The Enhanced Electrochemical Properties of $\text{LiNi}_{0.6}\text{Co}_{0.2}\text{Mn}_{0.2}\text{O}_2$ Modified with Yttrium Oxide Coating as a Cathode Material for Lithium-Ion Batteries

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Due to its high capacity and energy density, $\text{LiNi}_{0.6}\text{Co}_{0.2}\text{Mn}_{0.2}\text{O}_2$ is broadly regarded as one of the most promising active cathode materials in lithium-ion batteries. However, poor rate capability and cycling performance have significantly hindered the further commercialisation of $\text{LiNi}_{0.6}\text{Co}_{0.2}\text{Mn}_{0.2}\text{O}_2$. In this study, $\text{LiNi}_{0.6}\text{Co}_{0.2}\text{Mn}_{0.2}\text{O}_2$ is successfully modified by Y_2O_3 -coating in order to avoid negative side reactions between the electrodes and electrolytes, as well as to stabilise the cathode material's structure. The newly coated materials are characterised and investigated by several tests at high cut-off voltages. The hybrids with Y_2O_3 exhibit an excellent rate capability and outstanding cycling performance. Especially, they display a discharge capacity of 170.6 mAh g^{-1} with a retention of 85% after 100 cycles at 0.5 C over 3.0–4.6 V at room temperature. Therefore, the improved cathode material demonstrates excellent potential for application in the emerging green energy industry.

Keywords: Lithium-ion batteries; Y_2O_3 coating; High Voltage; Cathode materials

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