

Electronic Supplementary Material

Adsorption-catalytic effects of metallurgical ferrous slag on polysulfides in Li-S batteries[†]

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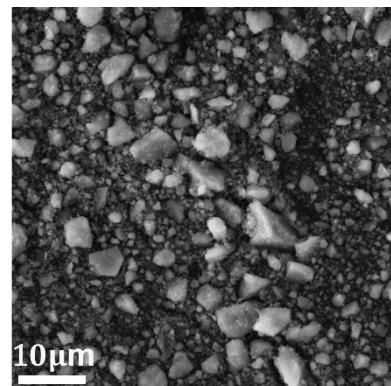


Fig. S1 SEM image of ferrous slag.

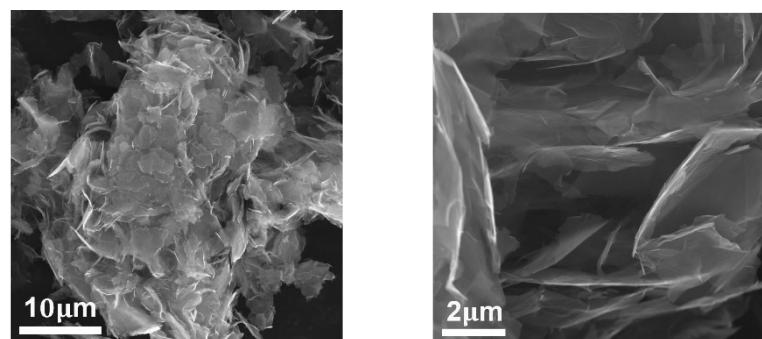


Fig. S2 SEM image of graphite.

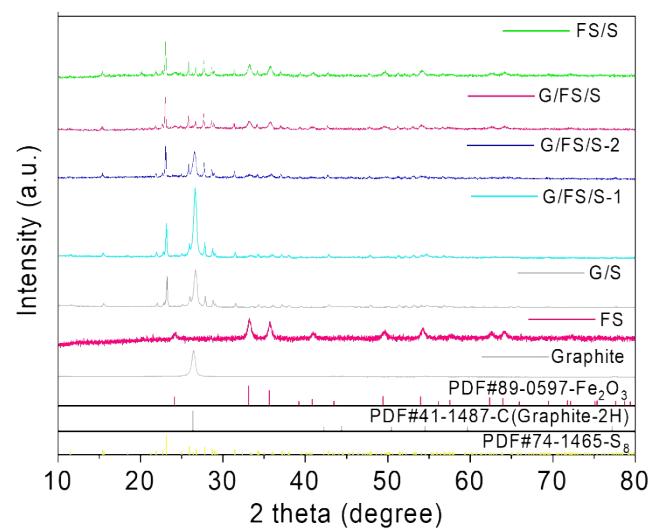


Fig. S3 XRD patterns of S, Graphite, Fe₂O₃, FS, and a series of G/FS/S.

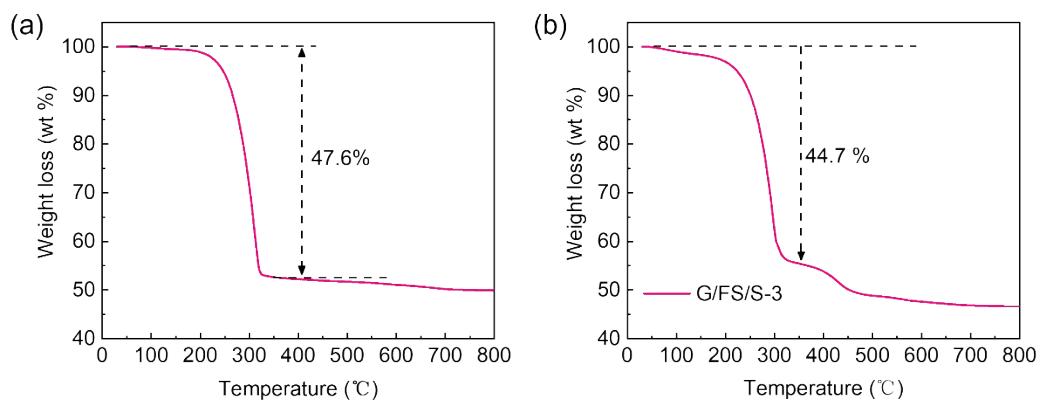


Fig. S4 TGA curve of G/S and G/FS/S composite.

