Supporting Information

Carbons derived from resole-type phenolic resins for use in Lithium-Sulfur batteries: Templating the resins with Sulfur leads to substantially enhanced cell performance

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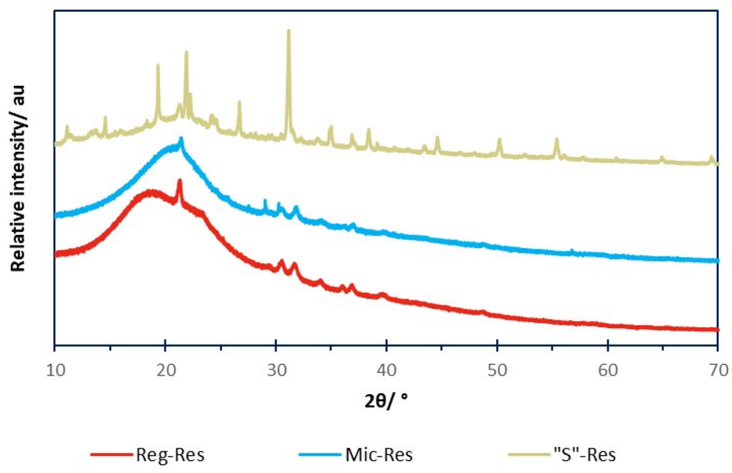
a)



b)

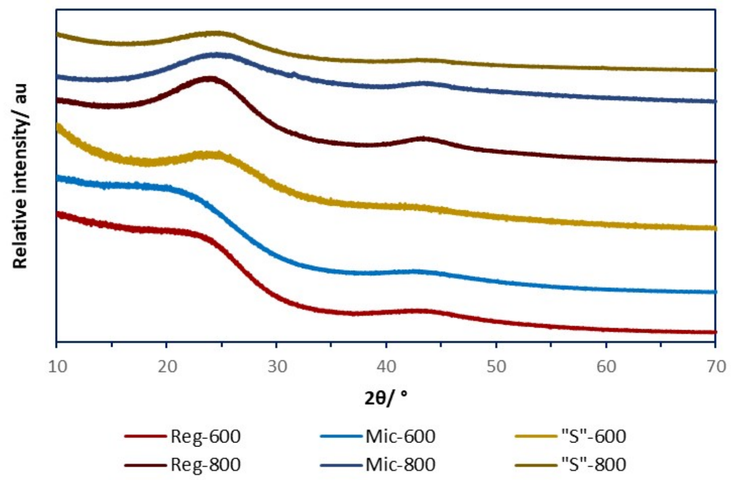


Fig. S1 XRD profiles for (a) the resole resins and (b) the various derived carbons.

