Hydrothermal Synthesis of High Specific Capacity Al-doped V_6O_{13} Cathode Material for Lithium-Ion Battery

Zhengguang Zou*, Qi Yuan, Jilin Wang, Yao Gao, Yi Wu, Fei Long, Shichang Han, Zhendong Wan

College of Materials Science and Engineering, Guilin University of Technology, Guilin, China

*E-mail: zouzgglut@163.com

doi: 10.20964/2017.03.27

Received: 2 December 2016 / Accepted: 9 January 2017 / Published: 12 February 2017

Al-doped V_6O_{13} were synthesized via a facile hydrothermal method using vanadium pentoxide, oxalic acid dehydrate, aluminum nitrate nonahydrate and deionized water as the starting materials. XRD, FESEM, EDS and XPS were employed to characterize the phase, morphology, composition and valence of the as-synthesized samples. After doping Al^{3+} , the discharge specific capacity and cycle performance of the samples could be significantly improved. When the mole ratio of Al/V was 0.041, the sample exhibited the best electrochemical performance. The initial discharge specific capacity was $496 \text{ mAh}\cdot\text{g}^{-1}$ and the capacity retention was 45.8% after cycling for 100 times. The enhanced electrochemical performance originated from that the sample was adhered together by stacking region in a regular arrangement and presented larger clearance between layers which could accommodate much more lithium-ion(Li^+) during the charge and discharge processes. Meanwhile, the increased specific capacity was attributed to the enhancement of the electrical conductivity after Al^{3+} doping.

Keywords: lithium-ion battery; V_6O_{13} ; Al-doped; electrochemical performance

[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/>).