Notification No: 539/2023

Date of Award: 05-06-2023

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Topic of Research: Fabrication and Characterization of Graphene Oxide and its Application

Findings

The discovery of graphene in 2004 sparked interest in graphene oxide, another 2D carbon material with distinct properties. It has substantial electrical conductivity and good physical, optical, and other properties that can be easily modified by varying the degree of oxidation. Huang et al. (2012) and Lundie et al. (2014) observed uncertainty in the oxygen-to-carbon ratio of fully oxidised GO. Huang et al. (2012) suggested that for fully oxidised GO, the bandgap is 3.04 eV, whereas Lundie et al. (2014) suggested the highest achievable value is 6.05 eV, but in our study, it was found to be 3.69 eV, showing the GO bandgap value can be higher than the 3.04 eV value. One of the experiments found that voltage application is the most effective of the three GO reduction methods investigated in the present study. The band gaps of graphene oxide and reduced graphene oxides that were obtained by different reduction techniques are GO 3.34 eV, rGO (electrically) 2.54 eV, rGO (heating) 2.96 eV, and rGO (Hydrazine) 2.56 eV. The band gap increases when the carbon to oxygen (C/O) ratio decreases, and it achieves its maximum C/O ratio of 4 when GO is reduced via the voltage application method. One of the investigations' findings was the occurrence of transitional ordering in the sheet resistance of thermally reduced graphene oxide (trGO). A transitional ordering of sheet resistance was found as the thickness of rGO films approached the sub-micron value from the nanometer thickness range. In one study, the Cu electrode was immersed in GO solution with a bias of 10 V for 2 hours. Thin graphene oxide (GO) and reduced graphene oxide (rGO) sheets were spin-coated in a square shape on a substrate secured with masking tape. Tauc's plot shows that the bandgap of GO is 3.84 eV, while that of rGO is 2.87 eV. Sheet resistance for GO was determined to be 2 MΩ/sq. and 1.5 KΩ/sq. for rGO. The figure of merit for a transparent rGO electrode determined by Haacke's formula was

$3.75 \times 10^{-5}\ \Omega^{-1}$. The final work findings discuss lead iodide (PbI_2) nanorod nanocomposites with graphene oxide (GO). Microwaves were used to successfully synthesise the nanocomposite at low temperatures. The effect of GO addition on the photodetector performance of PbI_2 was investigated by measuring the I-V characteristics under 532 nm laser light illumination. The photodetector performance of pure PbI_2 is stable and reversible, whereas the GO-PbI_2 composite exhibits improved performance characteristics for the pre-existing PbI_2 properties.