Electrochemical Evaluation of Co-Al Dual-doped LiMn_2O_4 Spinels Synthesized Via Hydrothermal Method

Chunrui Xu¹, Yunjiao Li^{1,*}, Hu Xu¹, Puliang Li³, Long Kong², Qianye Su¹, Xinlong Cao¹

¹ School of Metallurgical Science and Engineering, Central South University, Changsha 410083, P.R. China

² Department of Chemical Engineering, Graduate School of Science and Engineering, Tokyo Institute of Technology, 12-1, Ookayama-2, Meguro-ku, Tokyo 152-8552, Japan

³ Citic Dameng Mining Industries Limited, Nanning 530028, P.R. China

*E-mail: yunjiao_li@csu.edu.cn.

doi: 10.20964/2017.06.09

Received: 24 December 2016 / Accepted: 17 February 2017 / Published: 12 May 2017

In order to improve the cycling performance of LiMn_2O_4 -based cathode materials, the Co-Al dual-doped $\text{Li}_{1.088}\text{Al}_{0.037}\text{Co}_{0.028}\text{Mn}_{1.847}\text{O}_4$ cathode materials were prepared by hydrothermal method followed by heat treatment. XRD patterns reveal that the dual-doped Al and Co in spinel lithium manganese oxide does not affect the Fd3m space group of the cathode materials. SEM shows that all $\text{Li}_{1.088}\text{Al}_{0.037}\text{Co}_{0.028}\text{Mn}_{1.847}\text{O}_4$ samples exhibit a uniform, nearly cubic structure morphology with narrow size distribution. The effect of the dual-doped Co-Al on the electrochemical performance of $\text{Li}_{1.088}\text{Al}_{0.037}\text{Co}_{0.028}\text{Mn}_{1.847}\text{O}_4$ was investigated by galvanostatic charge-discharge test, cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS). The results demonstrate that the synthesized Co-Al dual-doped LiMn_2O_4 materials gain better cycling stability and rate performance, which retains a capacity retention of 95.9% after 100 cycles at 1 C and deliver a higher capacity of $77.5 \text{ mAh} \cdot \text{g}^{-1}$ at 8 C. This indicates superior cycling and rate performance compared with pristine one and single-phase doping of Al and Co.

Keywords: Lithium ion batteries; Co-Al dual-doping; Hydrothermal method; Spinel lithium manganese oxides

[FULL TEXT](#)

© 2017 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/>).