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Graphene – Future of Electrical Technology

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***Abstract*—Graphene sheet is a two dimensional carbon allotrope. It is a versatile material with remarkable properties. It is a light and strong material which means that it can be integrated into a huge number of applications. Graphene also improves the performance and efficiency of current materials and substances, for example lithium batteries, but it also has potential to develop alongside other two-dimensional crystals to create even more compounds to suit a wider range of graphene applications. Graphene production is inextricably linked to application development.**

***Index Terms*—Graphene, nano scale, hexagonal, latis**

I. Introduction

The "Power of Graphene" lesson explores graphene and its electrical properties and applications at the nano scale. We work in teams to test graphene using a simple circuit set up and consider how this remarkable material is impacting many industries. A graphite consist of sheets of carbon in hexagonal latis. Usually many layers are stacked together as we go removing one by one layer once in a while we get a single layer of carbon atom which is known as Graphene.

Graphene conducts electron faster than any other substance at room temperature. This is because of extraordinarily high quality of graphene latis. Graphene mixed with rubber gives us a very high temperature and high strength capability. It does not lose its properties for temperature change.

A. Block Diagram

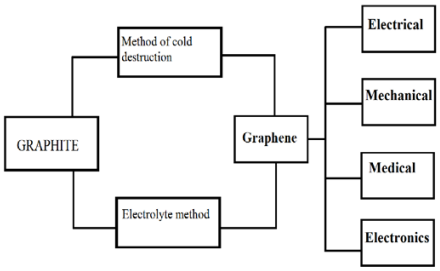

Fig. 1. Block diagram

B. Properties

- *Strength:* The most amazing thing about graphene is its strength it is light in weight but mechanicaly strong.
- *No band gap*: Graphene has no band gap. A band gap is the gap between the energy of an electron when it is bound to an atom, and the so-called conduction band, where it is free to move around
- *Best at electricity:* Graphene also has "the highest current density (a million times that of copper) at room temperature; the highest intrinsic mobility (100 times more than in silicon); and conducts electricity in the limit of no electrons“. Which means it can carry more electricity more efficiently, faster and with more precision than any other material.
- *Thermal conductivity:* Graphene also beats diamond in thermal conductivity. In fact, graphene now holds the record for conducting heat — it's better than any other known material.
- *Elastic:* Graphene stretches up to 20 percent of its length. And yet it is also the stiffest known material — even stiffer than diamond.

As shown in the block diagram there are two methods to obtain graphene.

1) Method of cold destruction
2) Electrolyte method

C. Technology

- This paper is based on how the material changes its properties on nano scale. And how the properties of this material can be used in the field of engineering.
- The material (Graphene) can be composed with other existing material to increase its properties.
- The production of graphene may serve the best products for the mankind.

D. Advantages

- Carries electricity faster than any other material
- High thermal and mechanical properties
- Light in weight
- Batteries life increases
- Anti-corrosive

E. Applications

1) Highly efficient batteries
2) Composite Conductor
3) Electronic circuit
4) Solar panel
5) Super Capacitors

II. Conclusion

Graphene (GR)/graphene oxide (GO) based polymer nano composites are an exciting field of research today. These wonderful materials have shown diverse range of applications in areas such as energy storage, optoelectronics, sensors, solar

cells, biomedical and many others. This paper demonstrates the successful synthesis of a series of GR/GO based nano composites with polymers such as polypyrrole (PPy), polythiophene (PTh) and polyester (PE) resin. We have provided an insight to the characterization of the prepared composites and studied their electrical, electrochemical, thermal and mechanical properties. All the composites showed superior properties compared to the pure polymer at low filler loading. This property enhancement is due to the synergetic effects between the nano filler and the polymer. The paper also provided the study of applications of the composites in sensor, super capacitor and solar cells. The results presented in this thesis may be useful for development of new high performance GR based polymer nano composites for applications in near future.

III. Future Scope

- Synthesis of GR/GO based composites with new host polymers.
- Applications of the composites in other optoelectronic devices e.g. LED, transistor etc.
- Study of biomedical applications of GR based composites.

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