEM images of lithium foils (a, b) and cathodes (c, d) after cycled at 0.5 C for 200 cycles. a, c) refer to the anode and cathode in FeSA-CN/S based cell; b, d) refer to those in CN/S based cell.

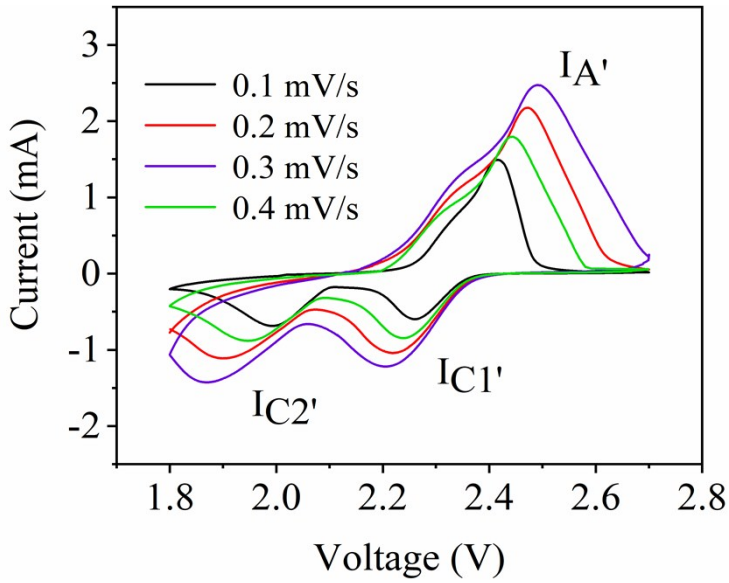

Figure S18. CV curves of CN/S at different scan rates.