Electronic Supplementary Material (ESI) for Nanoscale.

Supplementary Information

Center-iodized graphene material as an advanced anode to significantly boost the performance of lithium-ion batteries

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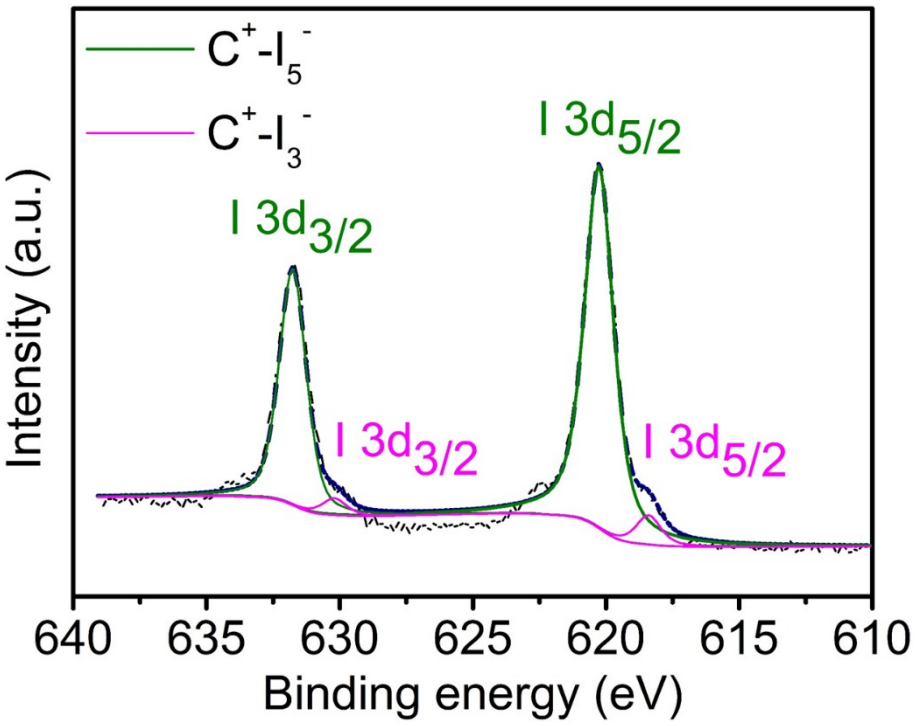

Fig. S1 I 3d XPS spectrum of the EIG composite.

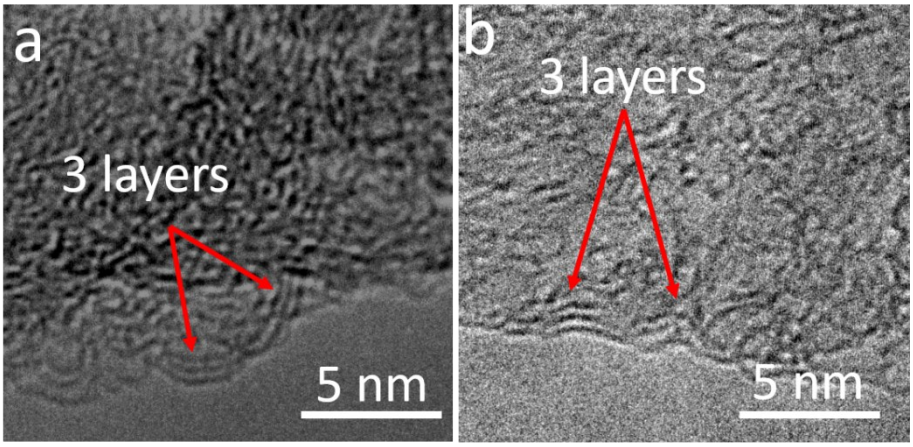

Fig. S2 High-resolution TEM images of (a) CIG and (b) EIG.

