Supporting Information

Ferrocene as a Novel Additive to Enhance the Lithium-Ion Storage Capability of SnO_2/Graphene Composite

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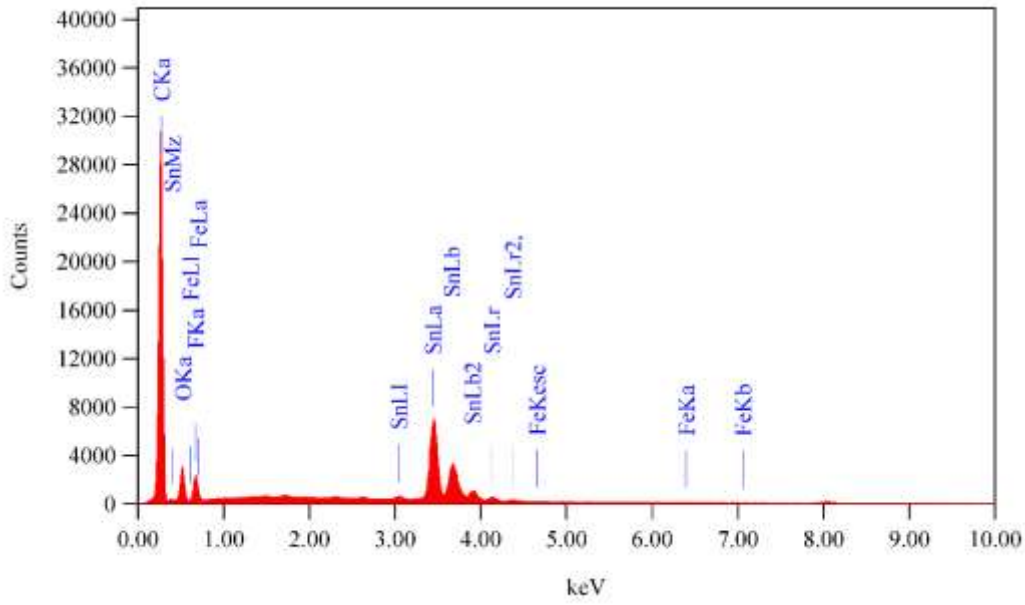

Figure S1. EDS spectrum of the fresh 10%Fc-SnO_2/G electrode.

The C, O, F, Sn and Fe peaks can be seen in the EDS spectrum of 10%Fc-SnO_2/G electrode.

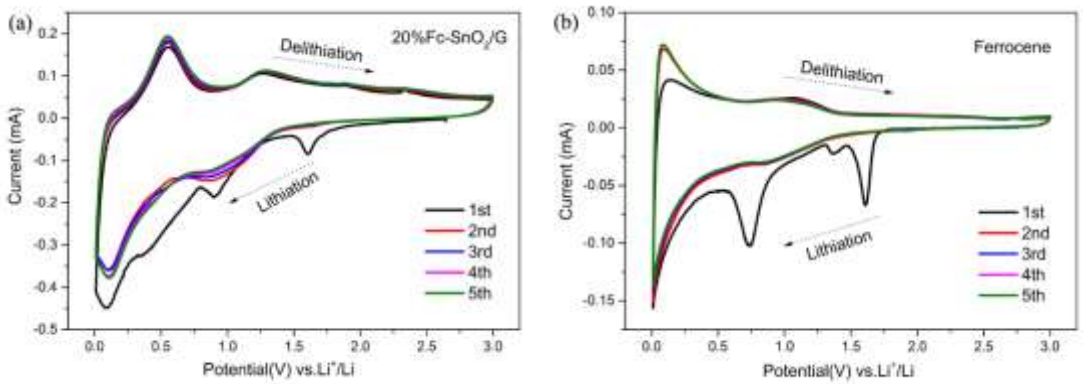

Figure S2. The CVs of (a) 20%Fc-SnO_2/G and (b) ferrocene electrodes scanned at 0.1 mV s^{-1}.

