Sol-Gel Combustion Synthesis of $\text{Li}_{1.2}\text{Mn}_{0.54}\text{Ni}_{0.13}\text{Co}_{0.13}\text{O}_2$ as Cathode Materials for Lithium Ion Batteries

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Nanocrystalline $\text{Li}[\text{Li}_{0.2}\text{Mn}_{0.54}\text{Ni}_{0.13}\text{Co}_{0.13}]\text{O}_2$ cathode materials are successfully prepared by sol-gel combustion method with urea as both chelating agent and fuel. The effects of calcining temperature and solvent on the electrochemical performance are studied. The as prepared samples are characterized and tested by means of XRD, SEM and electrochemical methods. The electrochemical tests indicate that the materials synthesized at 800°C with water solvent deliver a high initial discharge capacity of 255.8 mAhg^{-1} , and a capacity retention of 76.8% after 50 cycles at a current density of 20 mAg^{-1} between 2.0 and 4.8 V vs. Li/Li^+ . It also shows better rate capability compared with the materials calcined at 750°C, 850°C as well as the materials using alcohol solvent calcined at 800°C. The experimental results show that enhanced electrochemical performance of the materials calcined at 800°C with water solvent is due to the uniformly distributed nanoparticles with a shorter diffusion path, perfect crystallinity, and ordered layered structure including less cations mixing.

Keywords: Li-rich layered oxide, Sol-gel combustion, Lithium-ion batteries, Cathode materials

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