Sandwich-structured Fe₃O₄/Graphene Hybrid Film for High-Performance Lithium-Ion Batteries

Hua Fang^{1,*}, Fanteng Meng¹, Gaoyun Chen², Lixia Wang¹, Shichao Zhang^{3,*}, Ji Yan¹, Linsen Zhang, Yongxia Zhang¹

¹ School of Material and Chemical Engineering, Henan Provincial Key Laboratory of Surface Interface Science, Zhengzhou University of Light Industry, Zhengzhou 450002, PR China

² Institute of Chemical Defense, Beijing, 102205, China

³ School of Materials Science and Engineering, Beihang University, Beijing, 100191, PR China

*E-mail: fh@zzuli.edu.cn, csc@buaa.edu.cn

doi: 10.20964/2019.08.76

Received: 20 March 2019 / Accepted: 10 June 2019 / Published: 30 June 2019

Sandwich-structured Fe₃O₄/graphene hybrid film (FGHF) was prepared by electrostatic self-assembly and vacuum filtration. In the constructed architecture, the graphene sheets stacked densely in a nearly face-to-face fashion, while the Fe₃O₄ nanoparticles are homogeneously loaded on graphene nanosheets in a layer-by-layer manner. In this structure, the graphene sheets are supposed to provide high electronic conductivity, accommodate the volume fluctuation of Fe₃O₄, and improve flexibility of the electrode. Moreover, the FGHF exhibited a high surface area and hierarchical pore distribution, which are considered to be beneficial for fast ion transportation, short solid-state diffusion lengths and buffering volume expansion. As expected, the FGHF exhibited high lithium storage capacity (947 mAh g⁻¹ at 1 A g⁻¹), excellent rate capability (901, 806, 711 and 598 mAh g⁻¹ at 2, 5, 10 and 20 A g⁻¹, respectively) and stable cycle performance (798 mAh g⁻¹ after 300 charge-discharge cycles at 1 A g⁻¹).

Keywords: Fe₃O₄, Graphene, Nanocomposites, Lithium-ion batteries, Sandwich structure

[FULL TEXT](#)

© 2019 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/>).