Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supporting Information

Repurposing Paper By-Product Lignosulfonate as Sulfur Donor/Acceptor for High Performance Lithium-Sulfur Batteries

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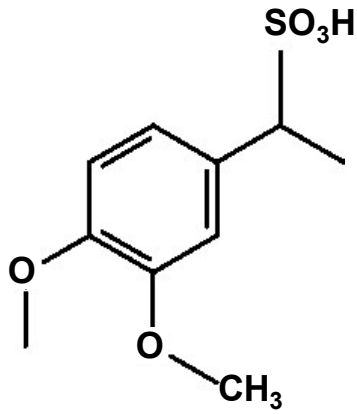

Fig. S1. Partial chemical structure of lignosulfonate.

Fig. S2. Photo of lignosulfonate “brown liquor”.

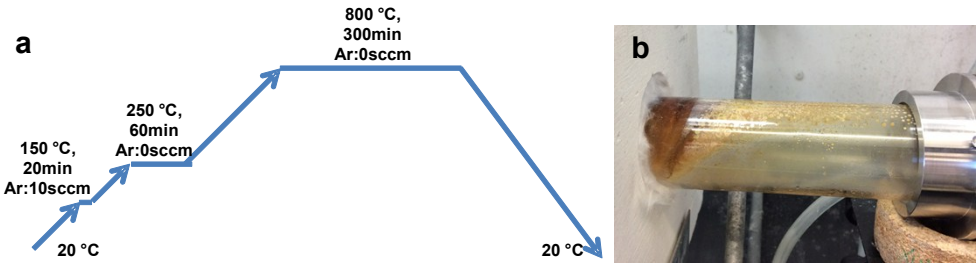

Fig. S3. (**a**) Pyrolytic reaction flow diagram of lignosulfonate. (**b**) Photo of reduced S condensed on the reaction quartz tube during the lignosulfonate pyrolysis process.

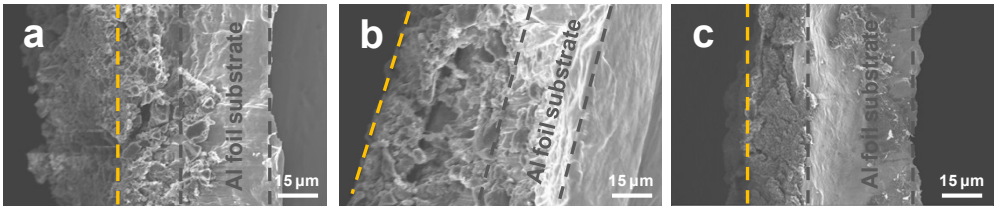

Fig. S4. Cross-sectional SEM images of (**a**) Act PyLs-Cap S+S electrode (56%S), (**b**) Act PyLs-Cap S electrode (34%S) and (**c**) pure S electrode (56%S).

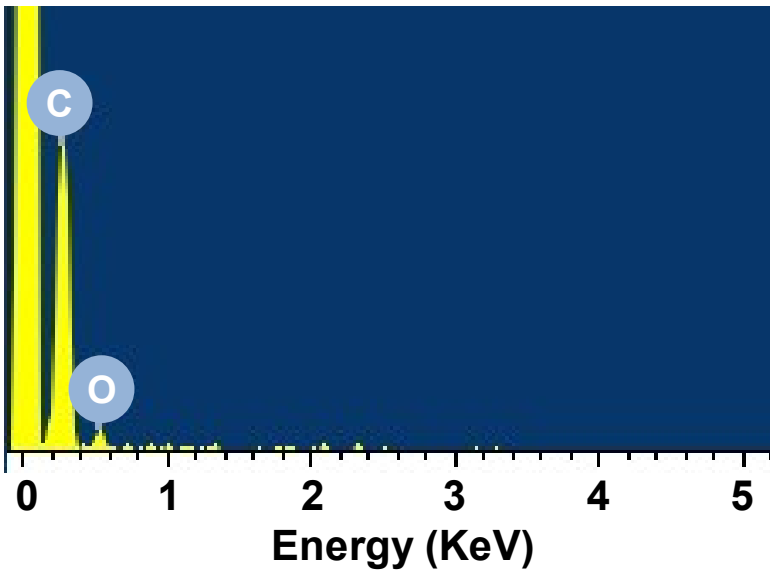

Fig. S5. EDX result of Act PyLs.

