

## Support Information

### Self-Healing Double-Crosslinked Supramolecular Binders of Polyacrylamide Grafted Soy Protein Isolate for Li-S Batteries

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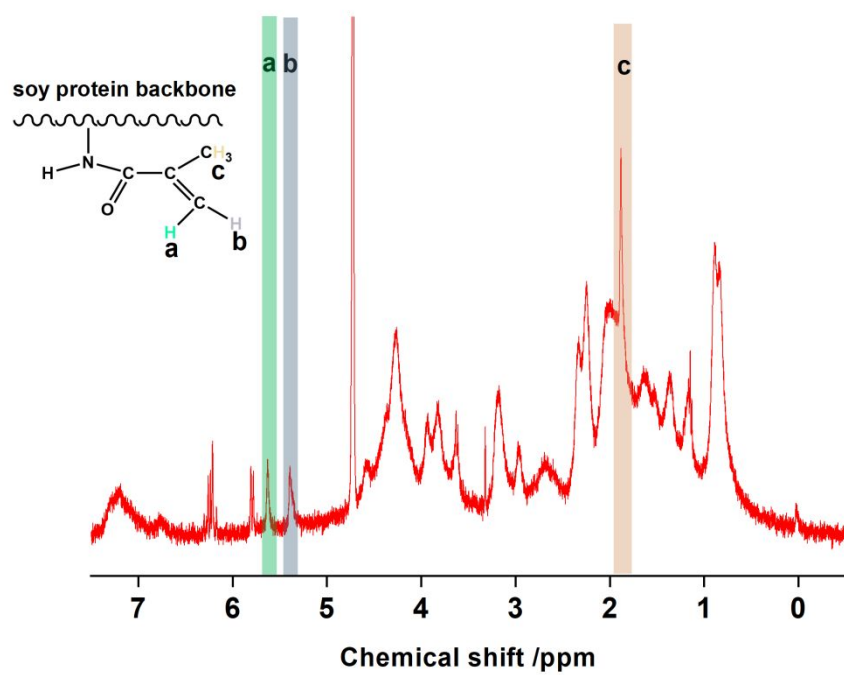
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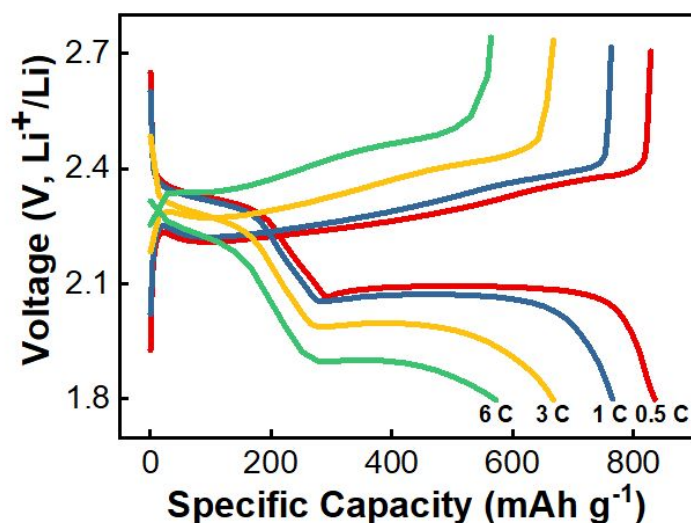
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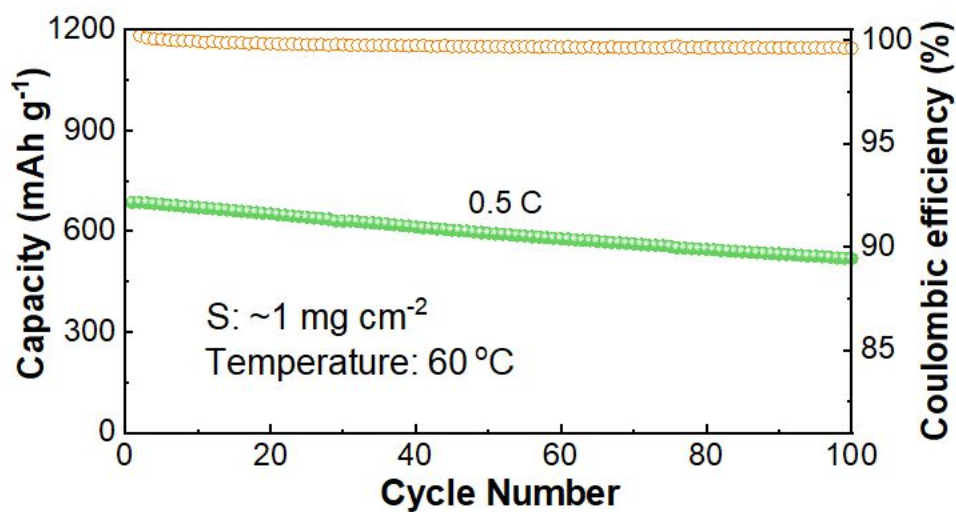
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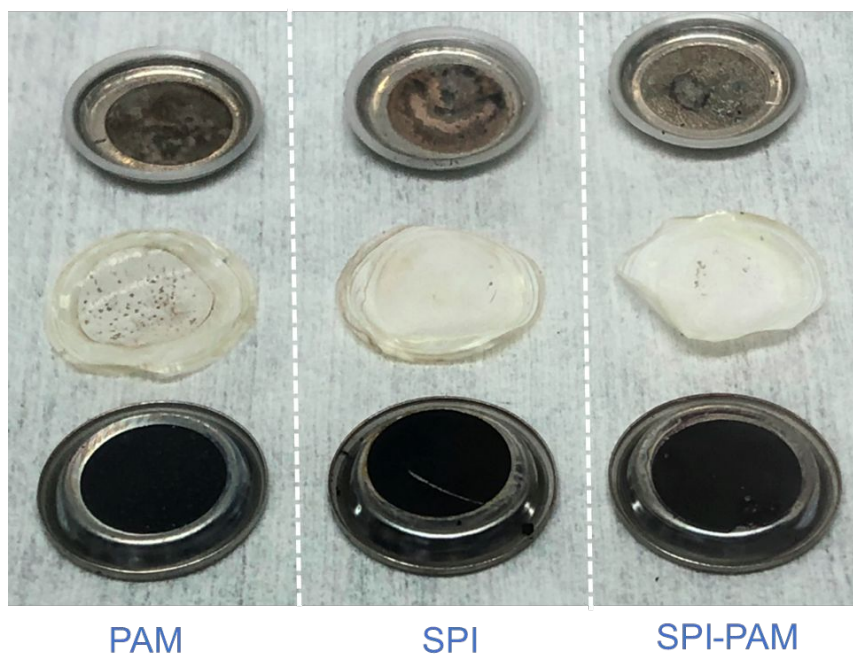
**Figure S1.**  $^1\text{H}$  NMR spectrum of methacrylic anhydride modified SPI in  $\text{D}_2\text{O}$ . The peaks at 1.9, 5.4 and 5.6 ppm confirm incorporation of acrylamide groups in the modified protein.