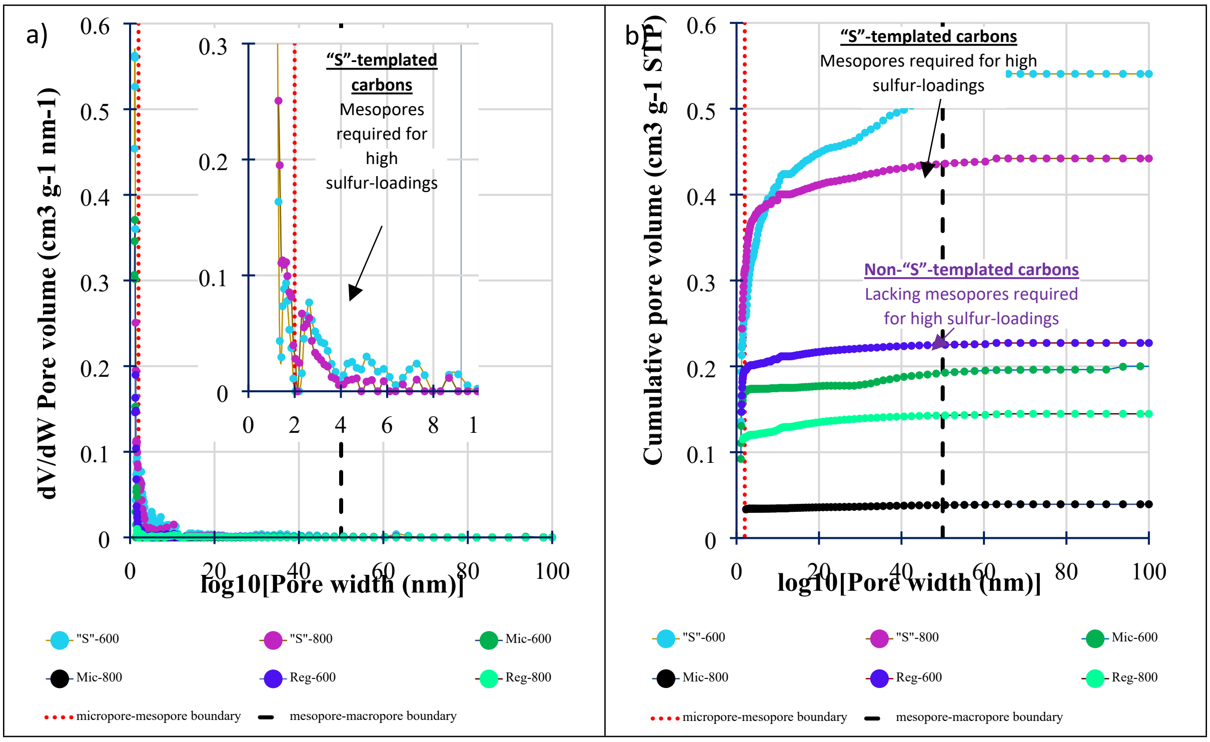


Fig. S2 The non-localised density functional theory pore modelled data of carbons with slit-shaped pores. The pore size distributions (a) and cumulative pore volume plots (b) were based on the sorption data presented in Fig. 2.

