

Supporting Information for

Solution Processible Hyperbranched Inverse-Vulcanized

Polymers for New Cathode Materials of Li-S Batteries

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Table S1. Reaction results for the synthesis of SIVHPs *via* thiol-ene addition of polymeric S₈ radicals to DIB (M_{n1}) and the modification of SIVHPs *via* thiol-ene reactions (M_{n2}).

Entry	γ^a	M_{n1}^b (g mol ⁻¹)	M_{n2}^b (g mol ⁻¹)
1	8:1	2600	2700
2	4:1	5400	5500
3	8:3	3000	3000
4	8:4	2900	2800
5	8:5	2700	2800

^a Feed molar ratios (γ) of S₈ to DIB. ^b Number-averaged molecular weight (M_n) determined by GPC.

Table S2. Solubility of SIVHPs in electrolyte.

Entry	γ^a	Soluble parts ^b (wt%)
1	8:1	1%
2	4:1	2%
3	8:3	3%
4	8:4	2%
5	8:5	3%

^a Feed molar ratios (γ) of S₈ to DIB.

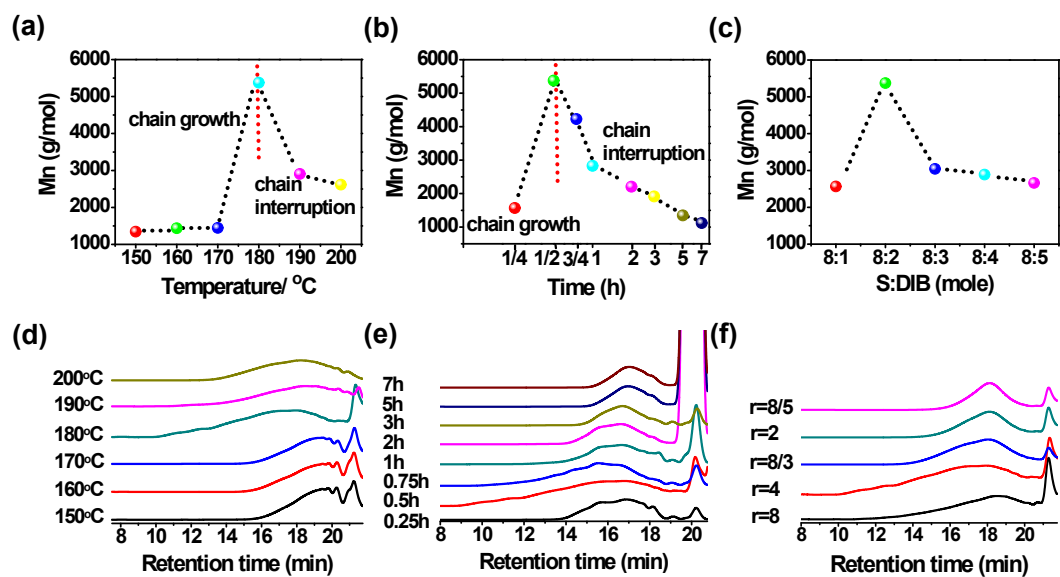


Fig. S1. Dependence of M_n on (a) temperature, (b) time and (c) feed molar ratios γ of S_8 to DIB. GPC peak evolution depending on (d) temperature, (e) time and (f) feed molar ratios γ of S_8 to DIB.

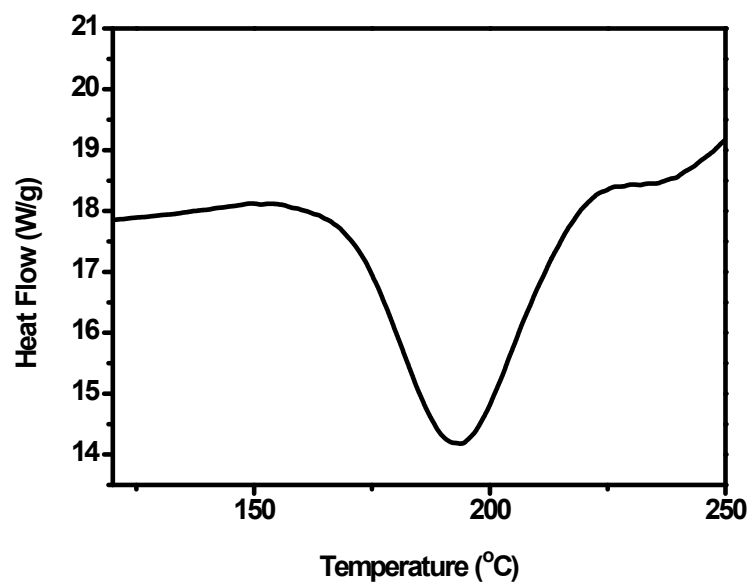


Fig. S2 DSC of the reactants to prepare SIVHPs with 4 as the feed molar ratio of S_8 to DIB, indicating the initial reaction temperature of 150 °C.