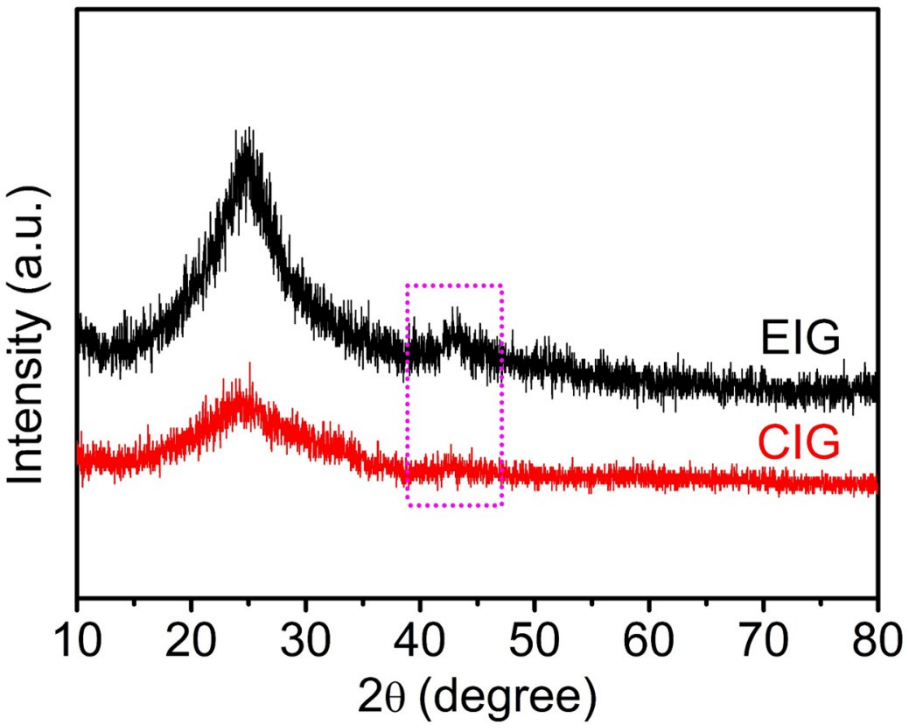

Fig. S3 XRD patterns of the CIG and EIG composites.

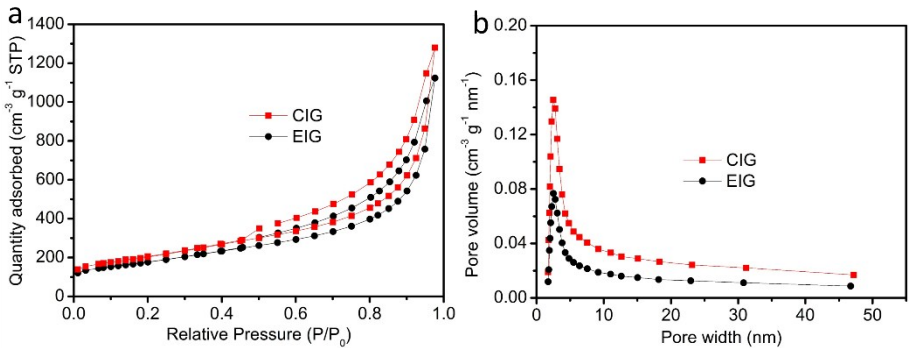

Fig. S4 (a) Nitrogen adsorption-desorption isotherms of CIG and EIG. (b) BJH Pore-size distributions of CIG and EIG.

