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Synthesis of Reduced Graphene Oxide from Biomass Sugarcane Dry Leaves by Two-Stage Pyrolysis

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Abstract

Reduced graphene oxides (rGO) are being applied liberally in electronics, energy storage, sensors, medicine, membrane, catalysis and in water purification due to their unique physical and chemical properties. Hitherto, chemical routes based on oxidative-exfoliation have been employed years for the synthesis of rGO from graphite as raw material, but the precursors involved are sparingly available resulting into high cost. In addition, processing of such synthetic graphite is carried out in high temperatures (≥ 2500°C). Due to the above limitations, the present focuses on using biomass, dry leaves of sugarcane (*Saccharum officinarum*) as an alternative start-up raw material. This new approach is observed to be economical and environmentally benign. In this study, the dry leaves are subjected to two-step pyrolysis without any catalyst or reducing agent in far divergent temperatures and in reaction parameters. The surface composition, structure, morphology, physical properties and elemental composition are studied in as prepared and acid treated rGOs by UV-Vis., FTIR, XRD, SEM, TEM, EDS and Raman spectroscopy. They have many oxygen-containing functional groups (–OH, C–O–C, C=O, and O=C–OH). The morphological studies showed that the prepared GO has nanosheets with few wrinkled textures on the surface. The carbon and oxygen ratio of the acid treated rGO (3.89) is higher than that of the as prepared rGO (3.76). The prepared rGOs have multilayered graphitic structure due to the unique ratio of G and D bands. The ratios are 1.34 in acid treated and 1.24 in as prepared rGO.

References:

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