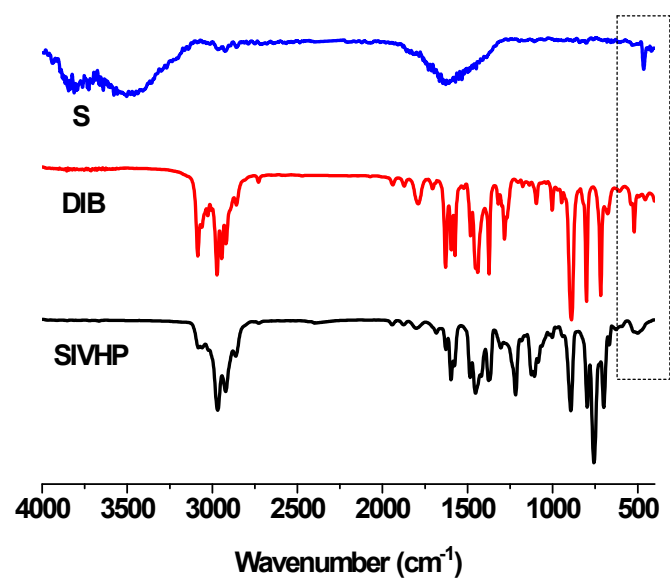


Fig. S3 FTIR spectra of sulfur, DIB and SIVHP.

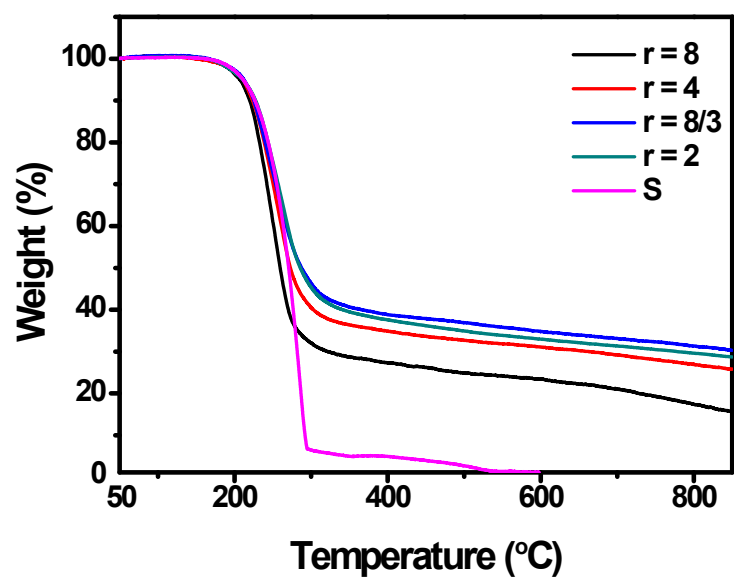


Fig. S4 TGA curves of S and SIVHPs with feed molar ratio of 8, 4, 8/3 and 2.

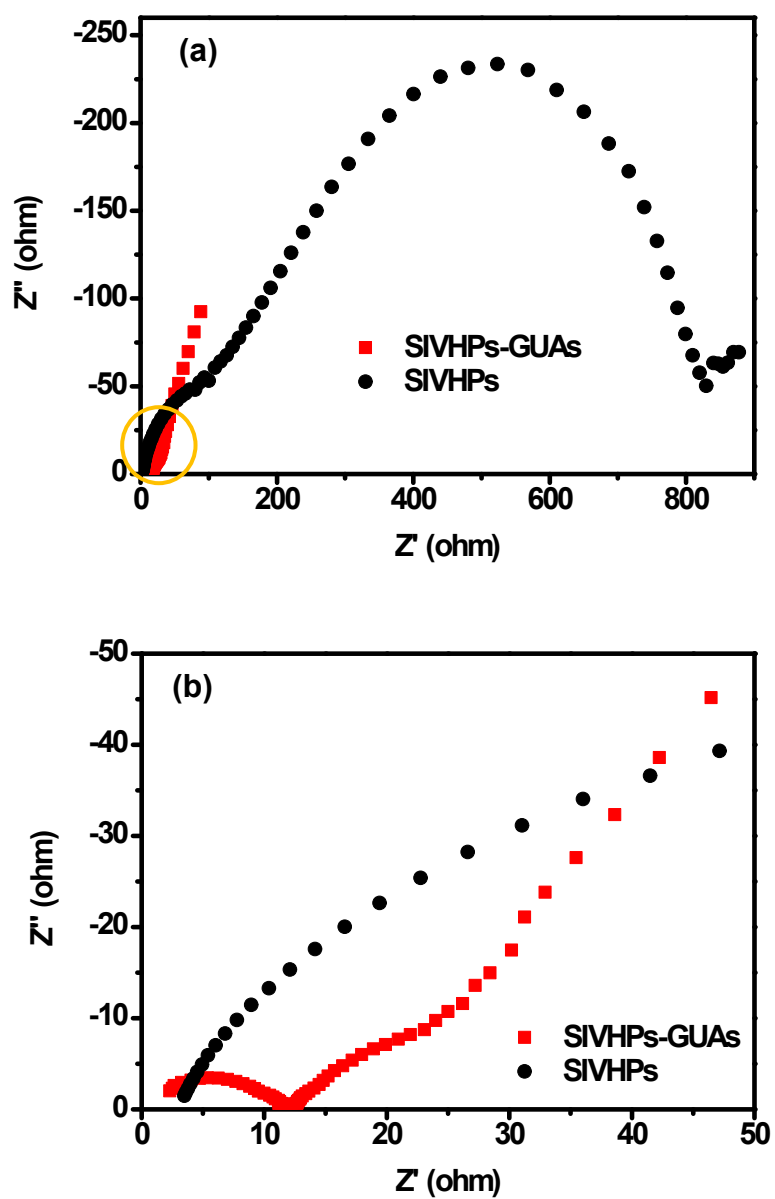


Fig. S5 (a) EIS spectra of the SIVHPs-GUAs electrode and SIVHPs electrode, with (b) showing a magnified plot.