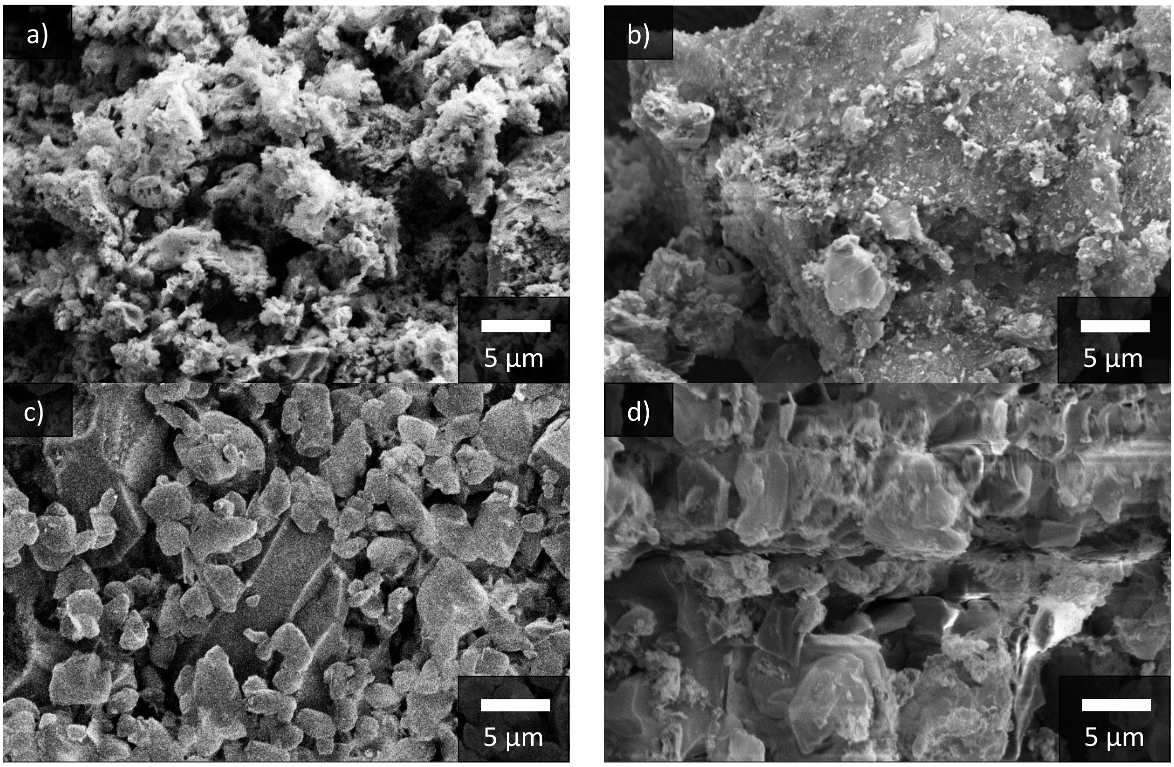


Fig. S3 Scanning electron micrographs of carbon/sulfur composites made with S”-600, by either deposit (a) or melt-loading (b) with elemental sulfur, or Reg-600, by either deposition-loading (c) or melt-loading (d) with elemental sulfur.

