Reduced Graphene Oxide as an Efficient Conductive Additive for High-Performance Graphite Anodes

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Abstract:

Graphite is one of the major anode materials for commercial lithium batteries because of its low cost, structural stability, and high Coulombic efficiency, however the poor electronic connectivity between graphite particles is a drawback to its electrochemical performance, and to overcome this, conventional carbon black additives are used. Conventional conductive additives normally require higher loading which reduces the total active material which limits the energy density. In this study reduced graphene oxide (rGO) is explored as an alternative conductive additive to enhance its electrical percolation network.

rGO was synthesized through thermal reduction of graphene oxide [1] and incorporated into the graphite anodes at low weight percentages. Due to its 2D morphology and higher electrical conductivity, rGO interconnects the graphite particles by forming a conductive framework with high electrical conductivity, which works better than conventional conductive additives, as confirmed by morphological characterization studies [3]. Coin cells were fabricated using rGO-containing graphite electrodes, and electrochemical studies were performed to evaluate the charge-transfer resistance, rate capability, and capacity retention, etc. The electrochemical study revealed reduced charge transfer resistance, improved rate capability and higher capacity retention while maintaining high initial coulombic efficiency.

This study suggests that rGO enhances the electronic transport efficiency of the graphite anodes with smaller additive content and also improves the overall performance of the graphite anodes which indicate the future of rGO as next generation conductive additive for high performance anode materials for Li-ion battery applications.

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