Electrochemical properties of LiCo$_{1/3}$Ni$_{1/3}$Mn$_{1/3}$O$_2$ as a Cathode for Lithium Ion Batteries

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LiCoO$_2$ compound as a cathode material has been used in commercial lithium ion battery production. However, due to the high costs and toxicity of LiCoO$_2$, many efforts have been made to replace LiCoO$_2$. LiNiO$_2$ is an attractive material because of its low cost and its possibility of a high charge/discharge capacity. However, LiNiO$_2$ compounds have two major drawbacks such as difficulty in preparation and poor cyclability. LiCo$_{1/3}$Ni$_{1/3}$Mn$_{1/3}$O$_2$ are very promising positive electrode materials. They provide a compromise between the good cyclability, reproducibility, and thermal stability of LiCoO$_2$ and the high capacity and the low prize of LiNiO$_2$ [1-3].

In this work, the LiCo$_{1/3}$Ni$_{1/3}$Mn$_{1/3}$O$_2$ were synthesized by sol-gel method using 2-ethylhexanoic acid as chelating agent, 2-methoxyethanol as solvent, and lithium acetate, cobalt acetate, nickel acetate, manganese acetate as other raw materials. The X-ray diffraction (XRD) pattern indicated that LiCo$_{1/3}$Ni$_{1/3}$Mn$_{1/3}$O$_2$ was pure phase. The SEM micrograph shows the particle size of synthesized LiCo$_{1/3}$Ni$_{1/3}$Mn$_{1/3}$O$_2$ morphology (Fig. 1). The electrochemical properties of these materials such as galvanostatic charge/discharge, cyclic voltammetry and a.c. impedance spectroscopy were systematically measured. The cathode materials show high reversible specific capacity and long cycling life (Fig. 2).

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References


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Figure 1. SEM micrographs of LiCo$_{1/3}$Ni$_{1/3}$Mn$_{1/3}$O$_2$

Figure 2. Discharge cycling performances using LiCo$_{1/3}$Ni$_{1/3}$Mn$_{1/3}$O$_2$ cathode.