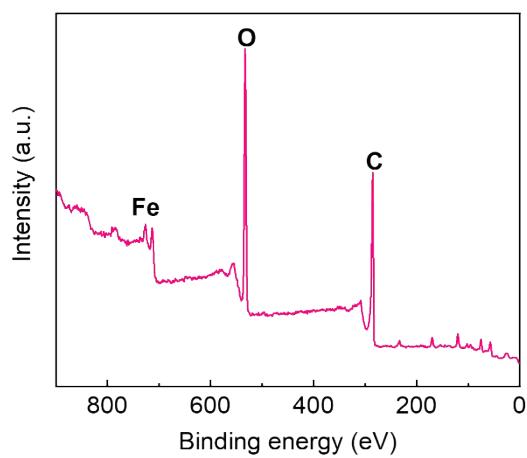


Fig. S5 XPS spectra of G/FS.

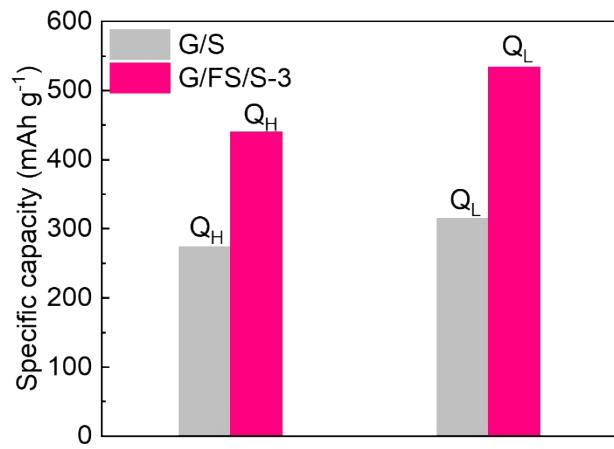


Fig. S6 The discharge capacities of G/FS/S and G/S electrodes.

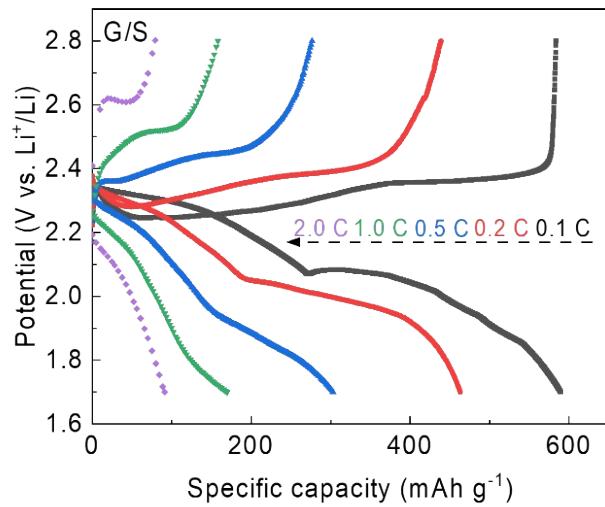


Fig. S7 Typical cycle galvanostatic charge-discharge profiles under different scan rate with G/S electrode.

