

## Supplementary Material

### Electrophoretic deposition of SnFe<sub>2</sub>O<sub>4</sub>-graphene hybrid films as anode for lithium-ion batteries

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The TGA curves of SFG-1, SFG-2, SFG-3, and SFG-4 revealed that weight loss below 250 °C correspond to evaporation of water adsorbed on surface of SnFe<sub>2</sub>O<sub>4</sub>-srGO, and weight loss between 250 and 550 °C is associated with decomposition of residual oxygen-containing functional groups on srGO and combustion of carbon skeleton from srGO.<sup>[1]</sup> According to TGA test results, mass percentage content of

SnFe<sub>2</sub>O<sub>4</sub> in SFG-1, SFG-2, SFG-3, and SFG-4 hybrid films totaled 74.50, 77.52, 81.47, and 83.76 wt.%, respectively.

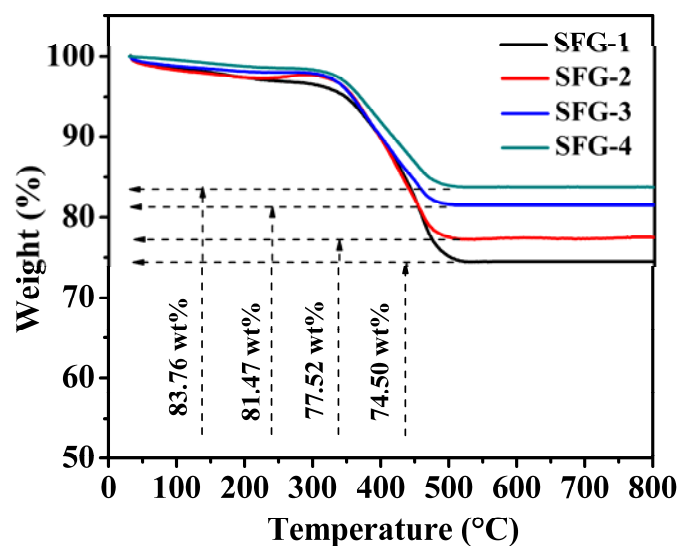


Fig. S1 TGA curves of SFG-1, SFG-2, SFG-3, and SFG-4.

Fig. S2 displays that XPS spectrum of C1s for sGO included four types of C-containing groups, namely, C–C/C=C (284.5 eV), C–O (286.5 eV), C=O (287.7 eV), and O–C=O (288.9 eV). In XPS for sGO, the C/O atomic ratios was 2.1, this value was close to the low limit of previous results (1.8 to 4.7) for GO products.<sup>[2-5]</sup> Peak area ratios of sp<sup>2</sup> C atoms (C–C/C=C) and oxygenated C atoms in the XPS spectrum measured 40.63% and 59.37%, respectively.

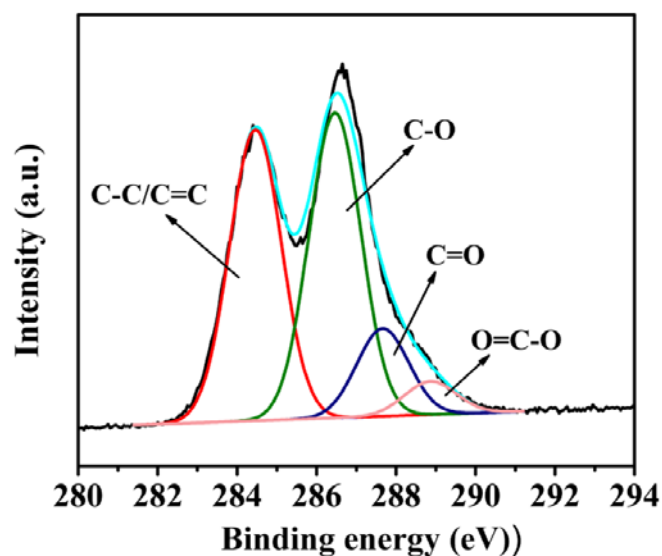
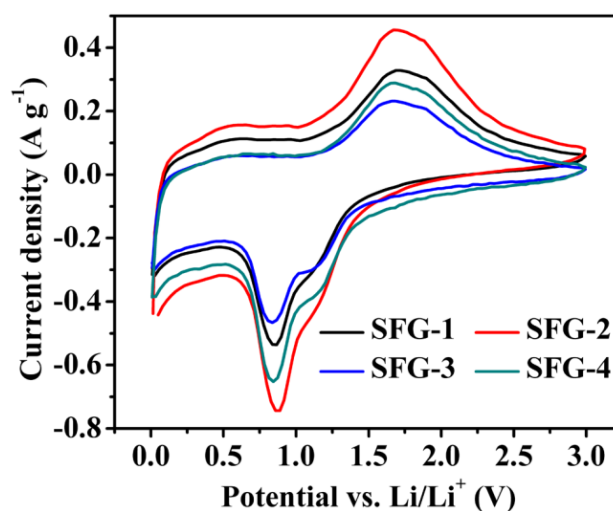