**Figure S2.** Galvanostatic charge/discharge profiles of SPI-PAM based electrode at different current rates of 0.5, 1, 3 and 6C within 1.8~2.7 V. The initial discharge curves show the typical two plateaus corresponding to the formation of long-chain polysulfides ( $\text{Li}_2\text{S}_x$ ,  $4 \leq x \leq 8$ ) at 2.32 V and short-chain polysulfides ( $\text{Li}_2\text{S}_x$ ,  $1 \leq x \leq 2$ ) at 2.1 V, respectively. When the current rate increases from 0.5 to 6.0 C, the galvanostatic discharge/charge curves keep the similar features, suggesting the good cycling stability under high rates.



**Figure S3.** Cycling performance of the SPI-PAM based electrodes at a rate of 0.5 C; The test temperature is 60 °C. The SPI-PAM based sulfur cathode has a specific capacity of 685.4 mAh·g<sup>-1</sup> at 60 °C, and the capacity retention rate is 75.7% after 100 cycles (specific capacity is 518.7 mAh·g<sup>-1</sup>) with a high coulomb efficiency of 99.6%.



**Figure S4.** Photos of disassembled PAM, SPI, SPI-PAM binder based Li-S button cell after 300 cycles. The separators of SPI-PAM binder-based cell is clean and white with scarce polysulfide residue compared with PVDF and SPI based cells.