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Epoxy/Graphene Composite for Industrial Applications

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Abstract

As of now, there is a prominent, global trend to reveal an efficient plus large-scale production method to produce Graphene as of its extraordinary electrical, mechanical and chemical properties of two-dimensional Graphene nanostructure. The main aim of the initial part of the study is to develop an innovative, cost-effective and eco-friendly Graphene production. Liquid phase exfoliation of Graphite via bath sonication in an ethanol/Deionized (DI) water mixture was employed to synthesise the Graphene. Obtained Graphene samples were subjected to miscellaneous analysing techniques to characterize the output. X-Ray Diffraction (XRD) data confirmed that the synthesized sample was graphene. Moreover, the product was within the nano-scale range. The mean crystalline size of the Graphene was determined by the Scherrer's formula and the calculated value was 80.0 nm. Functional group investigation of the prepared sample was done by Fourier-Transform Infrared Spectroscopy (FTIR) analysis which confirmed that the sample underwent neither oxidation reactions during the preparation process. The degree of defect density of the acquired sample was measured by the Raman analysis. Morphological changes of the graphene were detected through the microscopic surface analysis based on the Scanning Electron Microscope (SEM) images. Though the neat Epoxy resin is widely used in divergent industries, it has several undesirable properties which limit most vital applications. Synthesized Graphene can act as a utilitarian nanofiller to drastically reduce the unfavourable characteristics of the resin and enhance the existing properties of the Epoxy. Therefore, the second section of the research demonstrates a facile, novel and low-cost industrial-scale preparation of Epoxy nanocomposite with the incorporation of synthesized Graphene. Nanocomposite was developed through a vigorous mechanical stirring process and industrial applicability of the composite was estimated based on the electrical conductivity variation and melting point variation of the Epoxy/Graphene composite.

Keywords: *Graphene nanostructure, Liquid phase exfoliation, Defect Density, Nanofiller, Nanocomposite*