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STRUCTURAL PROPERTIES OF HYDROXYAPATITE AND REDUCED GRAPHENE OXIDE COMPOSITES TO ENHANCE ELECTROCHEMICAL BIOSENSOR PERFORMANCE

The hydroxyapatite/reduced graphene oxide (HA/rGO) composite has great versatility in applications because it exhibits a synergistic effect of its properties due to the unique characteristics of its components, such as biocompatibility, chemical and thermal stability, high surface area, excellent mechanical properties, and electrical conduction. Nowadays, there are several synthesis methodologies for this material. However, in this work, we synthesized HA/rGO composite through the microwave hydrothermal method because it combines the benefits of the hydrothermal and microwave methods, allowing us to reach ideal temperature and pressure conditions, thus reducing the synthesis time. The synthesized material was subjected to prior characterization by X-ray diffraction, Raman spectroscopy, FTIR, Scanning Transmission X-ray microspectroscopy (STXM), and SEM to elucidate the structural and morphological properties. Rietveld refinement was performed from XRD data, a Rwp value of 8.33 was obtained, and the presence of hexagonal crystalline phase of HA in HA/rGO composite was confirmed. No diffraction peak of rGO was observed in the XRD pattern because the characteristic rGO (002) peak is much weaker and broader than HA (002) peak owing to the amorphous nature of rGO. Thus, the rGO peak is covered by the highly intensified HA (002) peak with high crystallinity. Raman spectroscopy confirmed the formation of HA/rGO composite; Raman spectra show bands attributed to characteristic Raman active modes of each composite precursor. NEXAFS spectra of composite exhibit peaks associated with electronic transitions from C 1s level to $\sigma and\ \pi$ high energy levels of rGO, and transitions corresponding to Ca and O L-edge and P K-edge of HA. From SEM analysis, it is concluded that HA possesses nanorod morphology and is well distributed along the surface and edges of the graphitic layer of rGO.

Keywords

Composite, hydroxyapatite, reduced graphene oxide, electrochemical biosensing.

Reference

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