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A novel facile synthesis and electromagnetic wave shielding effectiveness at microwave frequency of graphene oxide paper

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MICROSYSTEM TECHNOLOGIES-MICRO-AND NANOSYSTEMS-INFORMATION STORAGE AND PROCESSING SYSTEMS

Volume: 21 Issue: 10 Pages: 2155-2163

DOI: 10.1007/s00542-014-2311-8

Published: OCT 2015

[View Journal Impact](#)

Abstract

Nano-structured graphene oxide (GO) freestanding paper was synthesized by an arc recharge technique in flowing of oxygen for the first time. This technique offers new ways on how e.g. layers structure nanomaterials could be produced. The morphology and structural properties of the as-synthesized GO were examined by means of X-ray diffraction, Fourier transform infrared spectra, scanning electron microscopy, energy dispersive x-ray spectroscopy, transmission electron microscopy, high resolution transmission electron microscopy and selective area electron diffraction techniques. The structural and morphological characterizations revealed that the synthesized GO were well-defined nanosheets with a thickness of 6 nm. The optical band gap was calculated from the absorption spectrum, and was found to be 3.32 eV. Furthermore, we aim to use GO paper to develop new electromagnetic interference shielding sheets that have a high shielding effectiveness (SE) (over 30 dB) at frequencies in the 1-12 GHz range. The complex permittivity and total shielding effectiveness of as synthesized GO freestanding paper are measured at frequencies from 1 to 12 GHz. Finally, to enhance the performances of the electromagnetic shields effectiveness, five-layered GO sheets were made. Furthermore, the highest SE for the light-weight freestanding GO paper was 50 dB at 1 GHz, indicating commercial use for many industrial or military shielding applications as an attractive candidate for the new type of microwave shielding.

Keywords

KeyWords Plus: COMPOSITES

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Funding

Funding Agency	Grant Number

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