Facile preparation of three-dimensional Fe_3O_4/macroporous graphene composite for high-performance Li storage

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Supplementary Information

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Table S1. Zeta potential of various composites tested

pH=5	GO	$Fe(OH)_3$/GO	c-PS
Zeta Potential (mV)	-28.84	27.77	-54.40

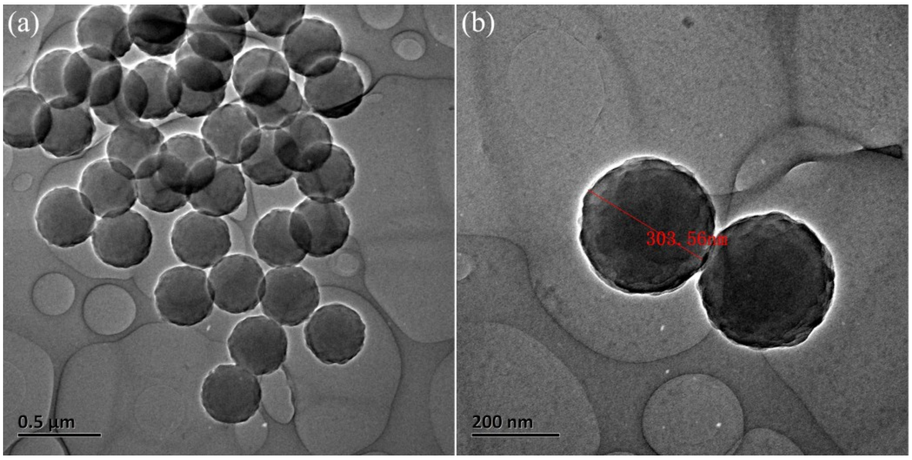


Fig. S1 TEM images of as-prepared c-PS spheres at different magnification.

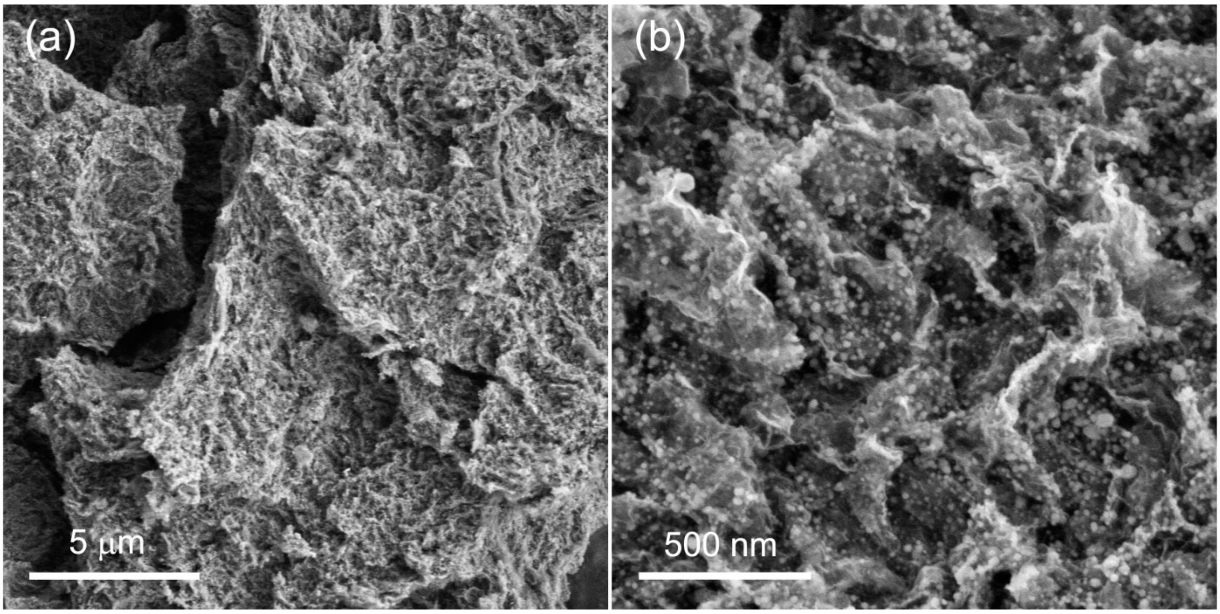


Fig. S2 SEM images of the Fe_3O_4/GS at different magnification.

