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WELCOME

The aim of the conference is to overview and share information about the latest achievements in bioceramic nanotechnologies with the scientific community. Over the duration of the conference, scientists from the fields of chemistry, physics, technology, medicine and implantology will be able to acquaint themselves with synthesis methods, unique properties, and applications of bioceramic nanomaterials.

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Synthesis and Structural Characterization of Graphene Oxide and Thermally Reduced Graphene Oxide

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ABSTRACT

Graphene is a two-dimensional (2D) material with sp^2 hybridized carbon atoms configured in a honeycomb-like structure. Unique thermal, electrical, optical, physical and mechanical properties make it highly promising material for biomedical applications such as bioimaging, drug delivery, neural regeneration, and bone tissue engineering. Graphene and its derivatives such as graphene oxide (GO) and reduced GO can be used as reinforcement fillers for improving the mechanical and electrical characteristics of bioceramics. [1, 2] Today thermal reduction of GO is one of the potential synthesis methods to obtain graphene in a simple, low-cost, high yield and time-saving way. However, high volume of CO_2, CO and H_2O is released due to the deoxygenation of functional groups in GO lattice. The vigorous process of deoxygenation generates topological defects and C vacancies in the final product and causes poor electrical conductivity of graphene prepared this way. [2] To overcome these drawbacks, efficiency recovery of conjugated π-electron system could be achieved by using a suitable source of elemental carbon. According to the literature, the reaction between malonic acid (MA) and phosphorus pentoxide gives carbon suboxide (C_3O_2) that decomposes into carbon atoms at low temperatures. [3] By addition of these compounds in the reduction of GO lower defects concentration and better structural properties of thermal reduced graphene oxide can be achieved.

In this work, we present a new approach of thermal reduction of GO in the presence of additives. Two GO samples were synthesized using different oxidizing agents. Each purified and dried graphene oxide was mixed with MA, and P_2O_5 and thermally reduced under Ar gas atmosphere for 30 min at 100 ºC and 800 ºC temperatures. Structural changes caused by thermal exfoliation were determined by X-ray diffraction, Fourier transform infrared and Raman scattering spectroscopies. The morphology of the obtained products was evaluated using scanning and transmission electron microscopy methods. The surface area and pore volume of prepared samples were quantified using the Brunauer–Emmett– Teller method. Furthermore, measurements of electrical conductivity have also been carried out.

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