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 Fe₃O₄/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 Fe²⁺. 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 O₂ 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 Fe₃O₄ 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

