Study on Electrochemical Performance of LiMg$_{0.06}$Mn$_{1.94}$O$_4$ Synthesized by Solid-State Combustion Method

Gang Li$^{1,2,3}$, Yue Yu$^{1,2,3}$, Jintao Liu$^{1,2,3}$, Tao Feng$^{1,2,3}$, Miaomiao Shao$^{1,2,3}$, Changwei Su$^{1,2,3}$, Junming Guo$^{1,2,3,*}$

1 Key Laboratory of Comprehensive Utilization of Mineral Resources in Ethnic Regions, Yunnan Minzu University, Kunming 650500, PR China
2 Key Laboratory of Resource Clean Conversion in Ethnic Regions, Education Department of Yunnan, Yunnan Minzu University, Kunming 650500, PR China
3 Joint Research Centre for International Cross-border Ethnic Regions Biomass Clean Utilization in Yunnan, Yunnan Minzu University, Kunming 650500, PR China
*E-mail: guojunming@tsinghua.org.cn

doi: 10.20964/2018.02.19

Received: 18 August 2017 / Accepted: 3 November 2017 / Published: 28 December 2017

Spinel LiMg$_{0.06}$Mn$_{1.94}$O$_4$ cathode materials for lithium-ion batteries were prepared by a solid-state combustion method at 500°C in different time (1, 3, 6 and 9h). The structure and morphologies of LiMg$_{0.06}$Mn$_{1.94}$O$_4$ samples were characterized by scanning X-ray diffraction (XRD) and electron microscopy (SEM), respectively. It turned out that all samples show a single phase LiMn$_2$O$_4$ spinel structure with a good crystallinity. The electrochemical performances of the samples were investigated by charge-discharge cycling test and cyclic voltammetry. By means of charge-discharge cycling test, LiMg$_{0.06}$Mn$_{1.94}$O$_4$ synthesized at burning reaction time 6h had a better electrochemical performance, which presents a capacity retention rate of 81.25% after 500th cycles at 1C (1C=148 mAh/g) with initial discharge capacity of 101.9 mAh/g. Simultaneously, LiMg$_{0.06}$Mn$_{1.94}$O$_4$ prepared at 6h exhibits the lowest apparent activation energy than other samples, which indicated that Li$^+$ with a higher diffusion rate in the lattice, and show a better electrochemical performance.

Keywords: Solid-state combustion synthesis, Mg-doped, Spinel LiMn$_2$O$_4$, Lithium-ion batteries(LIBs), Cathode materials

FULL TEXT

© 2018 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/).