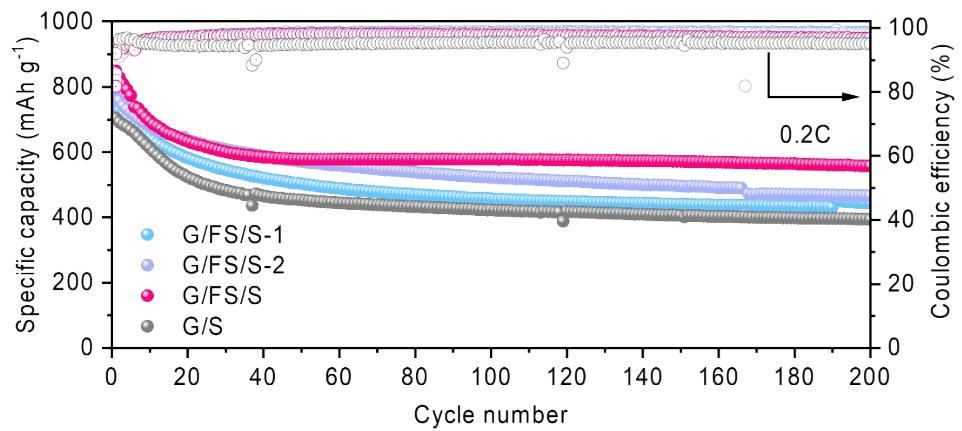


Fig. S8 Cycling performance of the G/FS/S and G/S electrodes with various FS contents at the current density of 0.2 C. The ratio of G: FS: S in G/FS/S-1, G/FS/S-2, G/FS/S samples are 40:15:45, 25:30:45, 8:47:45, respectively, and G: S in G/S sample is 55:45.

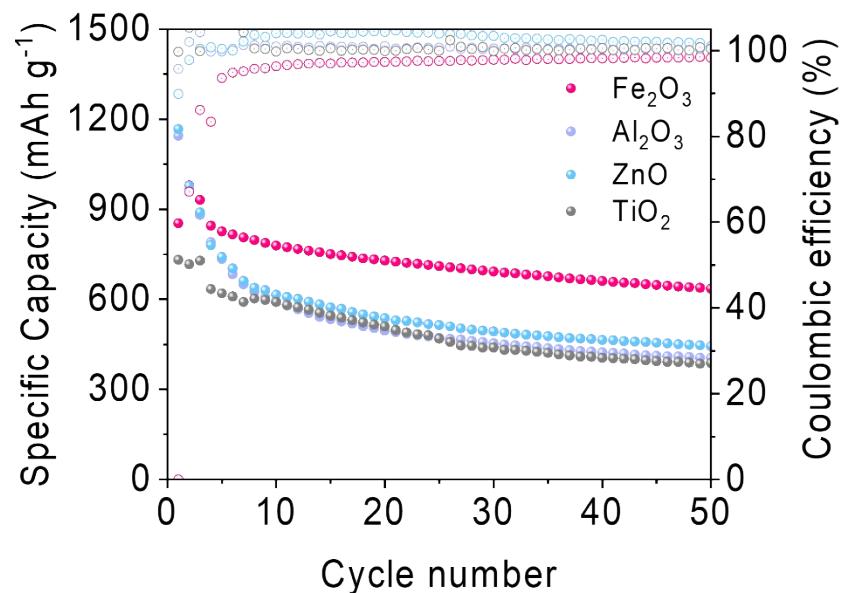


Fig. S9 Cycling performance of the sulfur cathodes with various oxides at the current density of 0.2 C.

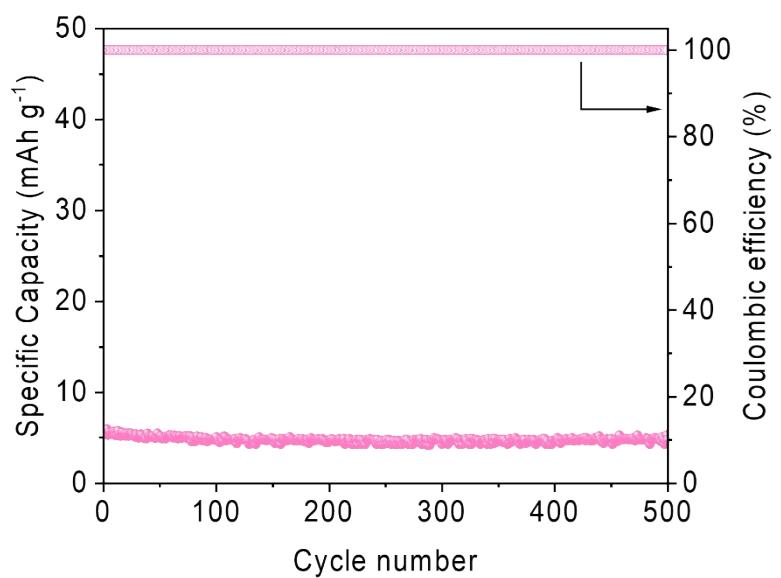


Fig. S10 Cycling performances of the FS/Li cell at 0.2 C.

