

Supplementary Information

An Aqueous Inorganic Polymer Binder for High Performance Lithium-Sulfur Batteries with Flame-Retardant Properties

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Table S1. The binding strength between different Li-S species and two kinds of polymers (unit: eV).

	Li ₂ S	Li ₂ S ₂	Li ₂ S ₄	Li ₂ S ₆	Li ₂ S ₈
APP	2.30	2.25	2.19	2.17	2.16
PVDF	0.72	0.74	0.61	0.58	0.59

Table S2. The Bader charge variances for the key atoms in two kinds of polymers. Here, the Bader charge variance Δe_B is expressed as the charge difference between the specified atom in the polymer and in an isolated state. “+” and “-” means the atom gains and loses electrons in the polymer, respectively.

	APP			PVDF		
	Bond	O	P	Bond	F	C
Δe_B	-O-P-	+1.40	-3.47	-C-F	+0.59	-1.05

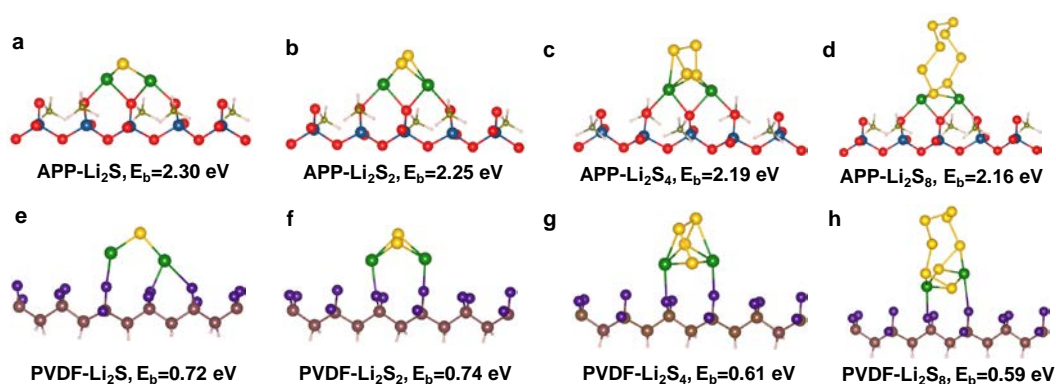


Figure S1. The adsorption conformations and binding strengths for (a-d) APP and (e-h) PVDF binders with Li-S species.

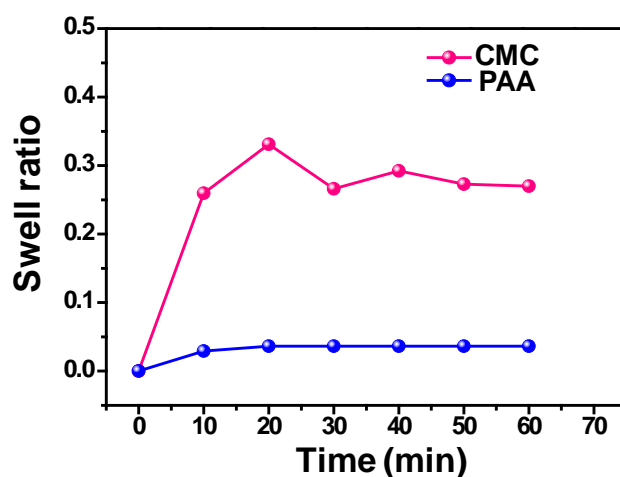


Figure S2. Swelling ratios of the CMC and PAA binders.

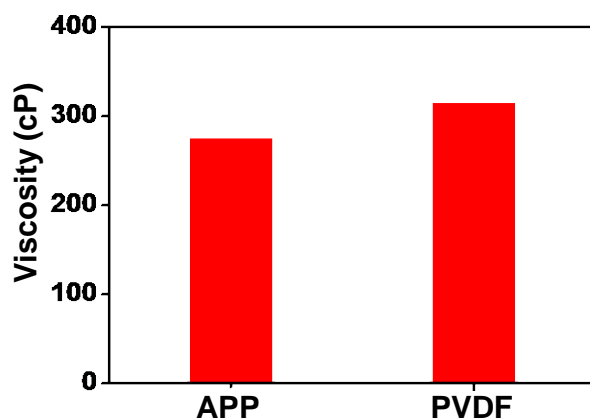


Figure S3. Viscosity of the 5 wt% APP and PVDF binder solutions.

