Supplementary Information

Fe$_2$O$_3$@SnO$_2$ Nanoparticles Decorated Graphene Flexible Films as High-erformance Anode for Lithium-ion Batteries

Shuo Liu, Ronghua Wang, Miaomiao Liu, Jianqiang Luo, Xihai Jin* and Jing Sun*

The State Key Lab of High Performance Ceramics and Superfine Microstructure, Shanghai Institute of Ceramics, Chinese Academy of Sciences, 1295 Ding Xi Road, Shanghai 200050, China

*Corresponding authors. Tel: +86 21 52412720. Fax: +86 21 52413122.
E-mail address: jingsun@mail.sic.ac.cn, jinxihai@hotmail.com
Fig. S1  N$_2$ adsorption/desorption isotherms of (a) FeOOH nanoparticles and (b) FeOOH@SnO$_2$ nanoparticles.

Fig. S2  Images of water dispersion of FeOOH nanoparticles (left) and FeOOH@SnO$_2$ nanoparticles (middle), dispersion of FeOOH@SnO$_2$ nanoparticles in GO water solution (right).
**Fig. S3**  TEM images of Fe$_2$O$_3$@SnO$_2$/GS film.

**Fig. S4**  (a) Cross-section SEM image of Fe$_2$O$_3$/GS film. (b) Top-view SEM image of Fe$_2$O$_3$/GS film. (c) Cross-section SEM image of SnO$_2$/GS film. (d) Enlarged cross-section SEM image of SnO$_2$/GS film.
**Fig. S5**  First three CV curves of (a) Fe$_2$O$_3$/GS electrode and (b) SnO$_2$/GS electrode at a scan rate of 0.5 mV s$^{-1}$ over the voltage range of 0-3.0 V. The scan direction follows with the arrows.

**Fig. S6**  Charge-discharge profiles of the bare graphene paper anode at a current density of 100 mA h g$^{-1}$, with a first discharge capacity of 827.4 mA h g$^{-1}$ and a discharge capacity of 67.3 mA h g$^{-1}$ after 5 cycles.

**Fig. S7**  TGA curves of Fe$_2$O$_3$/GS and SnO$_2$/GS films, revealing that contents of Fe$_2$O$_3$ and SnO$_2$ in the Fe$_2$O$_3$/GS and SnO$_2$/GS composites are 63.82% and 62.32%, respectively.
**Fig. S8** EIS spectra and equivalent circuit fitting of Fe$_2$O$_3$ /GS electrode before and after ten cycles at a current density of 100 mA g$^{-1}$.

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<th>Rs/Ω</th>
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<th>CPE-T/s</th>
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<th>Wo-R/Ω</th>
<th>Wo-T/s</th>
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**Fig. S9** The fitted EIS results from the equivalent circuit.