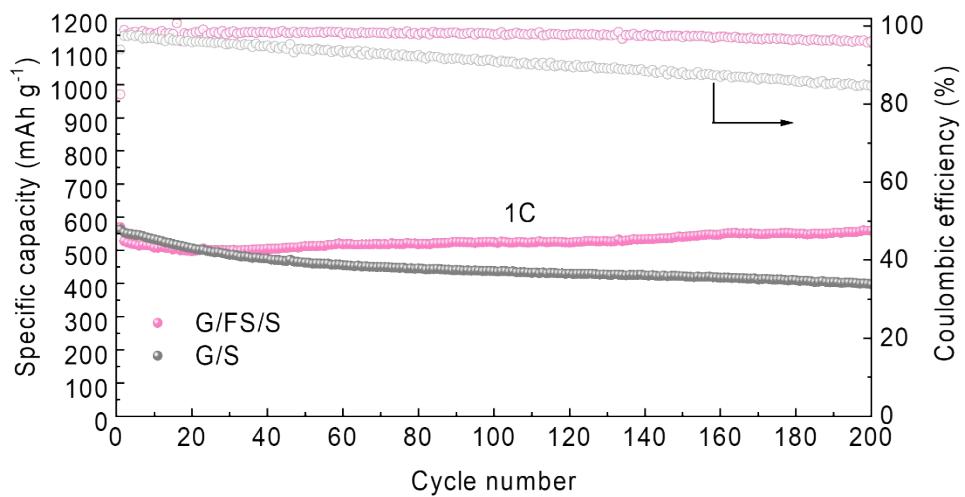


Fig. S11 Cycling performance of G/FS/S and G/S electrodes at 1 C.

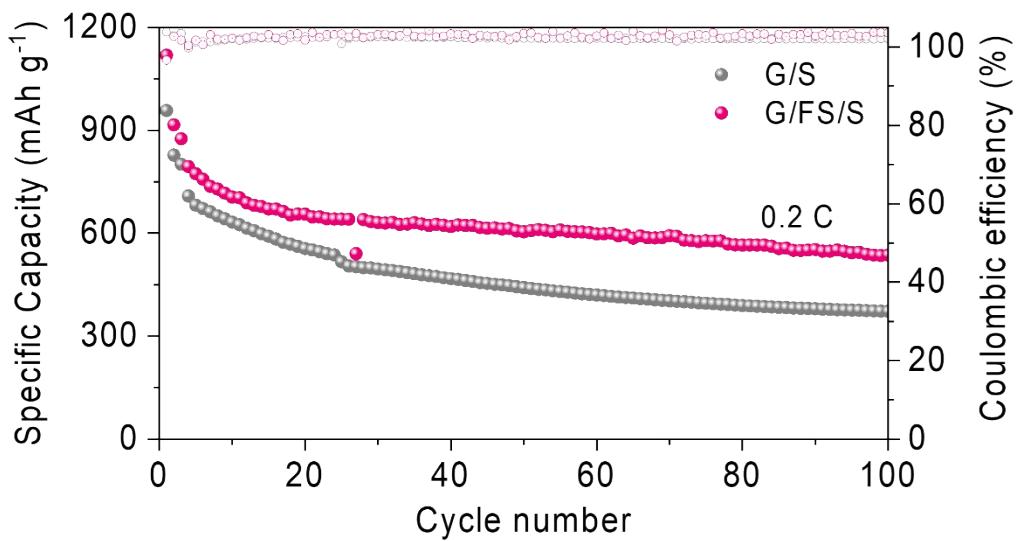


Fig. S12 Cycling performance of the G/FS/S and G/S electrodes with higher S content of 70 wt.% at the current density of 0.2 C.

