Graphene quantum dots as a novel conductive additive to improve the capacitive performance for supercapacitors

Yongfang Niu, Jing Wang, Jin Zhang, Zhiqiang Shi

PII: S1572-6657(18)30584-8
DOI: doi:10.1016/j.jelechem.2018.09.003
Reference: JEAC 12586

To appear in: *Journal of Electroanalytical Chemistry*

Received date: 1 April 2018
Revised date: 13 August 2018
Accepted date: 3 September 2018

Please cite this article as: Yongfang Niu, Jing Wang, Jin Zhang, Zhiqiang Shi , Graphene quantum dots as a novel conductive additive to improve the capacitive performance for supercapacitors. Jeac (2018), doi:10.1016/j.jelechem.2018.09.003

Graphene quantum dots as a novel conductive additive to improve the capacitive performance for supercapacitors

Yongfang Niu, Jing Wang, Jin Zhang, Zhiqiang Shi *

Tianjin Key Laboratory of Advanced Fibers and Energy Storage, College of Materials Science and Engineering, Tianjin Polytechnic University, Tianjin 300387, P. R. China

Abstract

Graphene quantum dots (GQDs) as a novel conductive agent with nanometer-scale instead of the common carbon black (CB) offer a promising rount to construct an effective conductive network for the improvement of the supercapacitors' capacitive performance. Interestingly, the electrochemical performance of activated carbon (AC)-based composite electrodes with different amounts of GQDs in two composite ways was tested, which showed the extremely apparent correlation between the electrode structure and the capacitive characteristics. It was found that the specific capacitance (C_m) and rate performance were enhanced when GQDs at an appropriate weight ratio (1 wt%) in the electrode material, compared with 10 wt% CB, and the corresponding C_m values are 110 and 100 F g^{-1} at a current density of 0.1 A g^{-1} and 85 and 65 F g^{-1} at 1 A g^{-1}, respectively. Furthermore, composite electrodes by heating treatment displayed the better electronic conductivity and cycling stability, which was caused by removing oxygen functional groups, at the expense of decline for the ionic conductivity and rate performance. This work demonstrates an effective method to

* Corresponding author. Tel.: +86 22 83955816; fax: +86 22 83955055.

E-mail address: shizhiqiang@tjpu.edu.cn (Z. Shi)