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Two-step synthesis ……. performance

Md. *[,a,b,c] and Rudolf e[d]

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Reduced graphene oxide (RGO) nanoflakes were synthesized by a two-step method in which the first step involved oxidation of graphite to produce graphene oxide (GO); the second step was carbonization process for reduction of the graphene oxide to yield the RGO nanoflakes. The reaction ……. electrochemical performance of this supercapacitor was studied. The specific capacitances of the RGO were found to be 157.29, 108.69, 104.18, 101.23, 93.78, 71.29, 55.78, 41.68 and 25.87 F/g at ….. shows that RGO was stable after completion of the initial 20 cycles.

Keywords: Reduced graphene oxide, nanoflakes, two-step method, supercapacitor

Introduction

Graphene is considered to be “gold rush” as it has firmly been proved been applied to various electrochemical energy storage systems such as supercapacitors and batteries.[3–5] Graphene has tremendous electric conductivity and high surface area, therefore, graphene and graphene-based nanomaterials have frequently been chosen to develop
has been
developed to obtain graphene showing various limitations. For instance, graphene could be synthesized by mechanical exfoliation of

In this article, a two-step synthesis process for graphene nanoflakes, followed by an oxidation process and then a of a supercapacitor, subsequently electrochemical performance of the supercapacitor was also studied.

Experimental

Chemicals and reagents

All chemicals were of ACS reagent grades. Graphite powder, from Sigma-Aldrich. In all experiments, ultrapure water (UPW) (ELGA Pure Lab) was used.

Instruments and operations

The surface texture X-ray (EDX) (JEOL 7001F, Japan) accessories. In order to deeply study the texture and crystallinity of the graphene, Transmission Electron Microscopy (TEM) was performed on an ultra-high resolution TEM, (HITACHI HT7700A).

A drastic oxidation environment existed when the temperature was elevated to 95 °C. This drastic condition could facilitate not only chemical modification of the graphite to

Synthesis of graphene nanoflakes

Graphene nanoflakes were synthesized by a two-step process prior to an oxidation process followed by Firstly, 3 g of sodium nitrate was dissolved in 15 mL of concentrated sulfuric acid which was previously chilled at 0–5 °C, the powder was taken into a 500 mL round bottom (RB) flask temperature, the mixture to keep at 500 °C for 3 hours. Finally, the temperature gradually dropped to room temperature to get the RGO. Eventually, the RGO was carefully collected and stored.

Electrochemical testing

Electrode preparation

The dropped on the flat surface of the working electrode. On the) was calculated to determine the specific capacitance.

Electrochemical cell construction

A Swagelok T-junction (13 mm diameter) made from cell conductivity. electrode-SCE; Radiometer Analytical) was dipped in the electrolyte through the tube.

Electrochemical protocol

All electrochemical experiments were carried out using an Iviumstat f the supercapacitor was calculated using Eq. (1)..

Results and discussion

Synthesis and characterization of graphene nanoflakes

within first ten cycles due to electrode activation. In the next ten cycles, the capacitance gradually falls. From 20 to 150 cycles, the graph is linear suggesting a stable capacitance performance of the RGO.

[a]*Discipline of Chemistry, The University of SW 2308, Australia.*
, Technische Universität Chemnitz, 09111 Chemnitz, Germany.
*Corresponding Author: im @duet.com

Conclusions

A two-step methodology for yielding reduced graphene oxide for applying them into other electrochemical energy storage systems.

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