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LITERATURE REVIEW ON PREPARATION OF GRAPHINE

Simhadri. Chakradhar[1] G.Rahul[2] and SantoshMadevaNaik[2]

[1]UG Scholar, [2]Assistant Professor,

Department of Mechanical Engineering,

HITAM, Hyderabad, India.

ABSTRACT

Graphene is the world thinnest, stronger then diamond, much lighter, flexible and stiffest material which exhibits a number of outstanding electrical, excellent conductors of heat and mechanical properties that makes them very attractive for micro and nanotechnology application. The thinnest layer of graphite is called Graphene, when oxidising agents reacting with graphite the inter planar spacing between the layers of graphite is increased. The complete oxidised compound Ca then dispersed in the Base solution then Graphene is formed. Graphene is intrinsically gap less; it is lighter, thinner, transparent and stronger then diamond. It is 5%higher the denser of the steel, 10times stronger then steel.

Keywords: *Graphene, Graphite, Graphene oxide, Graphite oxide, Hummers method.*

1. INTRODUCTION

Nano science deals with the synthesis, exploration and exploitation of nano materials .graphene is one of the allotropes of carbon atom which is commonly available atom on earth. A Graphene is the single unit layer of the graphite which is regularly utilized as a part of pencils drove and it is the world most slender, most grounded and stiffest material, and it is having the powerless meander dividers constrains and having high covalent holding which gives high solidness and adaptability and it is having high conductivity of heat. Graphene oxide is broadly utilized due to its simple accessibility, minimal effort and can change over it in to grephene with required properties.

Graphene oxide is created from the graphite which is subjected to oxidization by blending the carbon layers with oxygen particles and afterward decreased. To isolate the graphene layers here the oxidizing operators responds with graphite so that the interplanar dispersing between the layers of the carbon iotas of graphite increments by overcoming the Vander waalstrengths.There are two methods which were developed for the production of graphene oxide they are

1) Hummers method of synthesis
2) Modified hummers synthesis method

Hummers' method was developed in 1958 as a safer and faster method of producing graphite oxide. Before this method was developed the production of Graphite oxide is dangerous due to the addition of the NITRIC ACID and SULFURIC ACID, which are toxic in nature and harmful to both environment and living organisms. In Hummers method one gram of graphite oxide is produced for ten grams of potassium chloride.

2. METHODOLOGY

However an option strategy created by Willam s .Hummers and Richard E.offman subsequent to seeing the hazardous impacts they postured .There approach was comparative in adding the graphite to concentrated corrosive arrangement .how ever this procedure should be possible blow 98 °C and staying away from the majority of the dangerous ricks which are caused in this planning. The methodology begins with 100 g graphite and 50 g of sodium nitrate in sulfuric corrosive at 66 °C which is then cooled to 0 °C. 300 g of potassium permanganate is then added to the arrangement and blended. Water is then included augmentations until the point that the arrangement is roughly 32 liters. The last arrangement contains around 0.5% of solids to then be cleaned of polluting influences and got dried out with phosphorus confined oxide.

2.1 Modified Hummer's method of synthesis

This method involves both oxidation and exfoliation of graphite sheets due to thermal treatment of solution. Initially Graphite flakes (2 g) and NaNO3 (2 g) were mixed in 90 mL of H2SO4 (98%) in a 1000 ml volumetric flask kept under at ice bath (0-5.C) with continuous stirring. Then the mixture is stirred for 4 hours at this temperature and potassium permanganate (12 g) was added to the suspension very slowly. The rate of addition was carefully controlled to keep the reaction temperature lower than 15°C, . The mixture is diluted with very slow addition of 184 ml water and kept under stirring for 2 hrs. The ice bath was then removed, and the mixture was stirred at 35°C for 2 hrs. The above mixture is kept in a reflux system at 98°C for 10-15 min. After 10 min, change the temperature to 30°C which gives brown colure solution

Again after 10 min, change it to 25°C, and maintain the temperature for 2 hours .The solution is finally treated with 40 ml H2O2 by which colour changes to bright yellow. 200 ml of water is taken in two separate beakers and equal amount of solution prepared is added and stirred for 1 hr. It is then kept without stirring for 3-4 hrs, where the particles settles at the bottom and remaining water is poured to filter. The resulting mixture is washed repeatedly by centrifugation with 10% HCl and then with deionised (DI) water several times until it forms gel like substance (pH- neutral). After centrifugation the gel like substance is vacuum dried at 60°C for more than 6 hrs to GO powder.

