Three-Dimensional sp2 Carbon Networks Prepared by Ultrahigh Temperature Treatment for Ultrafast Lithium–Sulfur Batteries

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Supporting Information

Sample	CNTs:Gra	Temperature	Time (h)	I _G /I _D	Oxygen
		(0)			(wt%)
raw CNTs	1:0			1.13	2.69
raw Gra	0:1			0.98	15.95
CNTs-Gra	2:1			1.08	6.89
2250CNTs-Gra	2:1	2250	2	2.13	4.58
2550CNTs-Gra	2:1	2550	2	3.23	3.13
2850CNTs-Gra	2:1	2850	2	20.28	0.83
2850 ¹ CNTs–Gra	1:1	2850	2	12.38	1.21
2850 ² CNTs–Gra	3:1	2850	2	7.86	2.01
2850 ³ CNTs–Gra	2:1	2850	1	3.49	2.56
2850 ⁴ CNTs–Gra	2:1	2850	3	20.34	0.81
2850CNTs	1:0	2850	2	4.12	1.19
2850Gra	0:1	2850	2	10.76	2.45

 Table S1. Textural properties of the different carbon material



Figure S1. Rate performance of the seven cathodes at various current densities



Figure S2. (a) Typical TEM images of the 2850CNTs–Gra; (b) XRD curves spectras of the 2850CNTs–Gra and CNTs–Gra



Figure S3. Nitrogen sorption isotherm (a) and pore size distribution (b) of 2850CNTs, 2850Gra, 2850CNTs–Gra, raw CNTs, raw Gra and CNTs–Gra



Figure S4. Typical SEM images of 2850CNTs–Gra (a), 2850Gra (b), 2850CNTs (c), CNTs–Gra (d), raw Gra(e) and raw CNTs(f).



Figure S5. (a–b) Raman spectras, (c–d) XPS and (e–f) XRD curves of 2850CNTs, 2850Gra, raw CNTs and raw Gra



Figure S6. (a) X-ray diffraction curves of 2850CNTs–Gra, pure S and 2850CNTs–Gra–S composites; (b) TGA curves of the 2850CNTs–Gra–S composites; (c) Galvanostatic charge/discharge curves of the 2850CNTs–Gra–S cathodes at the rate of 0.5–10 C



Figure S7. Typical galvanostatic charge/discharge profiles of the 2850CNTs–Gra–S for (a) 10^{th} , 100^{th} , 500^{th} and 1000^{th} at 10 C; and (b) 100^{th} , 400^{th} , 800^{th} and 1200^{th} at 15 C.



Figure S8. Cycling performance of the 2850CNTs–Gra–S cathode with the sulfur mass loading of 3.03 mg cm⁻² at 1 C.



Figure S9. Rate performance of the three cathodes at various current densities.

Figure S10. (a) Cycling performance of raw CNTs–S and 2850CNTs–S cathodes; (b) cycling performance of raw Gra–S and 2850Gra–S at the rate of 10 C.

Figure S11. SEM images of cycled cathodes for the four cycled cathode at 10 C for 2850CNTs–Gra (a), 2550CNTs–Gra (b), 2250CNTs–Gra(c) and CNTs–Gra (d), respectively.