

Graphene-Oxide-Coated $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ as High Voltage Cathode for High Energy Density Lithium Ion Batteries

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ABSTRACT

Lithium ion batteries are receiving enormous attention as power source and energy storage devices in the renewable energy field. With the ever increasing demand for higher energy and power density, high voltage cathode has emerged as an important option for new generation batteries. Here we report graphene-oxide-coated $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ as high voltage cathode for lithium ion batteries. Mildly oxidized graphene oxide coating was found to improve the battery performance by enhancing the conductivity and protecting the cathode surface from undesired reactions with the electrolyte. As a result, after coating, the impedance of the batteries was significantly reduced. The graphene-oxide-coated high voltage cathode $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ showed 61% capacity retention after 1000 cycles in the cycling test, that is, only 0.039% capacity decay per cycle. At large current rate of 5C, 7C and 10C, the batteries were able to deliver 77%, 66% and 56% of the 1C capacity, respectively (1C = 140 mAh/g). The promising result demonstrated the potential of developing high energy density batteries with high voltage cathode $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ and improving the battery performance by surface modification with mildly oxidized graphene oxide.