Interface Control Strategy of Synthesis $\text{LiMn}_2\text{O}_4@\text{Al}_2\text{O}_3$ Assisted by Tert-Butanol

Yuhan Yao¹, Zhiwen Wang¹, Xiaohua Yu¹, Yingjie Zhang^{1,2}, Jianguo Duan², Chengyi Zhu¹,
Zhitong Hu¹, Zhengjun Shen¹, Qiang Wang¹, Zhaolin Zhan¹, Peng Dong^{2,*}, Yannan Zhang^{2,*},

¹ National and Local Joint Engineering Laboratory for Lithium-ion Batteries and Materials Preparation Technology, Key Laboratory of Advanced Battery Materials of Yunnan Province, Faculty of Materials Science and Engineering, Kunming University of Science and Technology, Kunming 650093, China

² National and Local Joint Engineering Laboratory for Lithium-ion Batteries and Materials Preparation Technology, Key Laboratory of Advanced Battery Materials of Yunnan Province, Faculty of Metallurgical and Energy Engineering, Kunming University of Science and Technology, Kunming 650093, China

*E-mail: dongpeng2001@126.com (Peng Dong) zyn_legolas@163.com (Yannan Zhang)

doi: 10.20964/2019.07.01

Received: 19 August 2018 / Accepted: 19 April 2019 / Published: 10 June 2019

$\text{LiMn}_2\text{O}_4@\text{Al}_2\text{O}_3$ cathode materials for lithium ion batteries are prepared through an sol-gel method with the assistance of tert-butanol. A uniform amorphous Al_2O_3 layer is formed on the surface of LiMn_2O_4 under the control of the hydrolysis mechanism of aluminum ion (Al^{3+}) and hydroxyl group (OH). The products are investigated by scanning electron microscopy (SEM), transmission electron microscopy (TEM), power X-ray diffraction (XRD), galvanostatic charge-discharge test system, electrochemical impedance spectroscopy (EIS) and inductively-coupled plasma emission spectrograph (ICP-AES). Structural and surface analysis reveal that the crystal structure and overall morphology of the LiMn_2O_4 electrode are found to be not significant unaffected by Al_2O_3 coating. Notably, the Al_2O_3 -coating assistant by tert-butanol can produce a compact amorphous layer on the LiMn_2O_4 particles, and displays capacity losses of only 92.2% after 100 cycles at 55°C, which is much better than bare sample and the sample synthesized without the assistant of tert-butanol. Furthermore, EIS and ICP analyses show that the Al_2O_3 coating assisted by tert-butanol significantly improves the electro-conductivity and relieves the dissolution of Mn in electrolyte.

Keywords: LiMn_2O_4 ; Al_2O_3 coating; tert-butanol; electrochemical performance; ICP

[FULL TEXT](#)

© 2019 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/>).