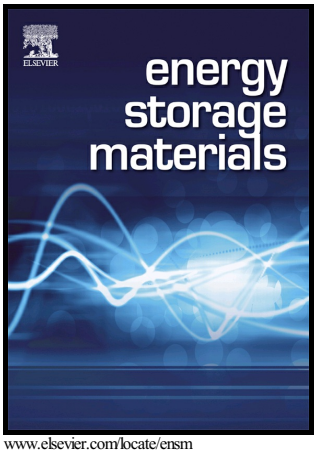

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Interfacial Engineering of Metal Oxide/Graphene Nanoscrolls with Remarkable Performance for Lithium Ion Batteries

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Abstract

The strong interfacial interaction between graphene nanosheets (GNS) and metal oxides (MO) intensively enhances Li^+ diffusion, achieving superior rate capability and excellent cycle stability as such interaction strongly restricts the expansion of MO near the interface during lithiation. However, how to design strong interface between GNS and MO is a challenge. Herein, strong interface was achieved by adding sodium citrate (SC) during the dispersion and mixing process of GO and MO (i.e., Fe_3O_4, Co_3O_4 and NiO). The use of SC enables better dispersion of MO particles and allows every MO particle to be attached on the GNS. The discharge capacity of Fe_3O_4@GNS(SC) was 1882 mAh g^{-1} in the second cycle at 0.1 C which is higher than Fe_3O_4@GNS (1120 mAh g^{-1}), and maintained at 1610 mAh g^{-1} after 100 cycles much better than that of Fe_3O_4@GNS (810 mAh g^{-1}). The Fe_3O_4@GNS(SC) composite material also delivered excellent rate performance of 1035 mAh g^{-1} at 1C, in contrast to Fe_3O_4@GNS (680 mAh g^{-1}). In the case of NiO and Co_3O_4, the corresponding composites displayed the same tendency as Fe_3O_4@GNS(SC). These results imply that SC with an oxygen functional group and short carbon chain can ensure a large contact area between MO and GNS and short diffusion path for lithium ions in the