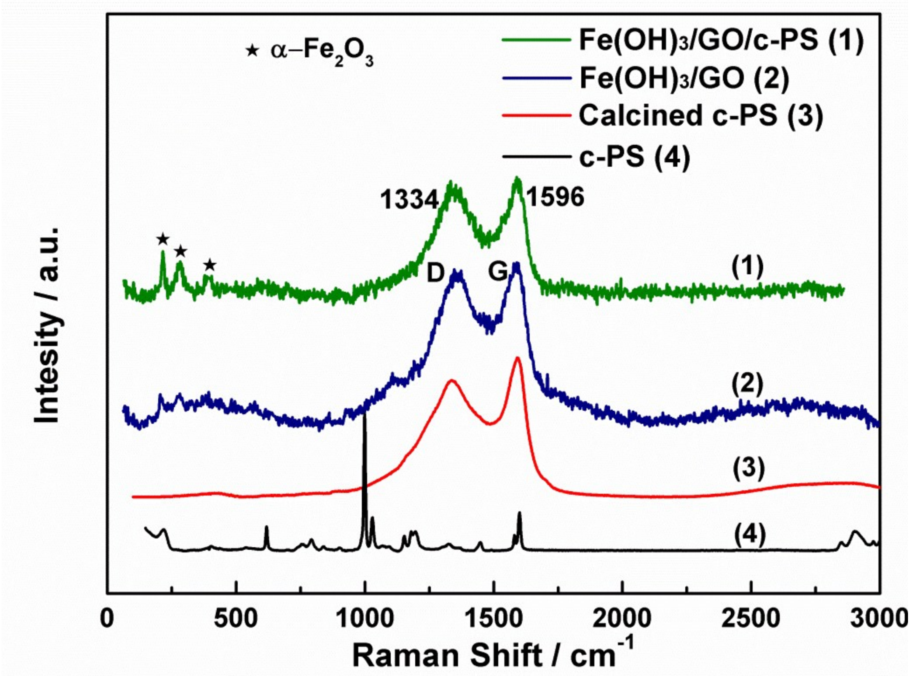


Fig. S3 Raman spectra of $Fe(OH)_3$/GO/c-PS, $Fe(OH)_3$/GO, calcined c-PS and pristine c-PS.

Table S2 Raman D and G band positions of different materials and the corresponding I_D/I_G value.

	FPG	Fe_3O_4/GS	$Fe(OH)_3$/GO/c-PS	$Fe(OH)_3$/GO	GO	Calcined c-PS
D band / cm^{-1}	1342	1334	1332	1348	1341	1335
G band / cm^{-1}	1585	1596	1589	1590	1576	1590
I_D/I_G	0.92	1.20	0.93	0.95	0.81	0.84

