https://chemistry-europe.onlinelibrary.wiley.com/doi/10.1002/cssc.201601553

Synthesis and Characterisation of Reduced Graphene Oxide/Bismuth Composite for Electrodes in Electrochemical Energy Storage Devices

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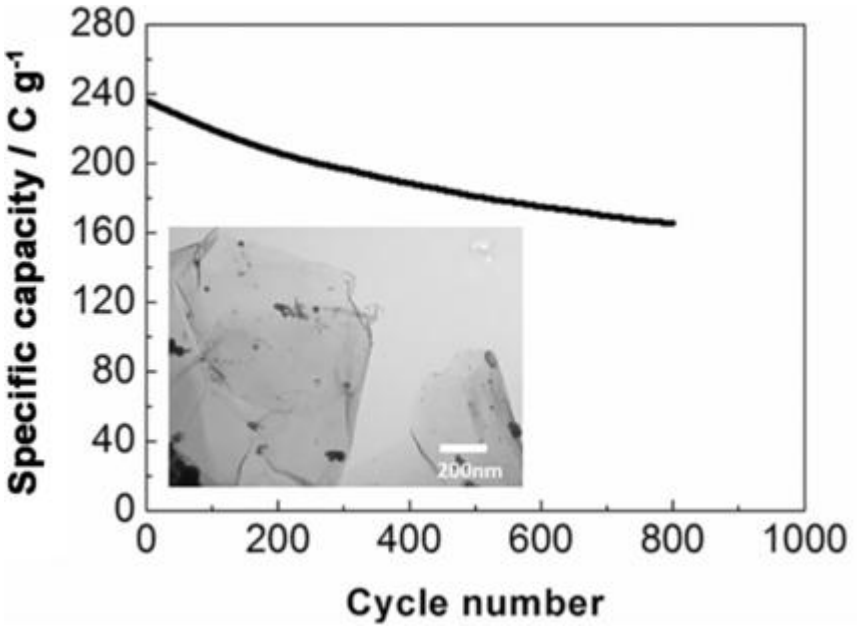
First published: 18 January 2017

https://doi.org/10.1002/cssc.201601553

Citations: 23

Abstract

Supercapattery composite! A reduced graphene oxide/bismuth (rGO/Bi) composite is synthesized for the first time using a low temperature (60 °C) polyol process with a short reaction time (3 hours). The rGO/Bi material has high specific capacity. The composite also exhibits moderate stability in cycling tests even at current densities as high as 5 A g^{-1}.



Abstract

A reduced graphene oxide/bismuth (rGO/Bi) composite was synthesized for the first time using a polyol process at a low reaction temperature and with a short reaction time (60 °C and 3 hours, respectively). The as-prepared sample is structured with 20–50 nm diameter bismuth particles distributed on the rGO sheets. The rGO/Bi composite displays a combination of capacitive and battery-like charge storage, achieving a specific capacity value of 773 C g^{-1} at a current density of 0.2 A g^{-1} when charged to 1 V. The material not only has good power density but also shows moderate stability in cycling tests with current densities as high as 5 A g^{-1}. The relatively high abundance and low price of bismuth make this rGO/Bi material a promising candidate for use in electrode materials in future energy storage devices.

key words
bismuth, composite materials, energy storage, nanotechnology, reduced graphene oxide