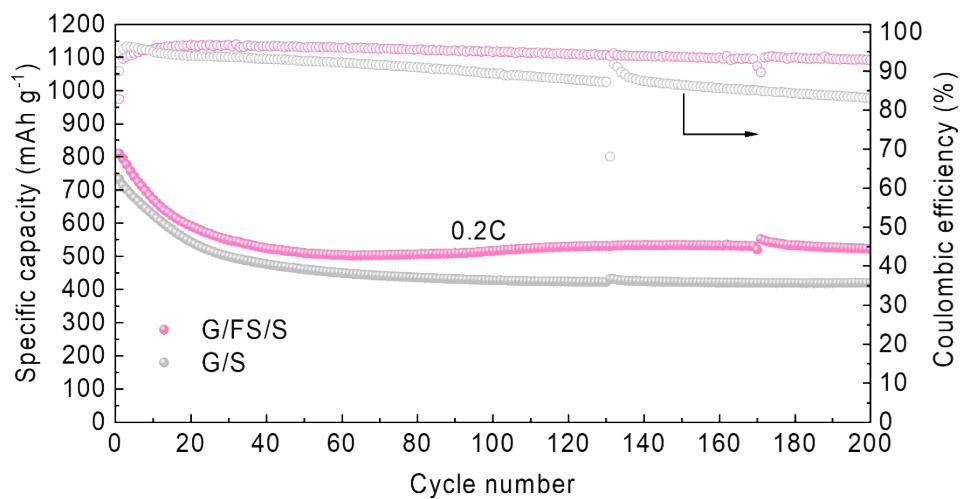


Fig. S13 Cycling performance of G/FS/S and G/S cathodes with a sulfur loading of ~2 mg cm⁻² at 0.2 C.

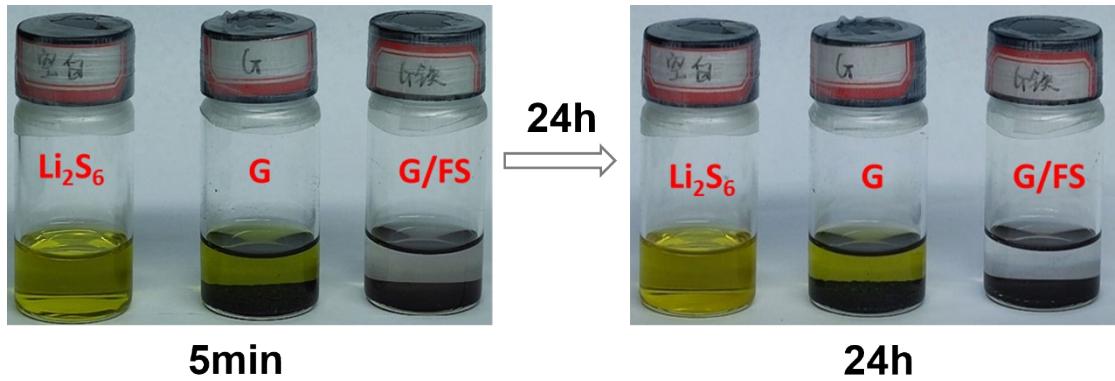


Fig. S14 Optical photos of Li_2S_6 adsorption test after adding G and G/FS composites in different times.