Compared to SnO_2/G electrode, the 20%Fc-SnO_2/G electrode shows two additional peaks at ~1.60 and 0.73 V. According to the references, the peak at ~1.60 V is ascribed to the formation of SEI, which disappears in the following cycles. This peak can also be found in the first discharge scan of the ferrocene electrode. Another peak at ~0.73 V could refer to the electrochemical reaction of ferrocene with Li^+.

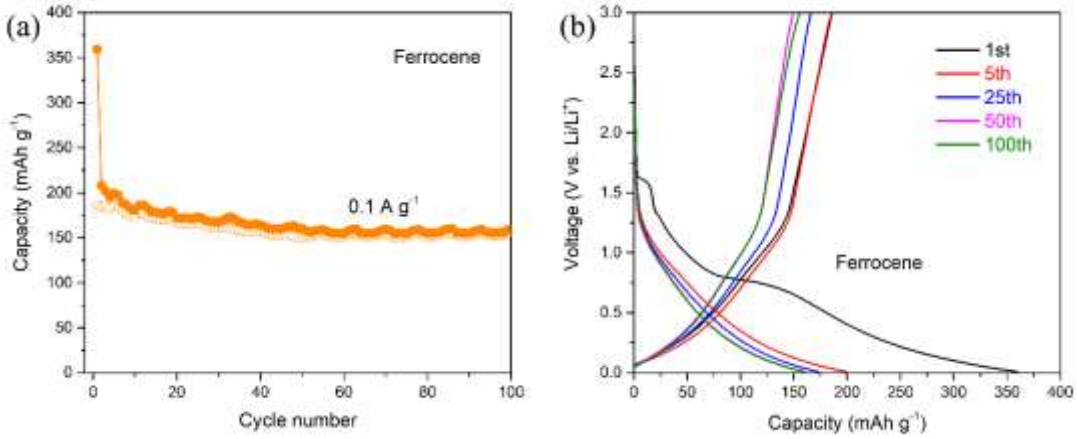

Figure S3. (a) Cyclic performance of ferrocene electrode at 0.1 A g^{-1}; (b) Selected discharge and charge voltage curves of ferrocene electrode.

The cycling performance of ferrocene was also conducted. It delivers a reversible capacity of 193.2 mAh g^{-1} after 100 cycles, which is much lower than that of the SnO_2/G composite. The first charge and discharge capacities of ferrocene are merely 186.1 and 359.3 mAh g^{-1}.

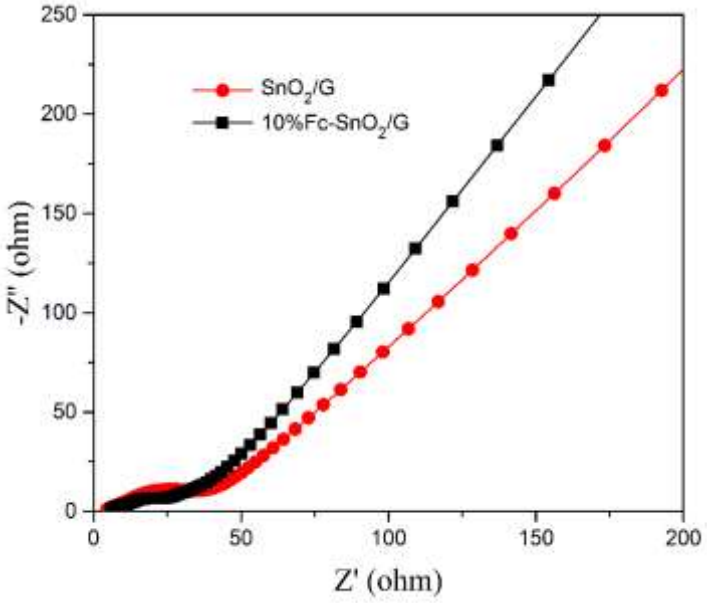

Figure S4. EIS spectra of the SnO_2/G and 10%Fc-SnO_2/G electrodes after 10 cycles.

As seen from the Nyquist plots, 10%Fc-SnO_2/G electrode shows a smaller diameter of the semicircle at high frequencies compared to SnO_2/G electrode. Besides, the slope of the straight line for 10%Fc-SnO_2/G electrode at low frequencies is larger than that for SnO_2/G electrode.