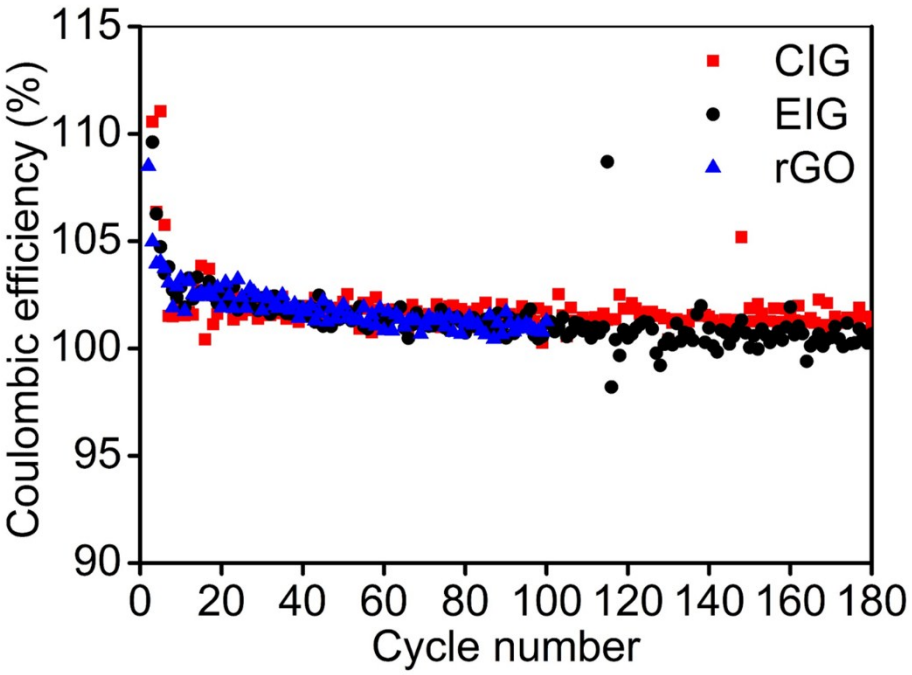

Fig. S5 Coulombic efficiencies of the CIG, EIG and rGO anodes at 500 mA g^{-1}.

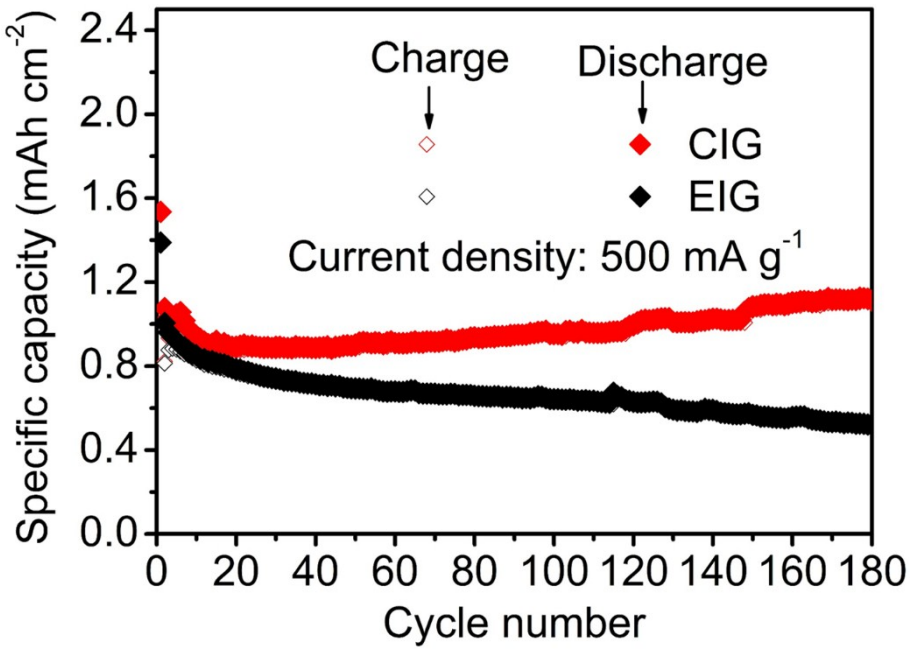

Fig. S6 Cycling performance of the CIG and EIG electrodes at 500 mA g^{-1}.

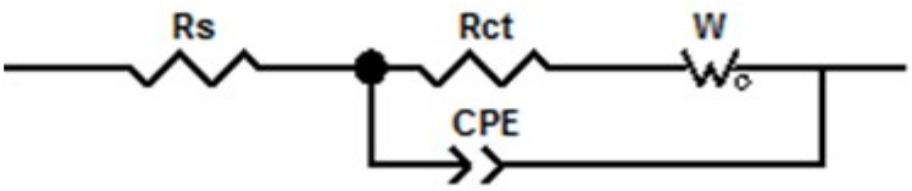

Fig. S7 The equivalent circuit model of electrochemical impedance spectroscopy (EIS).