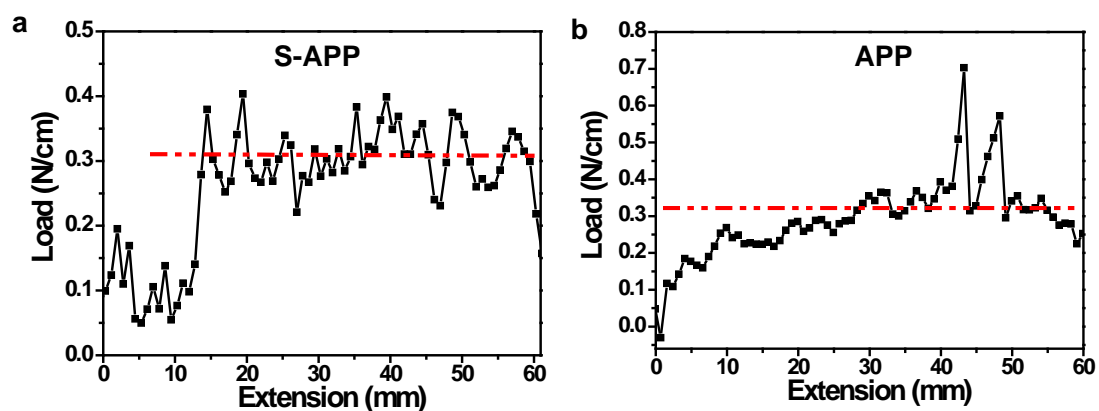


Figure S4. Adhesion strength of the (a) S-APP electrode and (b) APP to the current collector. The dotted line showing the average adhesion strength for S-APP and APP to the current collector.

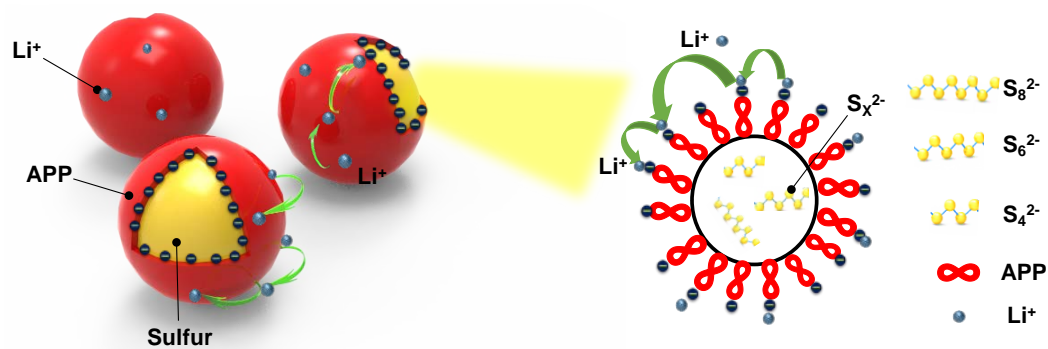


Figure S5. Schematic illustration of the functions of the APP binder in facilitating lithium ion transport due to the negatively charged side chain of APP.

