DISPERSION BEHAVIOR OF GRAPHENE OXIDE IN ORGANIC SOLVENTS

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ABSTRACT

Graphene has attracted the scientific interest in recent years due to its unique physical and chemical properties. The two-dimensional graphene is a new material with many emerging applications, and studying its chemical and physical properties is an important goal. Graphene oxide dispersion in organic solvent is highly desirable because it may significantly facilitatae the practical use of the material. Covalent functionalization is one of the ways to achieve single layer of dispersion, however the presence of stabilizer made it less desirable. To expand GO processibility and future practical use, the behaviour of GO in different organic solvent were investigated. In this study, graphene oxide was prepared by modified Hummer's method and the surface morphology of GO is examined using FESEM. The prepared GO powder was dispersed in three different solvents, namely, Water, N,N-dimethylformamide (DMF), and Dimethyl sulfoxide (DMSO). Ultrasonic bath was used to prepare the dispersion of GO in solvents and the effect of different sonication time on the dispersion behavior of GO was observed. UV-Vis was used to measure the absorbance of GO in the solvents. Homogeneous dispersion was found in solvent with longer sonication time, however, only DMF and Water showed stable dispersion after 1 week which indicated that DMF and Water can be used for dispersion formation and further processing of graphene.

TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

1.1 Research Background

Graphene (G) is a two-dimensional (2D) carbon nanomaterial which is made up of a single layer of carbon atoms that are chemically bonded in a crystalline hexagonal arrangement (Bykkam & Rao, 2013; Rattana et al., 2012; Y. Zhang, Wu, Guo, & Zhang, 2013a). Graphene has high mechanical strength (>1060 Gpa), high thermal conductivity (~3000 W/m K), high electron mobility (15000 cm^2/V s) and high specific surface area (2600 m^2/g) (D. H. Kim, Yun, & Jin, 2012). Due to its outstanding properties, graphene are able to attract an exceptional amount of interest for potential applications such as super capacitors, biosensors, photovoltaic, and touch panels (Konios, Stylianakis, Stratakis, & Kymakis, 2014).

However, graphene also suffers from some important drawbacks. It is a poor electric conductor due to the presence of oxides. Even though the oxides can be removed by reduction, the major problem is that reduction process are not able to remove the many structural defects introduced by the oxidation process. These will disrupt the band structure and completely degrade the electronic properties that make graphene unique (Paredes, Martı, & Tasco, 2008). The preparation and processing process of graphene sheets has been a challenge because of its hydrophobic properties and is prone to form aggregation which restrains graphene from exhibiting outstanding properties (Ahmad et al., 2013).