Preparation and Electrochemical Performance of Modified $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ Cathode Material for Lithium-ion Batteries

Xiaoling Tong, Min Zeng*, Jing Li, Hui Xu, Meili Du, Fuyun Li

School of Materials Science and Engineering, Southwest University of Science and Technology, Mianyang 621010, P R China

*E-mail: zengmin@swust.edu.cn

doi: 10.20964/2016.09.39

Received: 23 May 2016/ Accepted: 7 July 2016 / Published: 7 August 2016

Modified $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ -based materials with Cr-doped ($\text{LiNi}_{0.5}\text{Mn}_{1.4}\text{Cr}_{0.1}\text{O}_4$) and additional lithium ($\text{Li}_{1.1}\text{Ni}_{0.5}\text{Mn}_{1.4}\text{Cr}_{0.1}\text{O}_4$) have been synthesized by a solid-state method and their physicochemical and electrochemical performances have been investigated. The experimental results show that the Cr doping in $\text{LiNi}_{0.5}\text{Mn}_{1.4}\text{Cr}_{0.1}\text{O}_4$ and $\text{Li}_{1.1}\text{Ni}_{0.5}\text{Mn}_{1.4}\text{Cr}_{0.1}\text{O}_4$ suppresses the generation of Mn^{3+} , decreases the polarization, improves the conductivity and optimizes the cyclic performance and rate stability compared to the pristine $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$. Besides, $\text{Li}_{1.1}\text{Ni}_{0.5}\text{Mn}_{1.4}\text{Cr}_{0.1}\text{O}_4$ delivers a higher discharge capacity of 108 mAh g^{-1} for the first cycle and 99 mAh g^{-1} after 50 cycles, which is much better than $\text{LiNi}_{0.5}\text{Mn}_{1.4}\text{Cr}_{0.1}\text{O}_4$ and $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$. All these results show the vital role of the synergic effects between Cr^{3+} doping and additional lithium on the enhancement of electrochemical performance for $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$, which will guide the development of $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ -based cathode material in the future.

Keywords: Lithium-ion batteries; Cr-doped; additional lithium; $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ cathode;

[FULL TEXT](#)

© 2016 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).