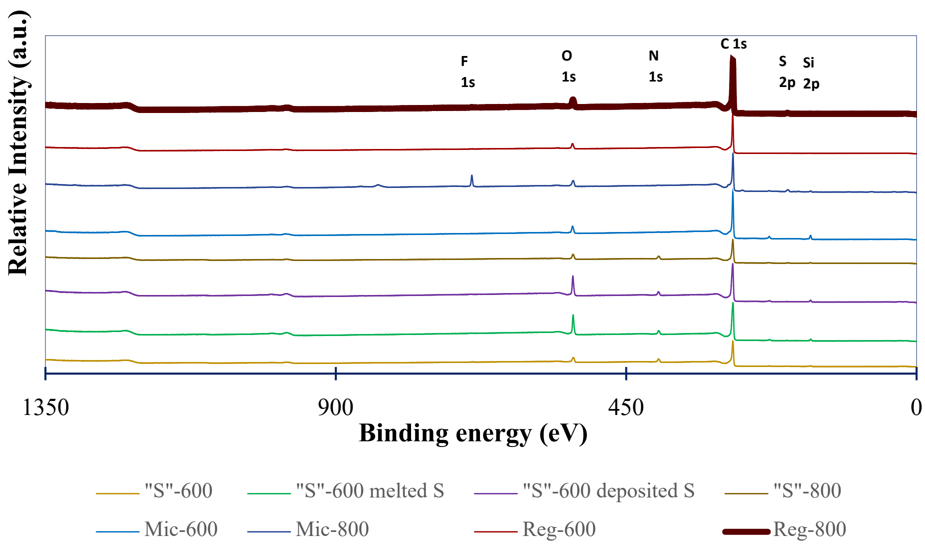


Fig. S4 The XPS spectra of the carbons and carbon/sulfur composites of “S”-600

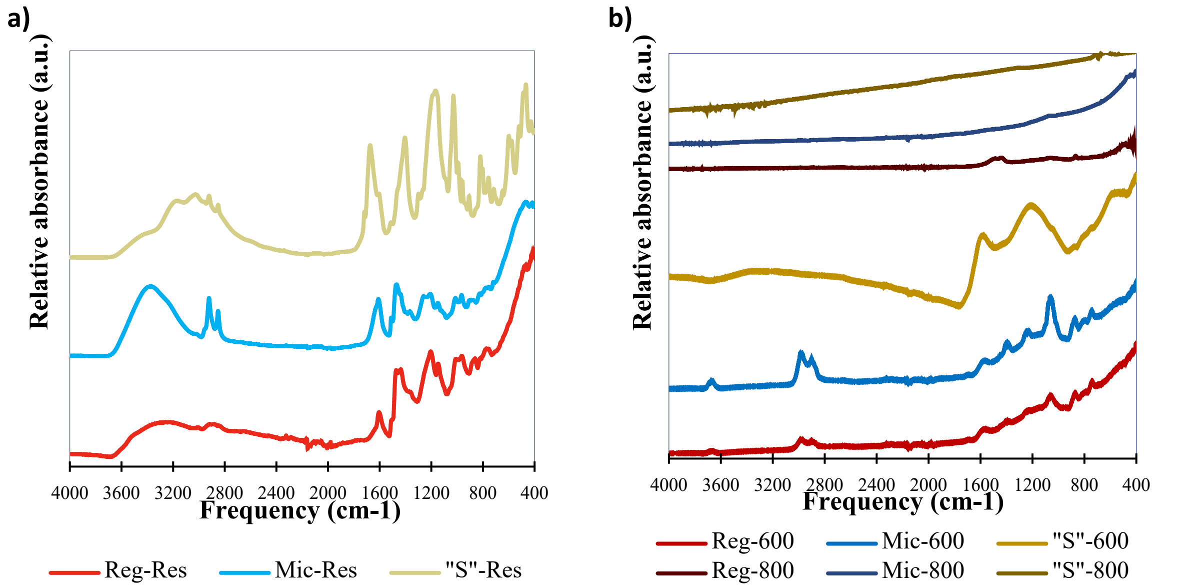


Fig. S5 The UATR-FTIR spectra of the unpyrolysed resoles (a) and XRD profiles for the various derived carbons (b).

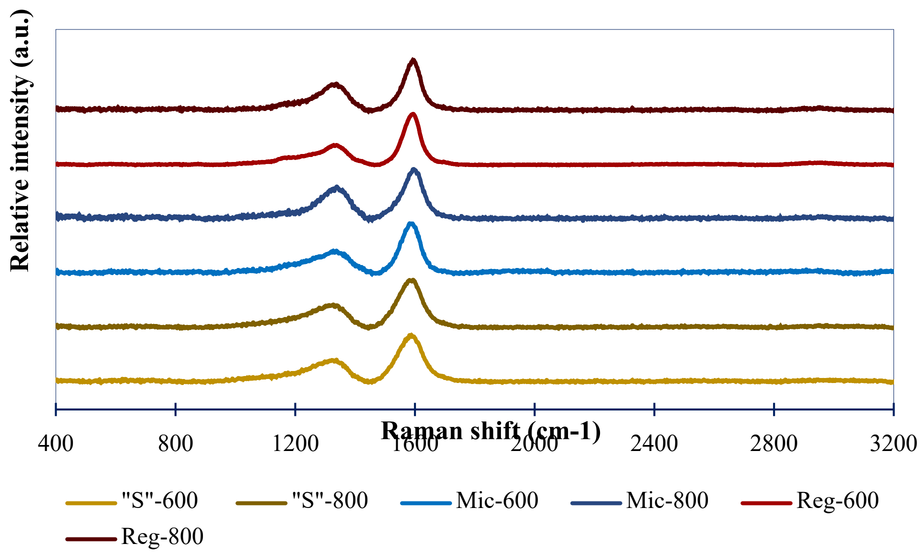


Fig. S6 The Raman spectra of the resole-derived carbons.