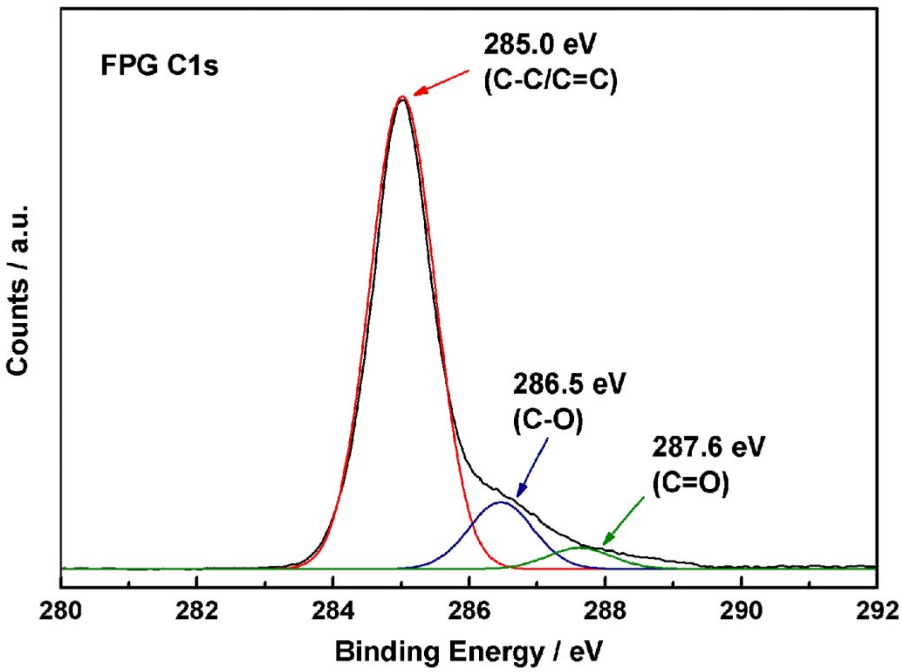


Fig S4. Core-level C 1s XPS spectrum of the FPG

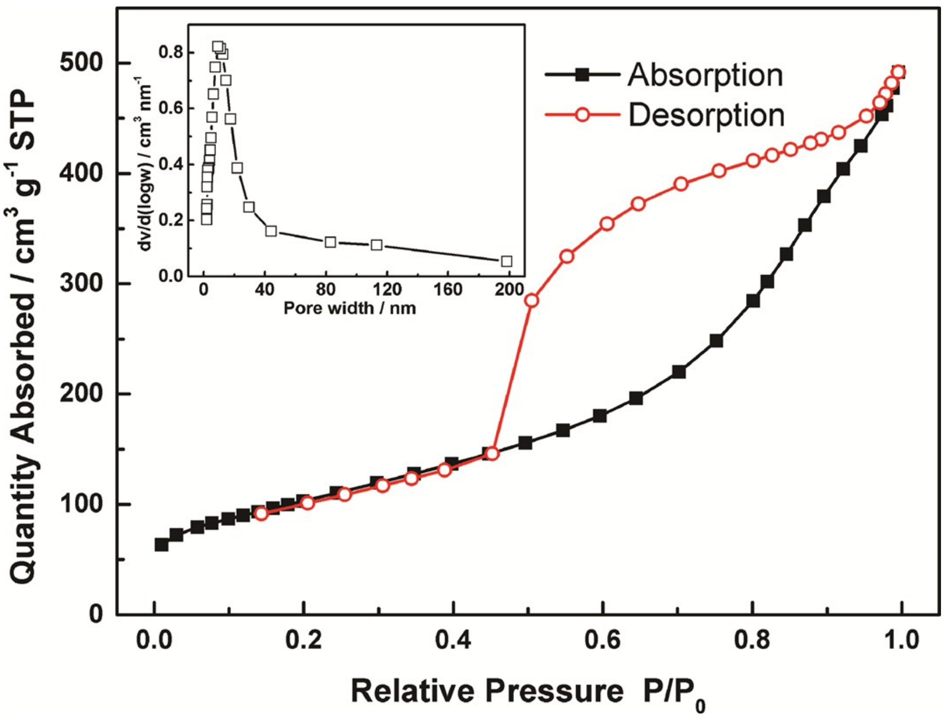


Fig. S5 Nitrogen adsorption/desorption isotherms of Fe_3O_4/GS and (d-inset) pore size distribution with BET surface of 371.9 m^2 g^{-1}.

