Graphene enhanced LiFeBO$_3$/C composites as cathodes for Li-ion batteries

Dongyun Zhang$^{1,*}$, Jin Qiao$^1$, Xiaoxiao Dong$^1$ Bingyan Xu$^2$, Runfa Li$^1$, Chengkang Chang$^{1,*}$

$^1$ School of Materials Science and Engineering, Shanghai Institute of Technology, $^2$STATE GRID Shanghai Jinshan Electric Power Supply Company, *E-mail: dyz@sit.edu.cn, ckchang@sit.edu.cn

doi: 10.20964/2018.02.52

Received: 27 October 2017 / Accepted: 14 December 2017 / Published: 28 December 2017

Graphene enhanced LiFeBO$_3$/C composite electrodes are synthesized by a solid-state reaction. The effects of a graphene conductive additive on the LiFeBO$_3$/C electrodes are characterized by XRD, SEM and electrochemical tests. The results show that the electronic conductivities of the LiFeBO$_3$/C electrodes increase with increasing graphene content. The electronic conductivities of the LiFeBO$_3$/C electrodes with Super P (SP) and 5% graphene (5%GN+SP) are 5.16×10$^{-3}$ S/cm and 1.65×10$^{-2}$ S/cm, respectively. The lithium ion diffusion coefficient ($D_{Li^+}$) of the LiFeBO$_3$/C electrode with 3% graphene (3%GN+SP) is the highest at 9.85×10$^{-14}$ cm$^2$ s$^{-1}$, which is much higher than that of the SP electrode (5.94×10$^{-14}$ cm$^2$ s$^{-1}$). The 3%GN+SP electrode has the highest capacity of 189.6 mAh/g at 0.1 C, and its cyclic retention is 95% after 50 cycles at 1 C. The performance enhancement is mainly attributed to the moderate addition of the graphene conductor, which could improve both the electronic conductivity and ionic diffusion coefficient of the LiFeBO$_3$/C.

**Keywords:** Li-ion battery, cathode, LiFeBO$_3$, graphene, conductive additives

© 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/).