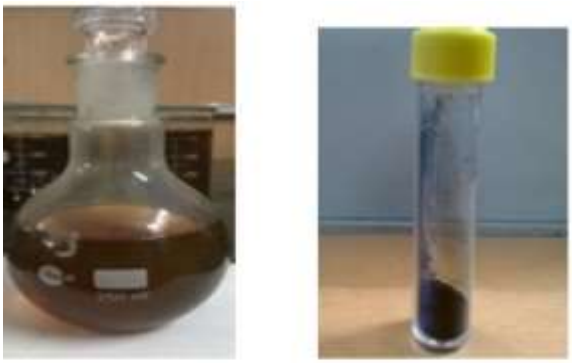

Fig.1 GO solution and GO powder

2.2 Chemical equations and efficiency

The basic chemical reaction involved in the Hummers' method is the oxidation of graphite, introducing molecules of oxygen to the pure carbon graphene. The reaction occurs between the graphene and the concentrated sulfuric acid with the potassium permanganate and sodium nitrate acting as catalysts. The process is capable of yielding approximately 188 g of graphite oxide to 100 g of graphite used. The ratio of carbon to oxygen produced is within the range of 1 to 2.1–2.9 that is characteristic of graphite oxide. The contaminants are determined to be mostly ash and water. Toxic gases such as nitrogen tetra oxide and nitrogen dioxide are evolved in the process. The final product is typically 47.06% oxygen, 27.97% carbon, 22.99% water, and 1.98% ash with a carbon-to-oxygen ratio of 2.25. All of these results are comparable to the methods that preceded them.

Table.1 A comparison of Hummers method to the Staudenmeier method

Method	% Oxygen	% Carbon	% Water	% Ash	Carbon-to-oxygen atomic ratio
Hummers	47.06	27.97	22.99	1.98	2.25
Staudenmeier	52.112	23.99	22.2	1.90	2.89

3. EXPERIMENTATION

Since it was first arranged in the nineteenth century, graphite oxide has been primarily delivered by the Brodie, Staudenmaier and Hummers techniques. Each of the three techniques include oxidation of graphite within the sight of solid acids and oxidants. The level of the oxidation can be changed on the premise of the strategy, the response conditions and the forerunner graphite utilized. The advancement of graphite oxide was enhanced after the revelation of graphene in 2004; So far, the materials delivered by these strategies have appeared to have a greater number of deformities than those created specifically from graphite. Hummers' technique remains a key purpose of intrigue since it is a simple strategy for creating extensive amounts of graphite oxide. Different gatherings have been cantered on making enhancements to the Hummers' strategy to make it more productive and ecologically agreeable. The strategy has additionally been adjusted now and again to deliver graphene oxide using peeling and ultrasonic waves.

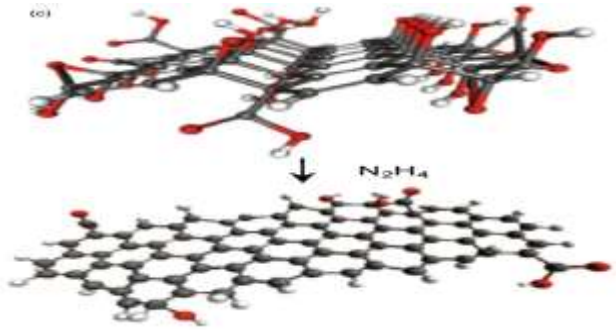

Fig.2 Molecular structure ofGraphene,

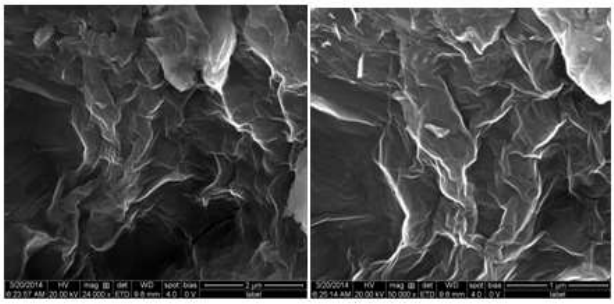

Figure.3FESEM images of GO at magnification (a) 24000 and (b) 50000.

4. RESULTS AND FUTURE USES

The Graphene oxide thus synthesized by Hummer's & Modified Hummer's method in this work shows the simple and convenient method of synthesis.Besidesgraphene, Hummer's method has become a point of interest in photo catalysts, after discovering that graphite oxide is reactive to many of the wavelengths of light found within sunlight, teams have been looking into methods of using it to bolster the speed of reaction in decomposition of water and organic matter. The most common method for producing the graphite oxide in these experiments has been Hummers' method.

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