Carbon Nanotubes Coating on $\text{LiNi}_{0.8}\text{Co}_{0.15}\text{Al}_{0.05}\text{O}_2$ as Cathode Materials for Lithium Battery

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The carbon nanotubes (CNTs) have been utilized as a coating for $\text{LiNi}_{0.8}\text{Co}_{0.15}\text{Al}_{0.05}\text{O}_2$ (NCA) synthesized by calcining Ni-Co-Al composite hydroxide as a strategy to improve the electrochemical performance of cathode. The samples coated with CNTs were characterized by X-ray diffraction (XRD), scanning electron microscopy, Raman spectroscopy, and elemental analyses. The CNTs coated $\text{LiNi}_{0.8}\text{Co}_{0.15}\text{Al}_{0.05}\text{O}_2$ (CNTs-NCA) exhibited an initial discharge capacity of 205.6 mAh g^{-1} and a highly improved discharge capacity retention (91.7%) after 80 cycles between 2.8 and 4.3V (versus Li/Li^+), compared with the pristine NCA (P-NCA), which presented an initial discharge capacity of 201.2 mAh g^{-1} and relative lower discharge retention of 84.4%. In addition, CV and EIS analysis demonstrated the CNTs coating NCA improved the surface electrochemical stability and rate capability, whereas the pristine NCA formed a thick resistive solid electrolyte interphase film by enhancing the surface side reactions. The improved electrochemical performance can be attributed to shorten the length of lithium transport path and improve the electronic conductivity of NCA.

Keywords: Lithium ion batteries; Cathode; $\text{LiNi}_{0.8}\text{Co}_{0.15}\text{Al}_{0.05}\text{O}_2$; Carbon nanotubes; Electrochemical performance

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