Highly reduced graphene oxide/Fe_3O_4 nanocomposites: Effect of graphene loadings and reduction temperature on the performance of lithium-ion battery anode

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As an anode material of lithium-ion battery (LIB), the transition metal oxide, Fe_3O_4 attracted much attention due to its higher specific capacity, eco-benignity, natural abundance, and higher electronic conductivity. Recently, the tremendous volume change of Fe_3O_4 during the electrochemical reactions has been alleviated by the hybridization with carbon based materials, which reduces the volume change of the electrode and leads to improve the cycle stability. Herein, the highly reduced graphene oxide/Fe_3O_4 (HRG/Fe_3O_4) nanocomposites is prepared by a facile solution based in-situ method without using further heat treatments. The effect of HRG loadings on the properties of HRG/Fe_3O_4 was evaluated by changing the HRG loadings from 9.4%, 11.6%, 14.3%, 30.3%, to 41.4%. As an anode material of LIBs, the HRG/Fe_3O_4-14.3% exhibited higher specific capacity and an excellent rate capability at all the C-rates in comparison to different loadings of HRG studied. Moreover, the effect of different reduction temperatures of HRG/Fe_3O_4 on the LIB performances were also thoroughly investigated.