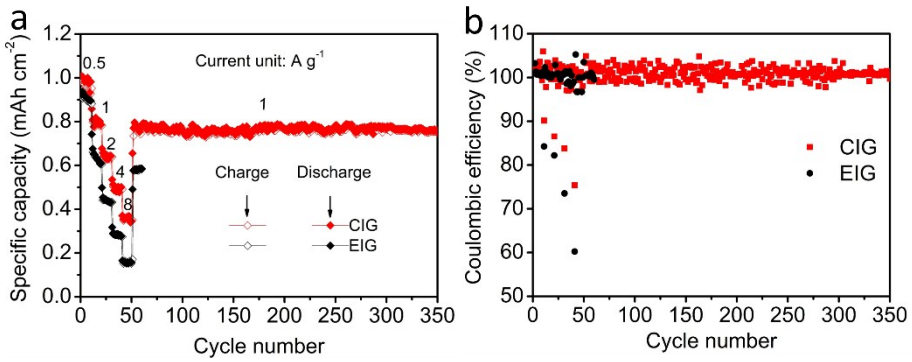

Fig. S8 (a) Rate performance and (b) coulombic efficiencies of the CIG and EIG electrodes at the corresponding current densities after 5 cycles' activation at 0.2 A g^{-1}.

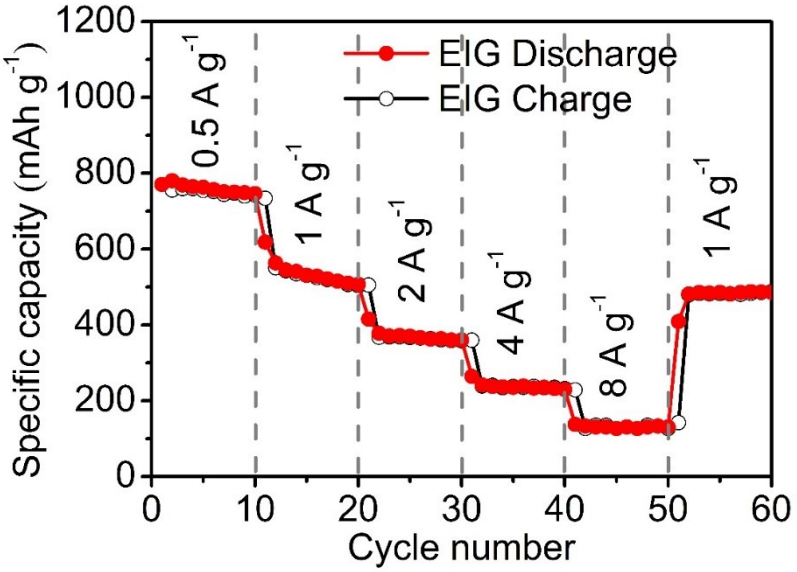

Fig. S9 Rate performance of the EIG electrode at corresponding current densities from 0.5 to 8 A g^{-1} after 5 cycles' activation at the current density of 0.2 A g^{-1}.

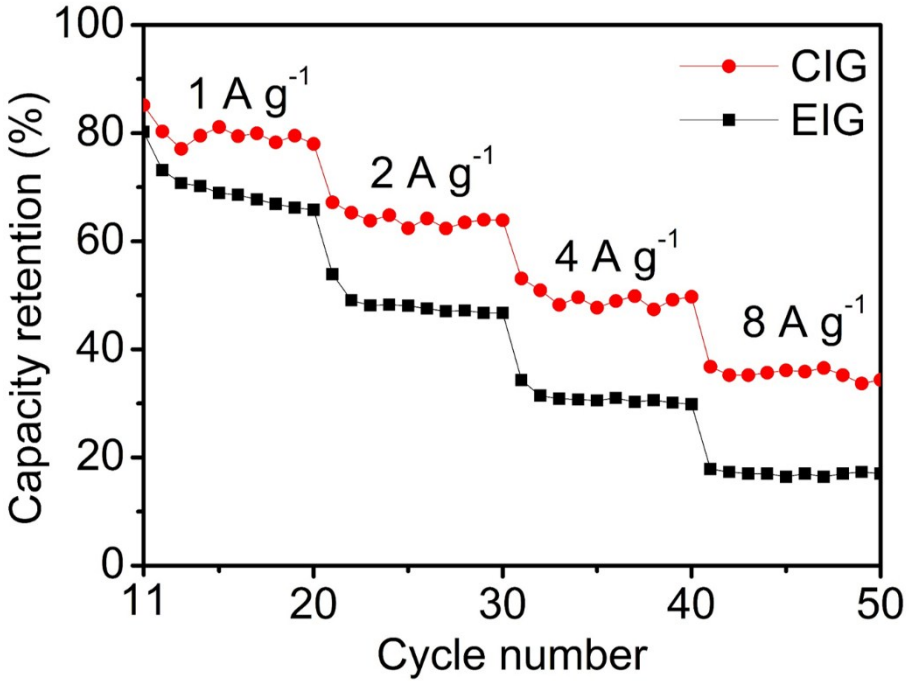

Fig. S10 The capacity retention of the CIG and EIG anodes cycled at high rates.