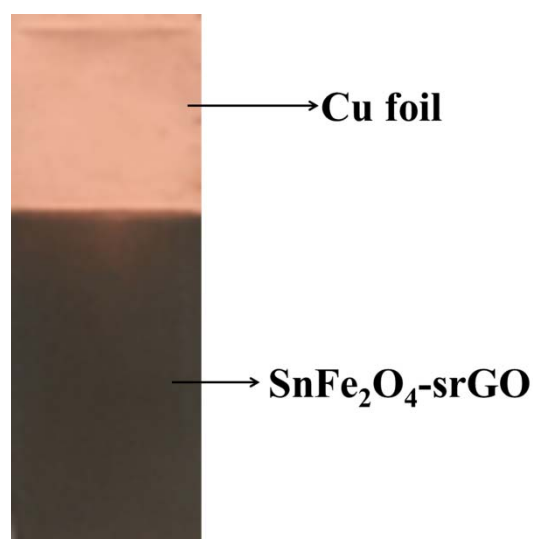
Fig. S2 XPS curve of sGO.

Fig. S3 shows CV curves of SFG-1, SFG-2, SFG-3, and SFG-4 electrodes for the fifth cycle at a scan rate of  $0.2 \text{ mV s}^{-1}$  and voltage range of 0.005–3.0 V. Decreasing order of CV areas starts from SFG-2, SFG-4, SFG-1, then end with SFG-3, revealing decreasing specific capacitance of SFG-2, SFG-4, SFG-1, and SFG-3.<sup>[6]</sup> These results agree with conclusions in the previous text (Fig. 6a).



**Fig. S3** The CV curves of SFG-1, SFG-2, SFG-3, and SFG-4 electrodes for the fifth cycle at a scan rate of  $0.2 \text{ mV s}^{-1}$  and voltage range of 0.005–3.0 V.

Fig. S4 displays the photograph of SnFe<sub>2</sub>O<sub>4</sub>-srGO hybrid films uniformly deposited onto copper substrate via electrophoretic deposition and subsequent carbonization treatment. The color of the obtained films is black. The hybrid film were used as binder-free anodes for lithium-ion half-cells.



**Fig. S4** The photograph of SnFe<sub>2</sub>O<sub>4</sub>-srGO hybrid films deposited onto copper substrate.

## References

- [1] B. Wang, S. Li, J. Liu, M. Yu, B. Li, X. Wu, *Electrochim. Acta* **2014**, *146*, 679.
- [2] Y. Xu, K. Sheng, C. Li, G. Shi, *J. Mater. Chem.* **2011**, *21*, 7376.
- [3] W. S. Hummers, R. E. Offeman, *J. Am. Chem. Soc.* **1958**, *80*, 1339.
- [4] W. Chen, L. Yan, *Nanoscale* **2010**, *2*, 559.
- [5] C. Botas, P. Álvarez, P. Blanco, M. Granda, C. Blanco, R. Santamaría, L. J. Romasanta, R. Verdejo, M. A. López-Manchado, R. Menéndez, *Carbon* **2013**, *65*, 156.
- [6] D. Liu, J. Shen, N. Liu, H. Yang, A. Du, *Electrochim. Acta*, **2013**, *89*, 571.