

Short Communication

## A Flower-Shape NiO/Co<sub>3</sub>O<sub>4</sub> Composite as Anode for Lithium Ion Battery Prepared by a Template-Free Hydrothermal Method

Qian Liu<sup>1,2</sup>, Guoxu Zheng<sup>2,1,\*</sup>, Jinghua Yin<sup>1</sup>, Mingxin Song<sup>4</sup>, Yang Wang<sup>3</sup>, Shiyi Tian<sup>3</sup>,  
Fengquan Zhang<sup>5</sup>

<sup>1</sup> School of Materials Science and Engineering, Harbin University of Science and Technology, Harbin 150080, P. R. China

<sup>2</sup> School of Soft and Microelectronic, Harbin University of Science and Technology, Harbin 150080, PR China

<sup>3</sup> School of Science, Harbin University of Science and Technology, Harbin 150080, PR China

<sup>4</sup> College of Applied Science and Technology, Hainan University, Haikou 570228, PR China

<sup>5</sup> No. 13 Middle School of Harbin, Harbin 150000, PR China

\*E-mail: [shandian2008.ok@163.com](mailto:shandian2008.ok@163.com)

doi: 10.20964/2020.11.34

Received: 1 June 2020 / Accepted: 28 August 2020 / Published: 30 September 2020

To improve the performance of lithium ion batteries and super capacitors, various metal organic frameworks (MOFs) and their derivations have been used as electrode materials because of their large surface area and excellent structural characteristics. Among MOFs derivations, transition metal oxides (TMOs) have attracted increasing attention due to their high theoretical capacitance and excellent chemical stability. Mixed TMOs, which contains multiple metal cations, can significantly enhance the storage capacity of lithium ion and improve the conductivity and electrochemical reactivity. In this study, a NiO/Co<sub>3</sub>O<sub>4</sub> composite material was prepared using a template-free hydrothermal method for lithium ion battery. The material's phase structure and morphology were characterized using X-ray diffraction and scanning electron microscopy. The results revealed that the composite material had a special flower-like morphology and was composed purely of rhombus NiO and cubic Co<sub>3</sub>O<sub>4</sub>. The electrochemical performance of the NiO/Co<sub>3</sub>O<sub>4</sub> composite material was tested when it was used as the anode material of a lithium ion battery. The electrochemical properties of the NiO/Co<sub>3</sub>O<sub>4</sub> composite material were excellent. The material's discharge capacity during the first cycle was 2700 mAh·g<sup>-1</sup> under a current of 100 mA·g<sup>-1</sup>; a specific capacity of 400 mA h·g<sup>-1</sup> was retained after 200 cycles; and the columbic efficiency could reach 99%.

**Keywords:** metal organic framework; lithium ion batteries; electrode material; NiO; Co<sub>3</sub>O<sub>4</sub>

[FULL TEXT](#)

© 2020 The Authors. Published by ESG ([www.electrochemsci.org](http://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/>).