Glucose-based surface modification of $\text{Li}_{1.2}\text{Mn}_{0.54}\text{Ni}_{0.13}\text{Co}_{0.13}\text{O}_2$ as a cathode material for lithium-ion batteries

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Under high voltage (> 4.4 V), many side reactions between the Li-rich Mn-based cathode materials and the electrolyte can occur, with a transition from the active lamellar phase to the inactive spinel phase occurring during cycling, which can reduce the cycle stability of the material. Glucose-based modification can significantly promote the electrochemical performance of $\text{Li}_{1.2}\text{Mn}_{0.54}\text{Ni}_{0.13}\text{Co}_{0.13}\text{O}_2$. After glucose-based modification, the sample surface after treatment confirmed the presence of chemically activated Li_2MnO_3 components and the LiMn_2O_4 spinel phases. Furthermore, the material capacity changed significantly at high rates. The 1 C discharge capacity of the raw material was 165.2 mAh/g, and the sample at 1 C discharge capacity after 10% glucose treatment was 183 mAh/g, while the capacity retention rate after 100 cycles was 98.5%. The initial coulombic efficiency of the sample after treatment increased from 71.3% for the raw material to 78.5%, and the impedance also significantly reduced. The significant improvement in electrochemical performance of the sample after treatment was attributed to the newly formed layered spinel surface and chemically activated Li_2MnO_3 phase, which significantly enhanced the redox reactions on the surface of the positive electrode, accelerating the diffusion rate of Li^+ and adjusting the electrochemical evolution behavior of the Li-rich layered oxides.

Keywords: $\text{Li}_{1.2}\text{Mn}_{0.54}\text{Ni}_{0.13}\text{Co}_{0.13}\text{O}_2$ cathode material; spinel; LiMn_2O_4 ; surface stability; cycle performance

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