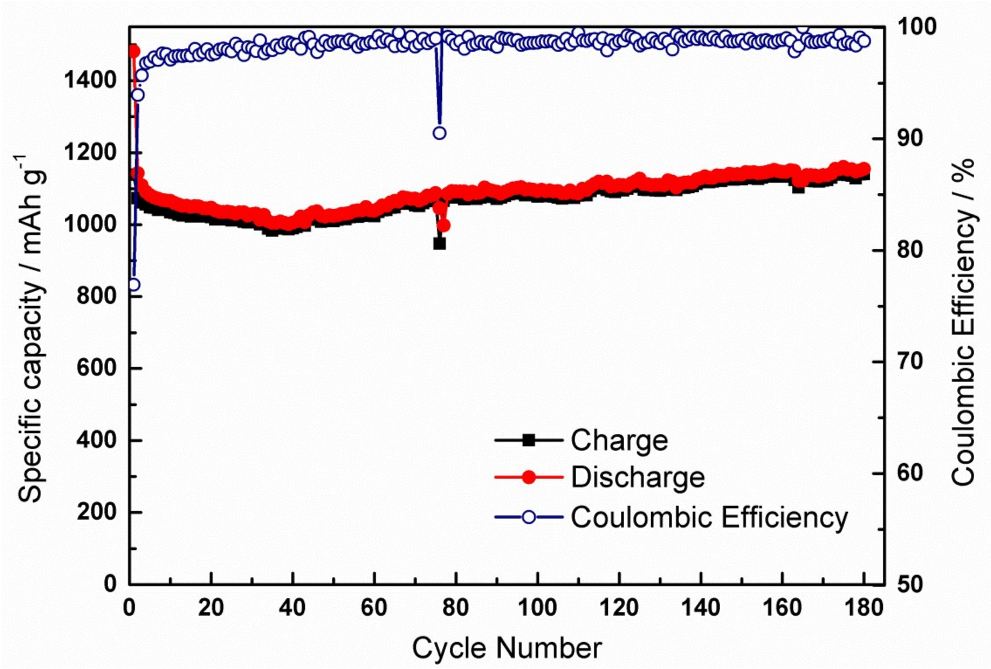
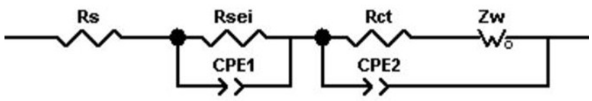


Fig. S6 Cyclic performance and coulombic efficiency of FPG at current density of 100 mA g^{-1}.

Table S3 Examples of electrochemical performances of Fe_3O_4/graphene composites for LIBs

Reference	Fe_3O_4 morphology	Graphene or graphene derivative	Electrochemical performance
Our work	NPs	graphene	1154 mAh g^{-1} for 180 cycles (0.1 A g^{-1}) 859 mAh g^{-1} for 1000 cycles (2 A g^{-1})
1	NPs	graphene	950 mAh g^{-1} for 85 cycles (0.035 A g^{-1}) 600 mAh g^{-1} for 100 cycles (0.7 A g^{-1})
2	NPs	graphene	1280 mAh g^{-1} for 100 cycles (0.1C) 450 mAh g^{-1} (10C 400 & 4C 400 cycles)
3	NPs	graphene	637 mAh g^{-1} for 60 cycles (0.2 A g^{-1}) 474 mAh g^{-1} for 30 cycles (1.6 A g^{-1})
4	NPs	graphene foam	1060 mAh g^{-1} for 85 cycles (0.93 A g^{-1}) 363 mAh g^{-1} for 60 cycles (4.8 A g^{-1})
5	hollow spindle	graphene	940 mAh g^{-1} for 50 cycles (0.2 A g^{-1}) 660 mAh g^{-1} for 50 cycles (0.5 A g^{-1})
6	NPs	N-doped graphene	1130 mAh g^{-1} for 200 cycles (0.1 A g^{-1}) 648 mAh g^{-1} for 40 cycles (1.6 A g-1)
7	NPs (carbon coating)	graphene	1344 mAh g^{-1} for 202 cycles (0.5C) 743 mAh g^{-1} for another 200 cycles (2C)
8	NPs	graphene foam	1200 mAh g^{-1} for 500 cycles (1C) 300 mAh g^{-1} for 50 cycles (20C)
9	NPs	graphene aerogel	1200 mAh g^{-1} for 100 cycles (0.086 A g-1) 577 mAh g^{-1} for 300 cycles (5.2 A g^{-1})

(a)



(b)

	FPG	Fe_3O_4/GS
R_{SEI} (Ω)	154	159
R_{ct} (Ω)	39	90

(c)

Cycle number	1	50	100	200	500	1000
R_{SEI} (Ω)	154	78	75	58	49	25
R_{ct} (Ω)	39	51	36	12	3	2

Fig. S7 (a) Equivalent circuit model used for calculation of R_{SEI} and R_{ct} of FPG and Fe_3O_4/GS electrode; (b) R_{SEI} and R_{ct} results for FPG and Fe_3O_4/GS after the 1st discharge process at current density of 2 A g^{-1}; (c) R_{SEI} and R_{ct} results of the FPG at different cycle numbers at current density of 2 A g^{-1}.

References:

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