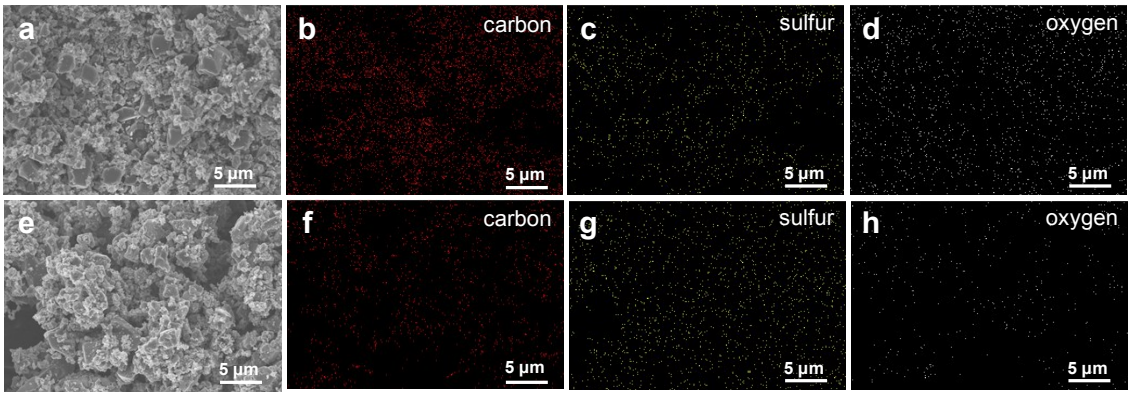

Fig. S6. (**a**) SEM image of Act PyLs-Cap S composite. (**b-d**) EDX element mappings of Act PyLs-Cap S composite. (**e**) SEM image of Act PyLs-Cap S+S composite. (**f-h**) EDX element mappings of Act PyLs-Cap S+S composite.

