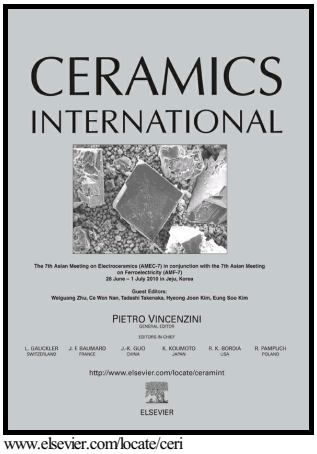

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Cu doped $LiNi_{0.5}Mn_{1.5-x}Cu_xO_4$ (x=0, 0.03, 0.05, 0.10, 0.15) with significant improved electrochemical performance prepared by a modified low temperature solution combustion synthesis method

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Abstract: A series of Cu-doped $LiNi_{0.5}Mn_{1.5-x}Cu_xO_4$ (x=0, 0.03, 0.05, 0.10, 0.15) spinel samples have been successfully prepared using a modified low temperature solution combustion synthesis method. X-ray diffraction(XRD) and infrared spectroscopy(FT-IR) analysis are used to characterize the phase structure. Scanning electron microscopy(SEM) is used to observe the microstructure of the products. The electrochemical performance are studied by galvanostatic charge-discharge testing, cyclic voltammetry(CV) and electrochemical impedance spectroscopy(EIS). No obvious sencondary phases were observed in XRD patterns of as-synthesized $LiNi_{0.5}Mn_{1.5-x}Cu_xO_4$ powders. The samples have a combination structure of ordered and disordered space group and the order degree increases with the increase of Cu doping content obtained from FT-IR spectra. The electrochemical performances show that although the specific capacity decreases with the Cu-doping content, the cycle-life both at room temperature and 55℃ and the C-rate performance are remarkably improved. The factors of stable structure, grain refinement, better crystallinity and lower charge transfer resistance lead to the excellent performance of Cu-doped samples.

Keywords: Lithium-ion batteries, $LiNi_{0.5}Mn_{1.5}O_4$, Cu doping, cycling stability, rate capability

1. Introduction

Lithium-ion battery has received wide attention as a new large-scale power source for electric vehicles (EVs) and hybrid electric vehicles (HEVs) attributing to its high capacity, high rate capability and long lifespan[1-3]. Among various lithium-ion batteries $LiNi_{0.5}Mn_{1.5}O_4$(LNMO)

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