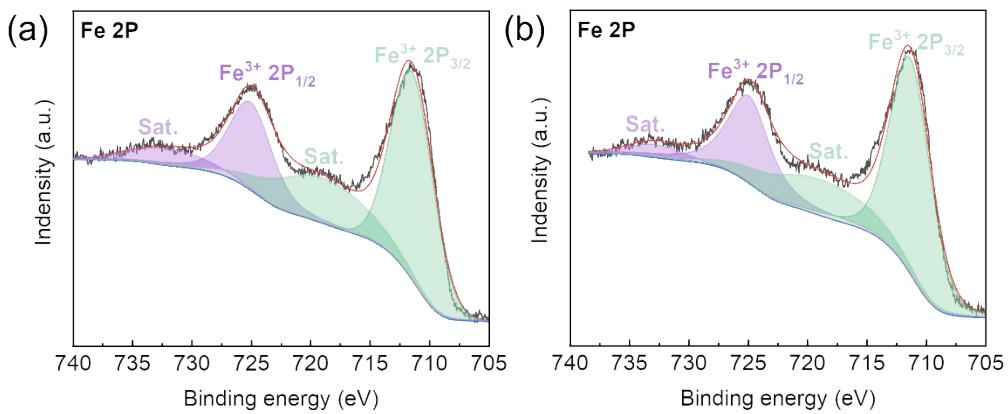


Fig. S15 High-resolution Fe 2p spectra (a) before and (b) after adsorption of Li_2S_6 .

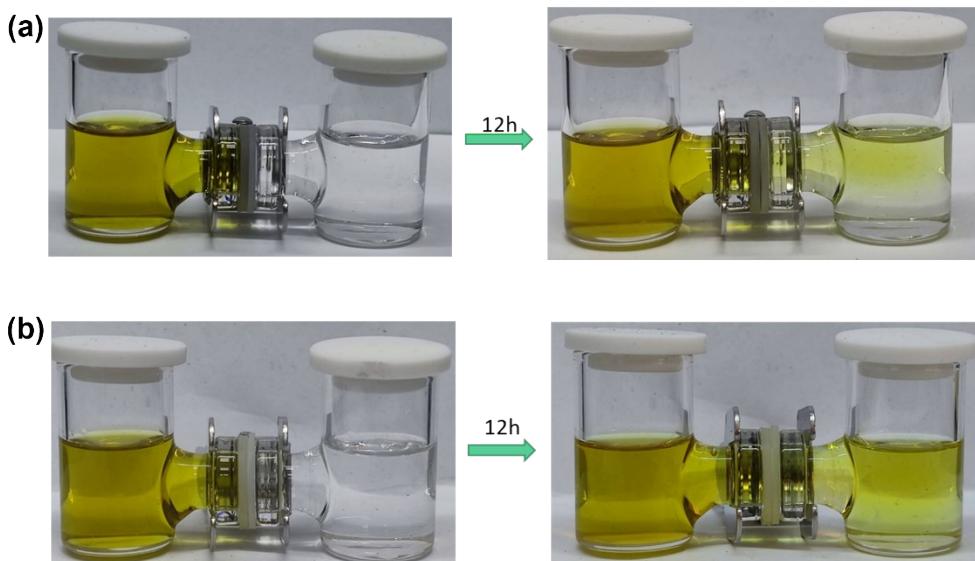


Fig. S16 Optical photos of Li_2S_6 diffusion test using (a) separator modified by FS composites; (b) unmodified separator.