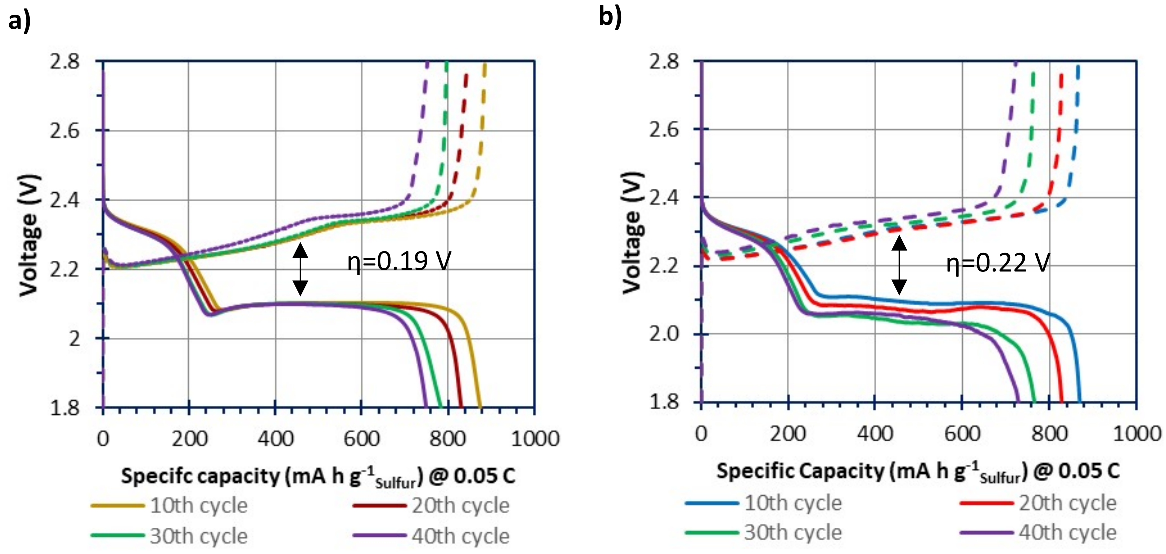


Fig. S7 Discharge and charge profiles at ten cycle intervals for cells made with deposition-loaded "S"-600 (a) and Mic-600 (b). The test involved 40 cycles at 0.05 C.

Table S1 Component values for the model equivalent circuits used in fitting the impedance data for cells with deposition-loaded “S”-600 and Mic-600. Cells were rested at OCV for > 2h both before and after 40 cycles at 0.05 C.

	“S”-600 before cycling	“S”-600 after cycling	Mic-600 before cycling	Mic-600 after cycling
R_s (Ohm)	1.5	2.0	3.0	6.5
R_{Cpbc} (Ohm)	4.5	-	5.0	-
CPE_{Cpbc} (F $s^{[\alpha-1]}$)	6.0×10^{-8} [α = 0.85]	-	4.0×10^{-7} [α = 0.80]	-
R_{SEI} (Ohm)	-	11.0	-	6.5
CPE_{SEI} (F $s^{[\alpha-1]}$)	-	5.0×10^{-9} [α = 0.60]	-	1.8×10^{-7} [α = 0.75]
R_{CT} (Ohm)	34.0	4.0	169.0	15.0
CPE_{CT} (F $s^{[\alpha-1]}$)	8.0×10^{-7} [α = 0.82]	1.0×10^{-5} [α = 0.80]	5.0×10^{-7} [α = 0.82]	4.5×10^{-6} [α = 0.80]
R_{Film} (Ohm)	4.0			2.0
CPE_{Film} (F $s^{[\alpha-1]}$)	2.0×10^{-4} [α = 0.60]			6.0×10^{-4} [α = 0.80]
$R_{Polysulfide\ solid/liquid}$ (Ohm)				3.0
$CPE_{Polysulfide\ solid/liquid}$ (F $s^{[\alpha-1]}$)				3.0×10^{-3} [α = 0.50]
W_s (Ohm $s^{-0.5}$)	2.6	1.0	5.8	0.9

R_s			Series resistance
R	CPE	Cpbc	Carbon host positive bulk contribution
R	CPE	SEI	Solid-electrolyte interface
R	CPE	CT	Charge transfer
R	CPE	Film	Li_2S/Li_2S_2 film formation
W_s			Warburg element
$CPE_{low\ frequency}$			Low frequency CPE