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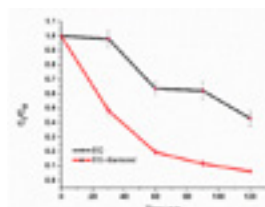
**DIAMOND AND CARBON MATERIALS & GRAPHENE AND SEMICONDUCTORS**

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**The application of diamond, graphene and exfoliated graphite in electrochemical sensing and electrochemical degradation of organic pollutants in water****Omotayo A Arotiba, MG Peleyeju, AO Idris, EH Umukoro, L Tshwenya and N Mabuba**

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This work presents an overview of our research on the use of carbon-diamond, graphene and exfoliated graphite in the development of electrochemical sensors and photo-anodic electrodes for the electrochemical degradation of organic water pollutants. In electrochemical sensing, a novel ternary composite electrode from diamond, graphene and polyaniline was prepared, characterised and applied for the electrochemical determination of 2,4-dichlorophenol (2,4-DCP) in aqueous media. The composite, obtained via the oxidative polymerisation of aniline in the presence of graphene and diamond, was characterised by FTIR spectroscopy, Raman spectroscopy, etc. and used to modify a glassy carbon electrode. The electrochemical properties of the bare and modified electrodes were investigated using cyclic voltammetry, square wave voltammetry (SWV) and impedance. The determination of 2,4-DCP in 0.1 M HNO<sub>3</sub> was carried out using SWV and a detection limit of 0.25 μM was calculated. The electrode exhibited antifouling capabilities during the electro-oxidation of 2,4-DCP. For electrochemical degradation, composites' electrode consisting of exfoliated graphite (EG) and diamond were prepared and used for the electrochemical degradation of organics in water. The extent of degradation of the organics was monitored with UV/VIS spectroscopy and total organic carbon. Results showed that the incorporation of diamond into EG yielded a more robust electrode in terms of current density and also enhanced the rate of degradation of the organics. This approach is promising for the development of alternative or complementary methods for water treatment.

**Biography**

Omotayo A Arotiba is an Electrochemist with expertise in the applications of nanomaterials such as carbons, dendrimers, metal/metal oxides for the development of (bio)sensors and photo-electrochemical systems for biomedical, environmental (water) related problems. He is currently involved in the development of electrochemical water treatment technologies as well as sensors for toxic metals, toxins and many substances of biomedical importance. He received his BSc (Hons) and MSc in Industrial Chemistry from the University of Ilorin and the University of Benin both in Nigeria. He obtained his PhD from the Department of Chemistry, University of the Western Cape, South Africa. He joined the Department of Applied Chemistry, University of Johannesburg, where he is currently a Professor. He is a member of the International Society of Electrochemistry, Royal Society of Chemistry and South African Chemical Institute.

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