

Accepted Manuscript

Engineering reduced graphene oxides with enhanced electrochemical properties through multiple-step reductions

Min Wei, Liang Qiao, Hanguang Zhang, Stavros Karakalos, Kuo Ma, Zheng Fu, Mark T. Swihart, Gang Wu



PII: S0013-4686(17)32482-9

DOI: [10.1016/j.electacta.2017.11.120](https://doi.org/10.1016/j.electacta.2017.11.120)

Reference: EA 30710

To appear in: *Electrochimica Acta*

Received Date: 15 August 2017

Revised Date: 15 November 2017

Accepted Date: 16 November 2017

Please cite this article as: M. Wei, L. Qiao, H. Zhang, S. Karakalos, K. Ma, Z. Fu, M.T. Swihart, G. Wu, Engineering reduced graphene oxides with enhanced electrochemical properties through multiple-step reductions, *Electrochimica Acta* (2017), doi: 10.1016/j.electacta.2017.11.120.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

**Engineering Reduced Graphene Oxides with Enhanced Electrochemical Properties
through Multiple-Step Reductions**

Min Wei^a, Liang Qiao^a, Hanguang Zhang^a, Stavros Karakalos^b, Kuo Ma^a, Zheng Fu^a,
Mark T. Swihart^{a,*}, and Gang Wu^{a,*}

^aDepartment of Chemical and Biological Engineering, University at Buffalo (SUNY), Buffalo,
New York 14260, United States

^bDepartment of Chemical Engineering, University of South Carolina, Columbia, South Carolina
29208, United States

Corresponding authors: swihart@buffalo.edu (M.T. Swihart); gangwu@buffalo.edu (G. Wu)

Abstract: Currently, the most common approach to preparing graphene is based on oxidation of graphite to graphene oxide (GO), followed by the reduction of GO to reduced graphene oxide (rGO). Currently, most reduction methods only focus on one-step reduction by either thermal annealing or chemical reduction. This is no conclusive understanding which reduction method is superior to the other. Here, using the same GO precursors, we systematically studied various reduction methods to achieve optimal electrochemical properties. We found that, to improve electrochemical properties of rGO, multiple step reduction of GO was more effective when compared to individual methods including thermal annealing, microwave treatment, hydrazine reduction, and borohydride reduction. To evaluate electrochemical performance, rGOs were studied by using cyclic voltammetry to evaluate their electrochemical accessible surface areas and double layer capacitance. Their steady-state oxygen reduction reaction (ORR) activities were

Download English Version:

<https://daneshyari.com/en/article/6605221>

Download Persian Version:

<https://daneshyari.com/article/6605221>

[Daneshyari.com](https://daneshyari.com)