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ABSTRACT VOLUME

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PREPATATION OF GRAPHENE OXIDE FROM COAL

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1. Introduction

Nanomaterial synthesis from low-cost precursors is a highly desirable approach for bulk application in material science and technology [1]. Among the various nanomaterials, graphene is a single layer two-dimensional honeycomb carbon nanomaterial. Graphene /or graphene oxide is widely utilized in material science, bio-medicine technology as a sensor, cellular imaging, and many more due to its surface area, nanoscale size, and electrical charge properties, etc. Coal is the most abundant combustible energy source. Although, coal possesses a very complex structure, however, it consists significant amount of polyaromatic structure. Due to the presence of an inherent polyaromatic structure, coal becomes a promising candidate to replace graphite as a precursor material for the production of graphene / or graphene oxide [2]. Herein, a facile cost-effective approach is reported to synthesize graphene oxide from low-grade coal.

2. Material and Methods

2.1 Materials

Coal, sulphuric acid, nitric acid, sodium nitrite, aqueous ammonia, distilled water etc.

2.2 Methods

2.2.1 Preparation of Graphene Oxide

Graphene oxide (GO) was prepared by treating the coal in concentrated sulphuric acid followed by oxidation with $NaNO_2$. In brief, 2.5 gm of coal and 2 gm of $NaNO_2$ were placed in a flask. After that 120 ml of H_2SO_4 was added to it, followed by stirring for around 18 h at room temperature. After that the mixture was stirred for another 6 hour at 80^0C. When the temperature of the mixture was reduced to room temperature, dilution of the solution was done by 1 M HNO_3. After addition of the HNO_3, sedimentation of GO was observed by centrifugation at 10000 rpm for 15 minute. Furthermore, to remove the inorganic impurities and other ions of oxidants, the sediment was dispersed in water and again centrifuged at 10000 rpm for 15 minutes. This process is repeated for 5 times. A solution of GO was obtained after neutralizing the sedimentation in aqueous ammonia to pH 7.

2.2.2 Sample preparation for Raman Spectroscopy and X-ray Diffraction

For the characterization of the GO, the water- dissolved GO was taken and dried in a beaker at around 110^0C in the form of powder. Raman spectroscopy was done by WITEc alpha