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. $LiCo_xNi_yMn_{1-x-y}O_2$ 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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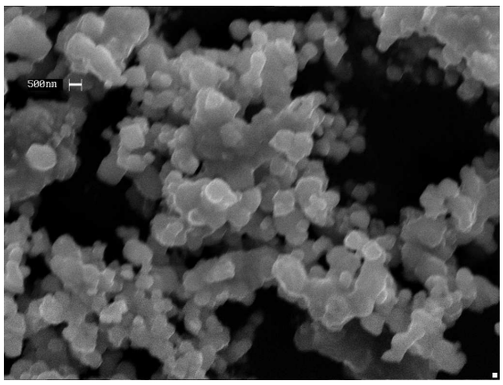

Figure 1. SEM micrographs of $LiCo_{1/3}Ni_{1/3}Mn_{1/3}O_2$

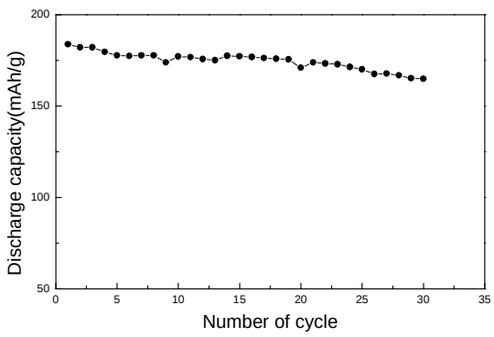

Figure 2. Discharge cycling performances using $LiCo_{1/3}Ni_{1/3}Mn_{1/3}O_2$ cathode.