INTRODUCTION

WHAT IS GRAPHENE?

Graphene is an extremely thin layer (only one atom thick) of densely packed carbon atoms connected in a hexagonal lattice, but it absorbs 2.3% of light so it can be seen with the naked eye. It is the thinnest, lightest, strongest material on earth and the best conductor of heat and electricity known to man. Graphene is an extraordinary material that could revolutionise the world of science.

DISCOVERY OF GRAPHENE

If you’ve ever drawn with a pencil, you’ve probably made graphene. Although scientists already knew about the one atom thick, two-dimensional, crystal graphene, it was not yet known as to how to extract it from graphite. The first graphene crystals were successfully extracted in 2004 using a very simple, but effective method – ordinary tape. At their Friday night meetings, scientists Andre Geim and Kostya Novoselov, noticed small parts of graphene on the tape used to clean a graphite stone. He applied the tape to graphite and peeled it away to create flakes of layered graphene. More tape peels created thinner and thinner layers, until a piece of graphene 10 layers thick was achieved. They refined their technique and eventually achieved a layer of graphene only one atom thick. They were awarded with the Physics Nobel Prize in 2010 for this groundbreaking discovery.

FUTURE APPLICATIONS

Graphene does not have many current applications since it was only discovered very recently in 2004, but the researchers at the University of Manchester have already been able to create graphene membranes (for possible use in water filtration, gas separation and desalination) and the world’s smallest transistor (for the improvement of circuit efficiency and the miniaturisation of technology). Currently, hundreds of labs worldwide are dedicated solely to the research of graphene.

Properties

- It is a crystalline allotrope of carbon that is 2D
- The lightest material known to man
- The strongest material (300 times stronger than steel)
- The world’s best thermal and electrical conductor
- The thinnest material on earth (1 million times thinner than a human hair)
- Its carbon atoms are arranged in a hexagonal (honeycomb) densely packed pattern, each atom having 4 bonds.
- Stable, stretchable, transparent and impermeable
- Graphene is the only carbon that has chemical and electronic properties
- It is known for being a zero gap semiconductor
- Has astounding electron mobility at room temperature

Did you know?

Graphene is harder than diamond, about 300 times stronger than steel, conducts electricity better than copper and is 1 mil times thinner than human hair.

It’s so strong that a one square metre hammock (if you could make a graphene sheet that big) would weigh less than a cat’s whisker, but would hold the weight of the cat.

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CURRENT APPLICATIONS

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Did you know?

Graphene membranes – These could be used for water filtration, gas separation and desalination projects.

Graphene coatings – If used on food and pharmaceutical packages, the transfer of water and oxygen can be stopped and perishable goods preserved for longer.

Graphene-based composites – e.g. Paint combined with graphene could possibly stop rust.

Graphene batteries – This could increase the lifespan of batteries and ensure quicker charging.

Graphene supercapacitors – These could provide huge amounts of power using much less energy.

Graphene could potentially be used in the storage of solar and wind power.

Medical science – tissue engineering, biomicrorobotics and, due to the atomic thickness and modifiable chemistry of graphene, it makes an excellent candidate for mammalian and diagnosis devices.

Graphene sensors – Able to detect on a molecular level.

Graphene electronics – The use of graphene could mean unbreakable touch screens, flexible and wearable technology and speedy graphene circuits and computer chips.

AND MORE!!!