Effect of Carbon Coating on the Properties and Electrochemical Performance of LiFePO₄/C Composites by Vacuum Decomposition Method

Xiaopeng Huang^{1,2,3}, Yuanchao Du^{1,2}, Pengwei Qu^{1,2,3}, Feng Liang^{1,2,3},
Yongnian Dai^{1,2,3} and Yaochun Yao^{1,2,3,*}

¹ Faculty of Metallurgical and Energy Engineering, Kunming University of Science and Technology, Kunming 650093, China

² Engineering Laboratory for Advanced Batteries and Materials of Yunnan Province, Kunming University of Science and Technology, Kunming 650093, China

³ National Engineering Laboratory for Vacuum Metallurgy, Kunming 650093, China

*E-mail: yaochun9796@163.com

doi: 10.20964/2017.08.77

Received: 4 April 2017 / Accepted: 15 June 2017 / Published: 12 July 2017

A modified method of carbon coating by vacuum decomposition was employed to synthesize nano-sized LiFePO₄/C cathode material. Sucrose, polyvinyl alcohol (PVA) and citric acid (CA) were used as different carbon resource and their pyrolysis behavior on the properties of the LiFePO₄/C composite was also investigated. During vacuum decomposition process, the organic carbon suppressed particle growth and decreased particle agglomeration, resulting in homogeneous carbon coated material. Among them, the sucrose coated LiFePO₄/C sample exhibited reduced particle size, regular spherical grains and graphitized carbon coating, indicating an enhancement to electrochemical performance. The sample delivered high specific capacity of 123.9 mAh/g at 5C and good capacity retention of 96.2% after 100 cycles at 1C. A comparison of carbon coating by traditional argon atmosphere and vacuum condition further demonstrated that vacuum decomposition method is conducive to refining particle for better carbon coating, leading to dramatically improved electrode polarization and rate performance of LiFePO₄/C composite.

Keywords: Lithium-ion battery, Lithium iron phosphate, carbon coating, vacuum decomposition method

[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/>).