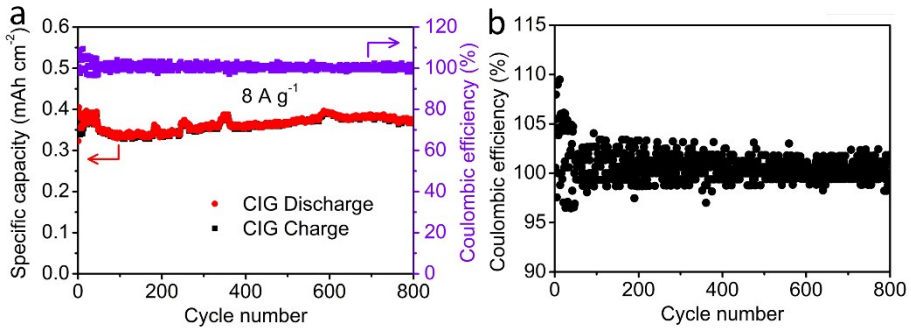

Fig. S11 (a) Cycling performance of the CIG electrode at 8 A g^{-1} over 800 cycles. (b) Coulombic efficiency of the CIG anode at 8 A g^{-1} on an expanded scale.

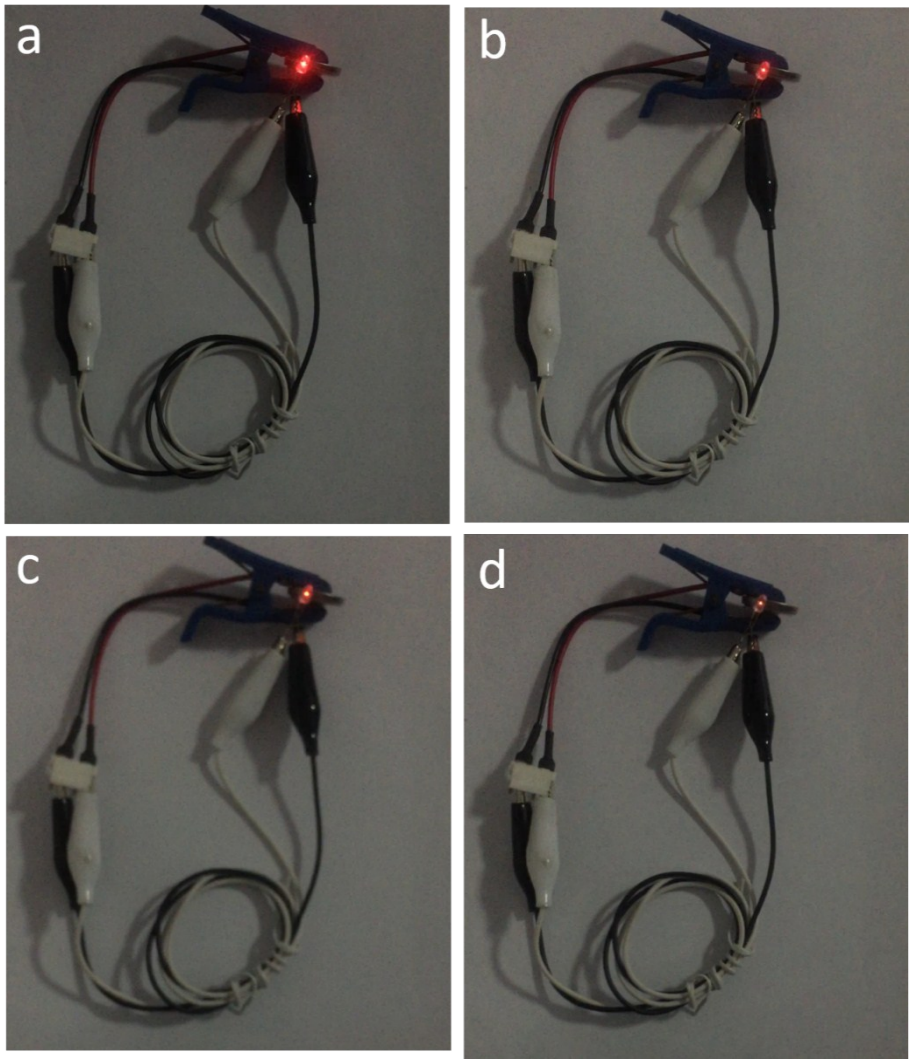

Fig. S12 The lighted time of images (a), (b), (c) and (d) is 10 min, 20 min, 30 min and 40 min, respectively.

