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Magnetite/graphene composites: microwave irradiation synthesis and enhanced cycling and rate performances for lithium ion batteries

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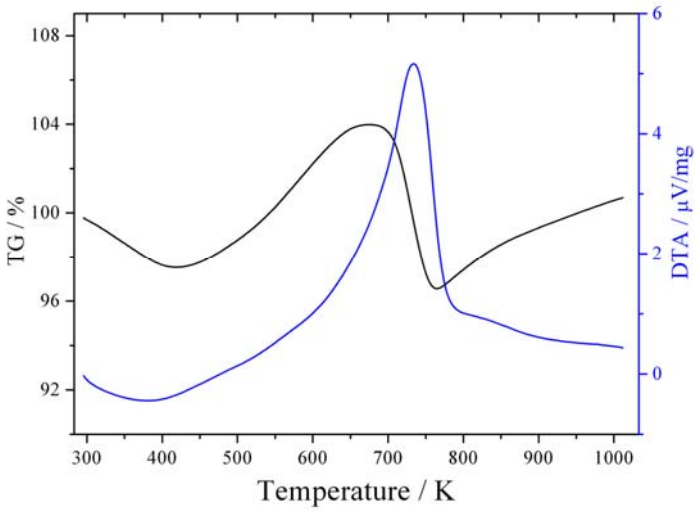

Figure S1. TGA and DTA traces of the as-synthesized Fe_3O_4/graphene composites (MGCs) (a heating rate of 10 K/min with an air flowrate of 10 ml/min). The TGA curve of MGCs displays a weight loss from 293 K followed by a weight gain between 423 and 673 K and again a weight loss from 673 followed by a weight gain between 766 and 1013 K. This complex curve results from the emersion of small molecule compounds and the redox of carbon and Fe^{2+}. The weight loss before 423 K, which is accompanied by an endothermic peak in the DTA curve, could be attributed to the elimination of absorbed/trapped water molecules or small molecule compounds. According to previous report [1], the weight gain between 423 and 673 K arise from the oxidation of the magnetite, which is accompanied by one exothermic peak. It is well known that the graphene was oxidated by O_2 beginning at 573 K [2] and the hematite was reduced by carbon monoxide above 573 K [3]. The weight loss between 673 and 766 K and an exothermic peak could be attributed to above reasons. The weight gain after 766 K could be attributed to the oxidation of Fe_3O_4 again. The final products were the hematite.

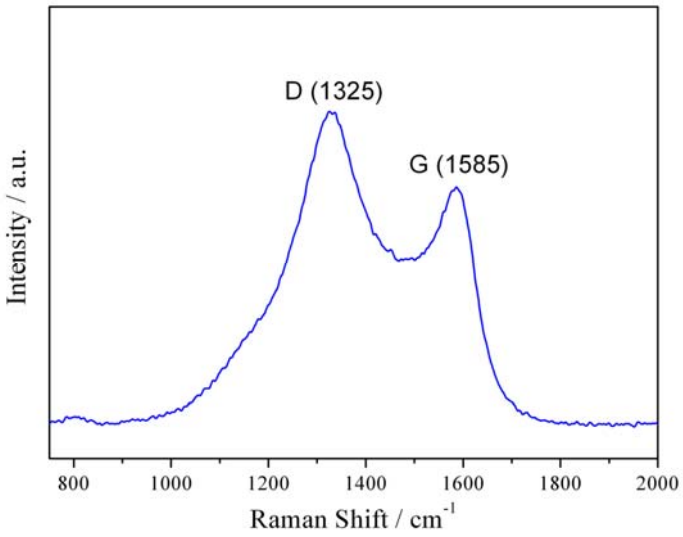

Figure S2. Raman spectra of MGCs. The peak at about 1585 cm^{-1} (G band) corresponding to an E_{2g} mode of graphite is related to the vibration of sp^2-bonded carbon atoms in a 2-dimensional hexagonal lattice, while the peak at about 1325 cm^{-1} (D band) is related to the defects and disorders in the hexagonal graphitic layers. The intensity ratio of the D to G band (I_D/I_G) is calculated as 1.32 for the samples.

References

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[2] A. B. Bourlinos, D. Gournis, D. Petridis, T. Szabó, A. Szeri and I. Dékány, *Langmuir*, 2003, **19**, 6050.

[3] W. K. Jozwiak, E. Kaczmarek, T. P. Maniecki, W. Ignaczak and W. Maniukiewicz, *Appl. Catal. A: General*, 2007, **326**, 17.