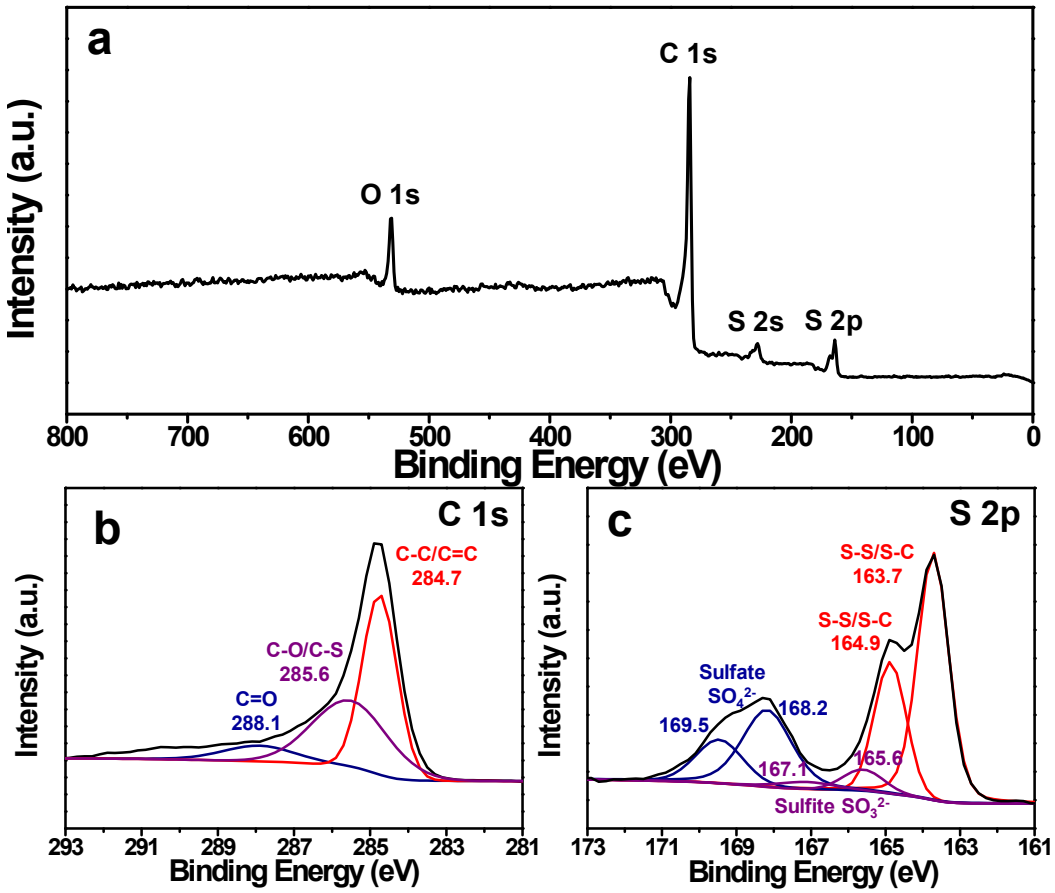

Fig. S7. (**a**) XPS survey spectra of Act PyLs-Cap S. High-resolution (**b**) C 1s and (**c**) S 2p XPS spectra of Act PyLs-Cap S.

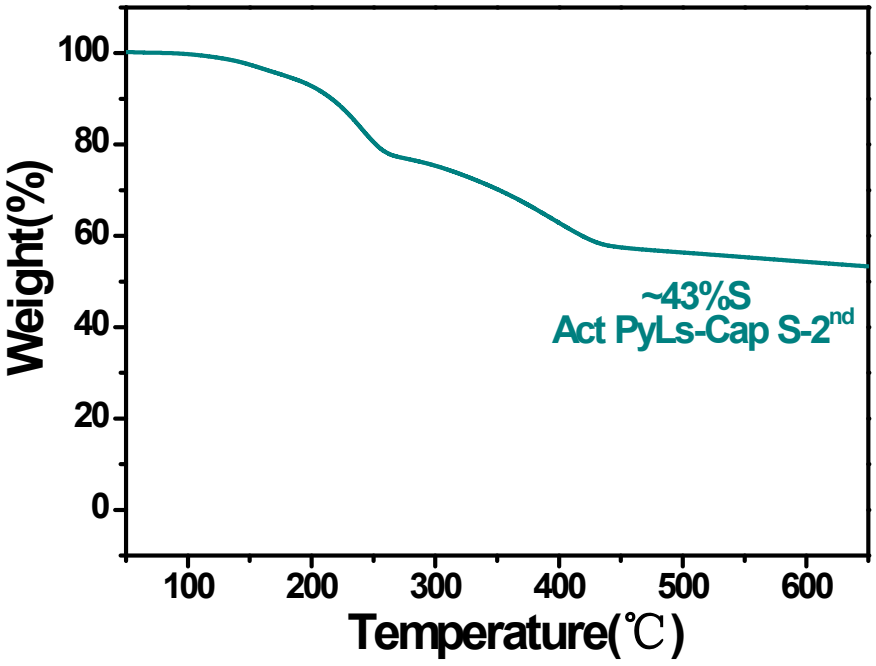

Fig. S8. TGA result of sulfur loading in the sample of Act PyLs-CapS-2nd from second capture process.

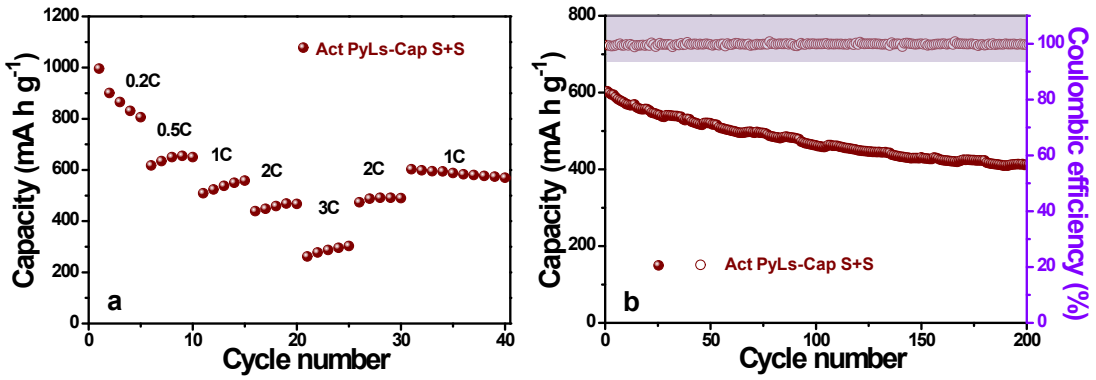

Fig. S9. (**a**) Rate capability and (**b**) Cycling performance and Coulombic efficiency of the Li-S batteries with Act PyLs-Cap S+S electrode at high sulfur loading (~3.5 mg/cm^2).