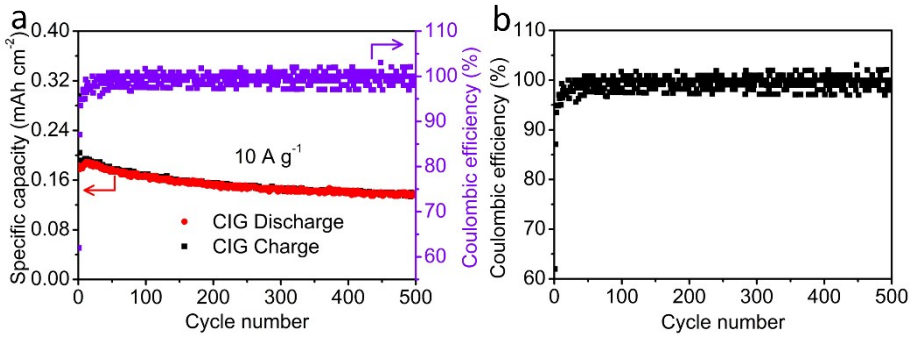

Fig. S13 (a) Cycling performance of the CIG/$LiFePO_4$ full-cell at 10 A g^{-1} over 500 cycles. (b) Coulombic efficiency of the CIG/$LiFePO_4$ full-cell at 10 A g^{-1} on an expanded scale.

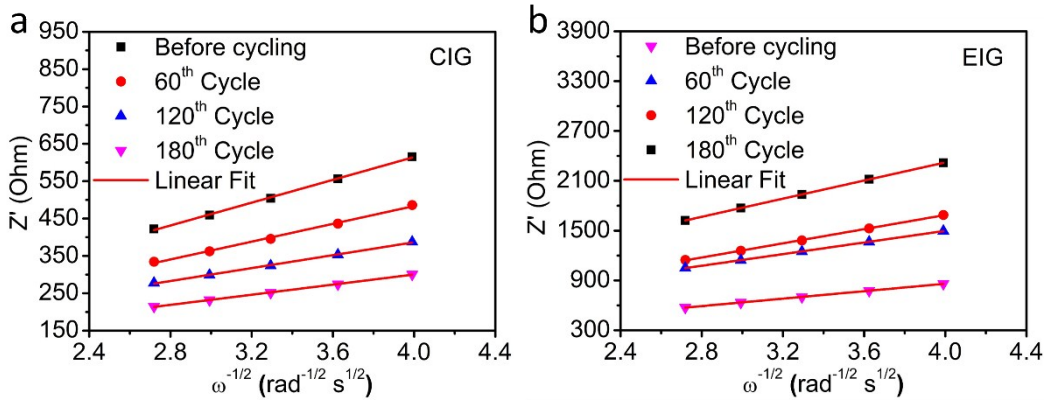

Fig. S14 Relationship between Z' and $\omega^{-1/2}$ of the (a) CIG and (b) EIG electrodes.