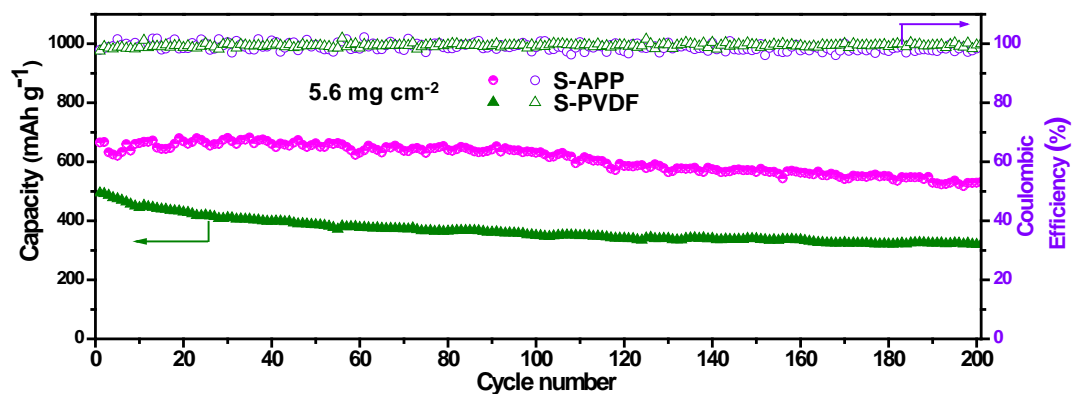


Figure S6. Long-term cycling stability and Coulombic efficiency of the S-APP and S-PVDF electrodes with a sulfur mass loading of 5.6 mg cm^{-2} at 0.5C for 200 cycles.

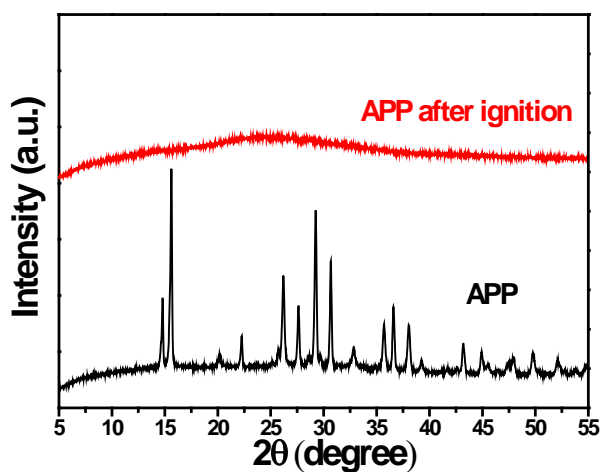


Figure S7. XRD patterns of the APP and its ignition product.

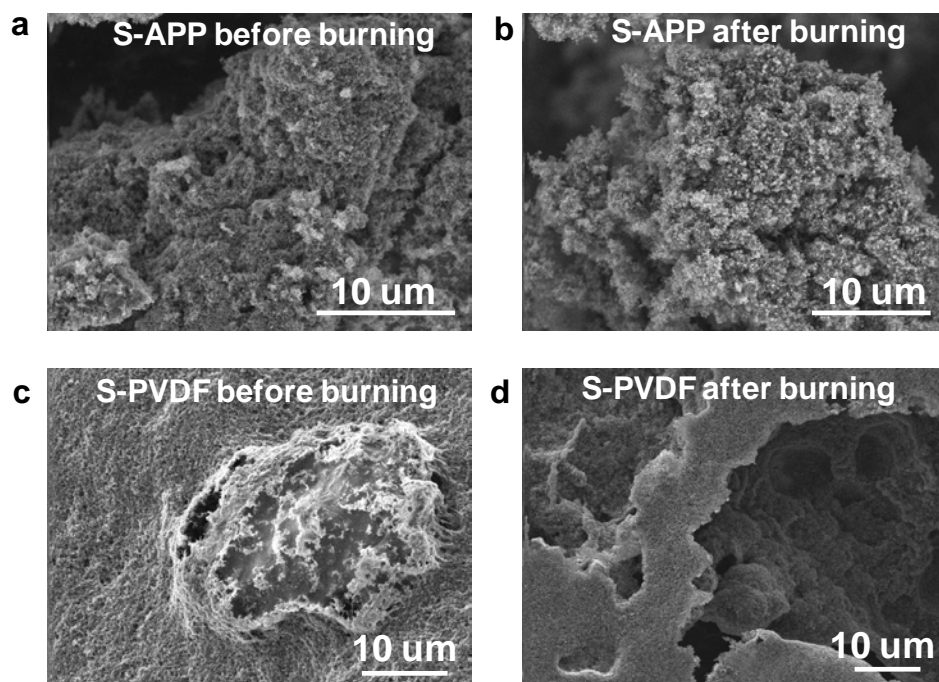


Figure S8. SEM images of the S-APP electrode (a) before and (b) after burning. SEM images of the S-PVDF electrode (c) before and (d) after burning.