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Synthesis of Carbon based Nanoparticles & Its Application

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Abstract— **Graphene can be described as a one-atom thick layer of graphite .Graphene is the strongest ,thinnest material known to exist.Graphene is an atomic scale honeycomb lattice madeof carbon atoms.world is going towards nanoparticles,there is a need to find most economical method and eco-friendly method.As we reviewed many process and find to most economical method to produce graphene.**

Keywords:- Electrochemical Exfoliation, Electrolyte Selection, Process parameters.

I. INTRODUCTION

Graphene is a thin layer carbon material that has become a hot topic of research during this decade due to its excellent thermal conductivity, mechanical strength, current density, electron mobility and surface area. These extraordinary properties make graphene to be developed and applied in various fields. On this basis, researchers are interested to find out the methods to produce high quality graphene for industrial use. Various methods have been developed and reported to produce graphene.It is a new and exciting material that has attracted much attention in the last decade and is being extensively explored because of its properties, which have been described with so many superlatives. Production of graphene for large scale application is still a major challenge. Top-down graphene exfoliation methods from graphite, such as liquid-phase exfoliation which is promising because of low cost and high scalability potential will be briefly discussed. . Its outstanding contribution is not only limited in nanoelectronics but also expanding in medical science, nanorobotics.

II. METHODS OF GRAPHENE SYNTHESIS

1. Chemical Vapours Deposition (CVD)
2. Mechanical Exfoliation.
3. Epitaxial Growth of Graphene on SiC
4. Chemical Methods Such as Hummers Method
5. Electrochemical Exfoliation .

III. METHODOLOGY

This is our new method .This is under Electrochemical exfoliation method. This method is not used by anyone till now .The electrochemical exfoliation is an eco-friendly method for producing high quality graphene.The electrochemical exfoliation of graphite due to the ions present in the solution give the graphene oxide (GO) depending upon the nature of electrolyte.The Mild steel rod and graphate electrode rod in the **waste Batteries** are used .The electrolytic solution is Ammonium sulphate or Magnesium Sulphate .By using Regulated power supply(RPS) to give 10 – 12 volt .After a month there is bubble and blackish colour is appeared that water is filtered then the is graphene is produced .To obtain free nanosheets ,this EEG-1 is shear mixed. The EEG that is collected is chatacterized by optical microscopy,The EEG graphene that is collected was then characterized by AFM,SEM,TEM,TGA and Raman Spectroscopy.

IV. EXPERIMENTAL

Fig. 1. *Graphide reacting with electrolytic solution*

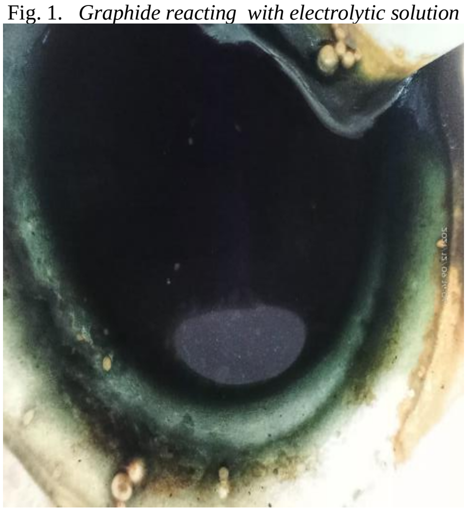

Fig. 2. Graphene after filteration

V. CHALLENGING AND FUTURE OUTLOOK FOR RESEARCH AND INDUSTRY

The advancements in the production strategies have been described, whilst the literatures have been analyzed extensively in evaluating the reinforcement efficiency of each graphene type in a range of matrices by involving different synthesis routes. It should be stated that there are still several challenges to overcome before industries can proceed with the mass production of graphene. An example of the challenges faced is the scale up of the production of high-quality graphene, as this is still a major issue which is always going to be reflected on the ultimate properties of the materials. Based on the findings presented earlier, the best quality graphene to be used in research and industry is the material with the largest aspect ratio with a thickness of few layers. In order for a graphene to be successfully produced graphene, all the parameters should be considered and controlled according to the method or route selected. The product of graphene still needs some characterization, which is compatible to industry scale. The important characterization technique to obtain graphene is Raman spectroscopy, XRD, XPS and other additional characterization for special application such as electrical or surface area parameters.