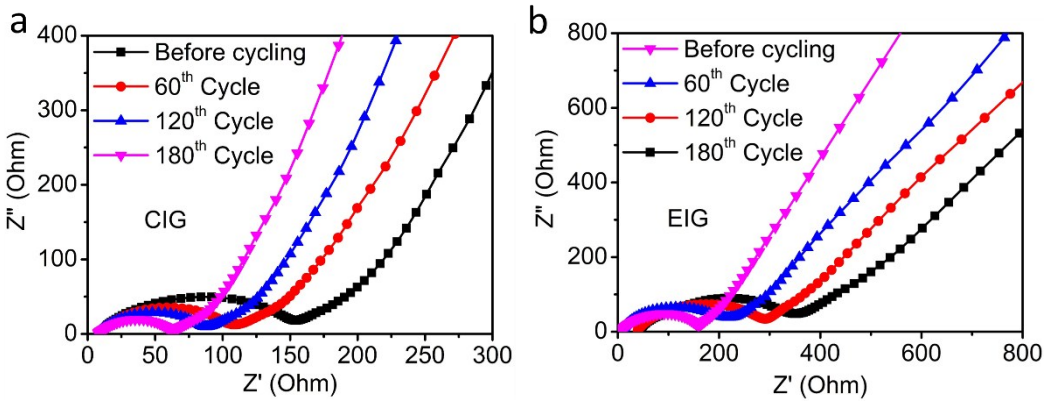

Fig. S15 Nyquist plots of the (a) CIG and (b) EIG electrodes at different cycles from 10^5 to 0.01 Hz.

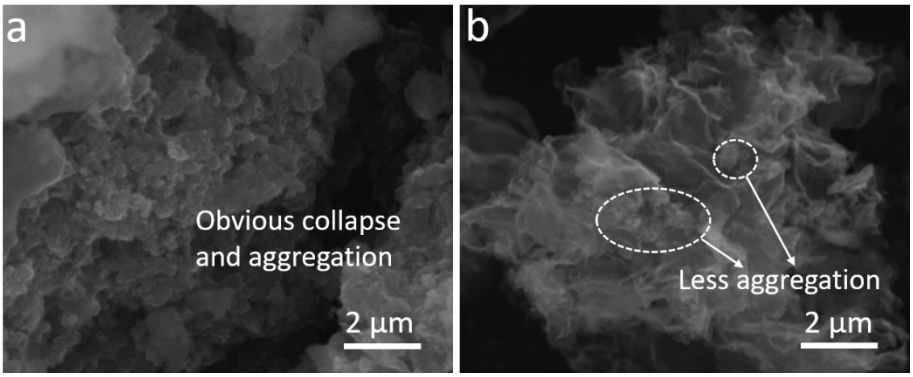

Fig. S16 SEM images of the (a) EIG and (b) CIG composites after 180 cycles at 0.5 A g^{-1}.

Table S1 The corresponding parameters of charge transfer (R_{ct}) resistance and linear fitting slope of the CIG and EIG composites.

Cycles	CIG		EIG	
	R_{ct} (Ω)	Slope	R_{ct} (Ω)	Slope
Before cycling	153.1	152.7	164.2	224.6
60th cycle	105.3	119.2	224.7	350.1
120th cycle	84.2	86.5	278.5	426.6
180th cycle	58.2	67.7	370.6	545.8

Table S2 A detailed comparison of Li-storage performance between CIG and the graphene-based anodes reported previously.

Material	Current density	Cycle number	Specific capacity	Reference
Hard carbon@graphene	20 mA g^{-1}	100	500 mAh g^{-1}	1
Graphene nanosheet	50 mA g^{-1}	20	240 mAh g^{-1}	2
graphene	200 mA g^{-1}	150	577 mAh g^{-1}	3
S-doped graphene	200 mA g^{-1}	150	491 mAh g^{-1}	3
N-dopedgraphene	200 mA g^{-1}	150	479 mAh g^{-1}	3
N-doped graphene	50 mA g^{-1}	30	873 mAh g^{-1}	4
graphene	100 mA g^{-1}	80	280 mAh g^{-1}	5
P-doped graphene	100 mA g-1	80	460 mAh g^{-1}	5
Reduced graphene oxide	100 mA g^{-1}	50	561 mAh g^{-1}	6
CIG	500 mA g^{-1}	180	1121 mA g^{-1} (Half-cell)	This study
CIG	8 A g^{-1}	800	374 mA g^{-1} (Half-cell)	This study
CIG	10 A g^{-1}	500	279 mA g^{-1} (Full-cell)	This study

Reference

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