Effects of LaPO_4 coating on the performance of $\text{LiNi}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3}\text{O}_2$ cathode material for lithium ion batteries

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$\text{LiNi}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3}\text{O}_2$ (NCM-523) cathode material is coated with 2.0, 4.0 and 6.0 wt% of LaPO_4 via liquid phase coating method. The structure, morphology and electrochemical properties of surface modified $\text{LiNi}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3}\text{O}_2$ materials are characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), electrochemical workstation, inductively coupled plasma emission spectrometry (ICP), and constant current charge and discharge test. The consequence indicates that the structure of the materials is not transformed significantly before and after coating. The cycling performance and rate capability of the coated samples are improved significantly. The capacity retention of 4 wt%-coated NCM-523 sample at 1 C and 5 C are 95.17% and 93.71% between 2.8 and 4.2 V after 100 cycles, respectively. The Correspond to capacity retention of pristine sample at 1 C and 5 C are only 77.25% and 73.16%. It can be ascribed to that LaPO_4 coating layer can effectively avoid the side reaction between active materials and electrolytes. Furthermore, the LaPO_4 coating layer can effectively reduce the dissolution of transition metal elements in electrolyte and the deposition of high impedance metal fluorides on the electrode surface.

Keywords: $\text{LiNi}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.2}\text{O}_2$; cathode; coating; co-precipitation method

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