It correlates the price of mass production toward the graphene quality obtained using various methods. The best route for graphene synthesis is using a new method. It opens the possibility of producing a high-quality graphene with the lowest number of defects. This method also is faster than the available method. Simple in procedure and control make this method have the lowest price for mass production which is the important factor in industrial production. Another suitable alternative which may be able to further build on is the electrochemical method. The principle of electrochemical method is to utilize the conductivity of the graphite to intercalate molecules between graphene layers. Using graphite as an electrode with the presence of electrical energy, intercalation of different charged ionic and facilitating exfoliation is able to be executed.Many researchers have reported that graphene production by electrochemical method exhibits a further possibility of avoiding the use of hazardous chemicals by utilizing electrochemical activation. Electrochemical method may also be applied to obtain a relatively high-quality product with minimum defect and a tunable level of oxidation. Furthermore, electrochemical process also demonstrates the possibility of purifying products in simpler steps when compared to other purifying methods.

VI. ANALYSIS

RAMAN ANALYSIS

Raman spectroscopy is a non-destructive technique that is widely used to obtain structural information about carbon-based materials. The main features in the Raman spectra of graphitic carbon based materials are the G and D peaks and their overtones. The first-order G and D peaks, both arising from the vibrations of sp2 carbon, appear at around 1580 cm-1 and 1350 cm-1, respectively. The G peak corresponds to the optical E2g phonons at the Brillouin zone center resulting from the bond stretching of sp2 carbon pairs in both, rings and chains. The D peak represents the breathing mode of aromatic rings arising due to the defect in the sample. The D-peak intensity is therefore often used as a measure for the degree of disorder. The shift and shape of the overtone of the D peak, called as 2D peak around 2680 cm-1, can be correlated to the number of graphene layers (N). The 2D peak is attributed to double resonance transitions resulting in the production of two phonons with opposite momentum. Further, unlike the D peak, which is Raman active only in presence of defects, the 2D peak is active even in the absence of any defects. Typical Raman spectrum of GO obtained at an excitation wavelength of 532 nm is shown in Fig 1. The prominent D peak at ~1392 cm-1 with an intensity comparable to the G peak ~1592 cm-1 along with their large band width are indicative of significant structural disorder in GO

SCANNING ELECTRON

Microscopy Analysis The SEM micrographs of synthesized GO with different scale bars are given in Fig.2. From the figure, it can be observed that graphene oxide has layered structure, which affords ultrathin and homogeneous graphene films. Such films are folded or continuous at times and it is possible to distinguish the edges of individual sheets, including kinked and wrinkled areas.

VII. APPLICATION

Graphite and its derivate recently gained science and engineering awareness due to its numerous applications. The discovery of graphene is rightly regarded as a milestone in the world of material science; as can be seen in the worldwide attention, the material has received in the fields of electronics, photonics, capacitors/supercapacitors, biosensing, etc. They are used in numerous applications as illustrated below. In this book, applications of graphene and its derivatives are discussed in detail. Thermal Management materials Optical Modulators ,Piezoelectric Materials ,Graphene Nanoribbons ,Monolayer graphene –ultrafiltration (Water purification system),Drug delivery system.

These applications include photocatalysis, electronics, gas sensing, graphene-based heterogeneous electrodes for energy storage devices, etc.

VIII. CONCLUSION

Recently graphene the noble material has brought a revolutionary change in the field of nanoelectronics. Its outstanding contribution is not only limited in nanoelectronics but also expanding in medical science, nanorobotics, commercial manufacturing of graphene synthesized products and so on.

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