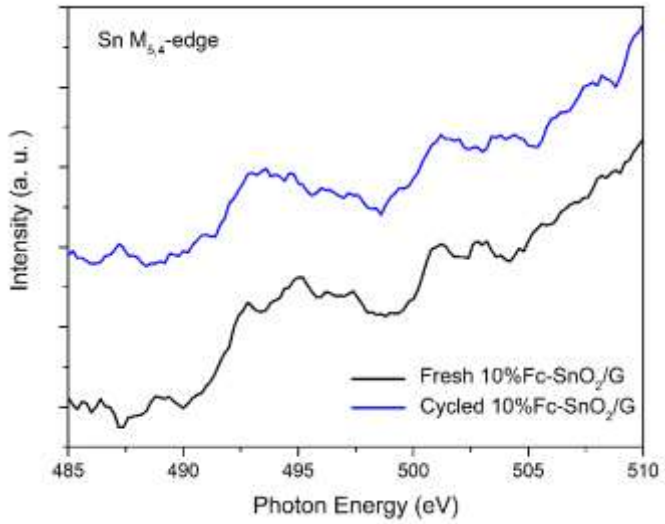

Figure S5. Sn $M_{5,4}$-edge XAS spectra of the 10%Fc-SnO_2/G electrode before cycling and after 150 cycles.

It can be seen that the spectral profile of the 10%Fc-SnO_2/G electrode after 150 cycles is similar to that of the fresh 10%Fc-SnO_2/G electrode, revealing the good reoxidation of Sn to SnO_2 in the 10%Fc-SnO_2/G electrode.

Table S1. Comparison of lithium storage performance of 10%Fc-SnO_2/G with some reported SnO_2-containing composites.

Materials	Voltage range (V)	Current density (mA g^{-1})	Cycle number	Capacity (mAh g^{-1})	Ref
10%Fc-SnO_2/G	0.01−3.0	100 500	150 220	1084.5 787.2	**This work**
SnO_2/NC submicrobox	0.01−2.0	500	100	491	1
SnO_{2-x}: RGO	0.01−3.0	200	100	950	2
H-SnO_2@rGO	0.01−3.0	100 1000	100 500	1107 552	3
Pd-doped graphene-based SnO_2 nanocomposite	0.01−3.0	100	100	900	4
Reduced GO/SnO_2 nanocomposite	0.01−2.0	100	200	718	5
SnO_2-RGO composite	0.005−3.0	100 1000	70 1000	776 531	6
Porous micron-SnO_2/C composite	0.01−3.0	200 1000	100 800	954 406	7
SnO_2NC@GG	0.05−3.0	200	200	1090	8
SnO_2/carbon nanotube	0.01−2.0	500	200	596	9
Bow-like SnO_2@C particles	0.005−3.0	400	100	963	10
SnO_2-QDs/N-GNs	0.005−2.5	100	80	803	11
SnO_x/Carbon Nanohybrids	0.005−3.0	500	200	608	12

SnO_2 Quantum Dots@GO	0.01−3.0	100	100	1121	13
SnO_2-Fe-graphite composite	0.01−3.0	200	400	1338	14
SnO_2@C nanocomposite	0.01−3.0	100	220	597.3	15
SnO_2-Mn-graphite composite	0.01−3.0	200 2000	200 1200	850 700	16
F-SnO_2@RGO	0.005−3.0	100	100	1277	17
SnO_2-Co-graphite	0.01−3.0	200 2000	250 1000	875 610	18
W-doped SnO_2/graphene	0.005−3.0	100 1000	100 2000	1100 776	19
Graphene-based Pt/SnO_2 nanocomposite	0.01−3.0	78.2	100	950	20
Porous SnO_2-C composite	0.02−3.0	200 1000	600 800	1400 930	21
SnO_2/Cu/GNS	0.01−3.0	100	200	890.6	22
SnO_2NC@N-RGO	0.005−3.0	500	500	1346	23
SnO_2@rGO	0.01−3.0	200	130	1149	24
3D SnO_2/graphene composite sphere	0.01−3.0	100	120	1140	25
SnO_2@C@VO_2 Composite	0.01−3.0	100 500	100 500	765.1 424.1	26

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