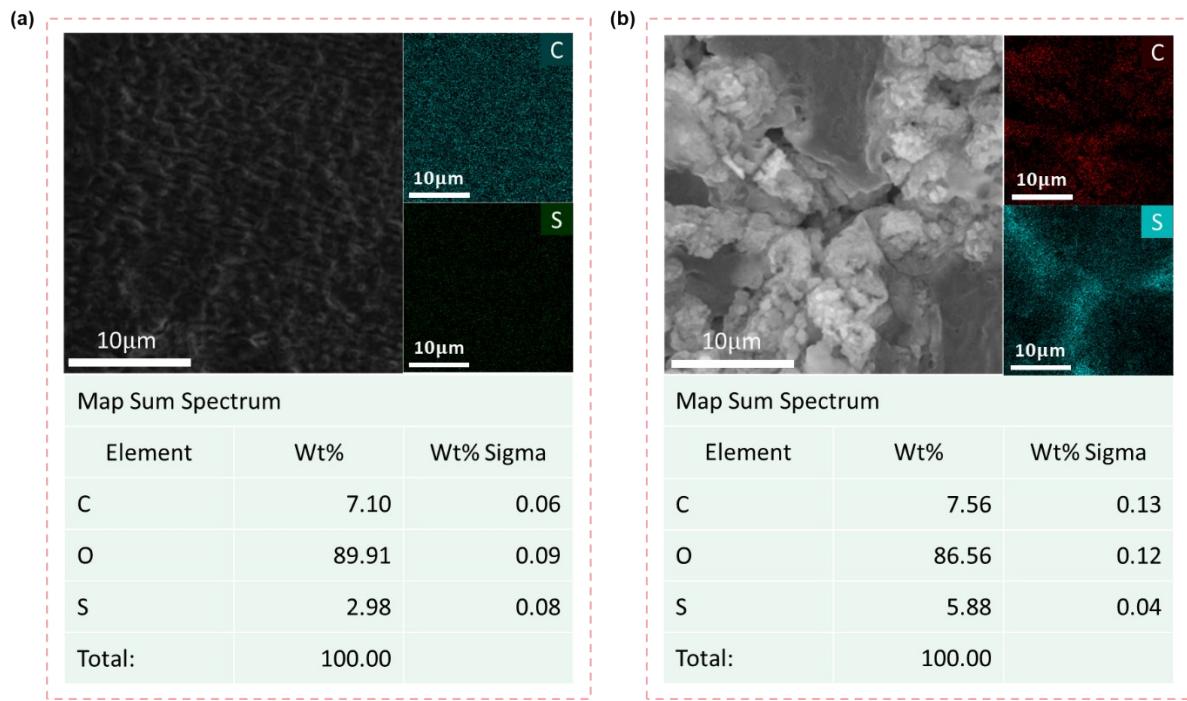


Fig. S17 SEM images and elemental content of lithium anodes for batteries with (a) G/FS/S and (b) G/S electrodes after 200 cycles at 0.2 C

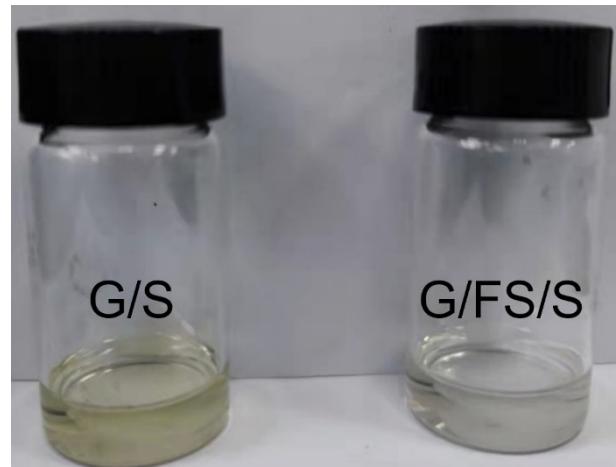


Fig. S18 Visual observation of different separators dissolving polysulfides in DME solvent after 200 cycles.

Table S1 Content of main elements in ferrous slag.

Elements	Fe	Al	Cr	Ni	Cu	Zn	Ti	V	Si	P	S	O
Contents	63.72	10.62	2.71	0.47	0.09	0.09	0.08	0.13	0.47	0.08	3.24	18.30

Table S2 Oxide content in ferrous slag.

Oxides	Fe ₂ O ₃	Al ₂ O ₃	Cr ₂ O ₃	NiO	CuO	ZnO	TiO ₂	V ₂ O ₅	SiO ₂	P ₂ O ₅	SO ₃	P ₂ O ₅
Contents	71.17	19.94	3.24	0.45	0.09	0.08	0.11	0.19	0.84	0.15	6.74	0.15

Table S3 The slope of the curve ($I_p/v^{1/2}$).

Samples	Peak I		Peak II
G/FS/S	3.12159		6.74816
G/S	2.31024		2.15094

Table S4 Lithium-ion diffusion coefficients.

Samples	D _{Li⁺} [cm ² S ⁻¹]	
	Peak I	Peak II
G/FS/S	7.13896 × 10 ⁻¹²	4.04103 × 10 ⁻¹¹
G/S	1.82384 × 10 ⁻¹²	1.1862 × 10 ⁻¹¹