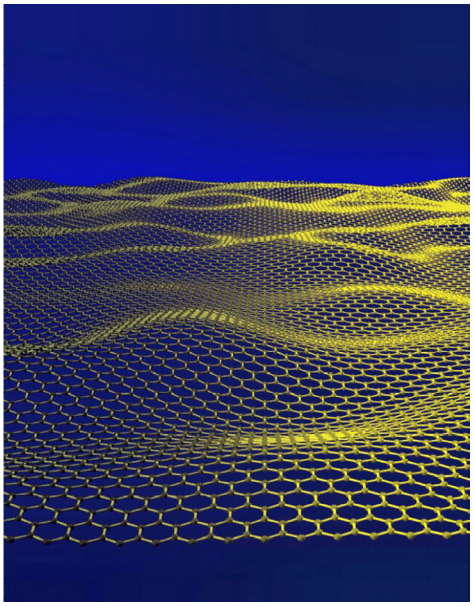
New technology grows large single crystal graphene

As world's thinnest material with superior electron mobility, mechanical strength and thermal conductivity, graphene is a very promising material in relation to electronic applications. However, until recently it was not possible to create graphene layers that are large enough to use in those and in other applications.

A team of TU Delft scientists succeeded in developing a method to grow graphene layers of substantial dimensions, up to 5 by 1 cm2.
As a carbon comprising material the structure of graphene relates to one-atom thick planar sheets of bonded carbon atoms that are arranged in a regular hexagonal pattern. These sheets are the building blocks for graphite materials of all other dimensions. For example these sheets can be wrapped up into fullerene, rolled into 1D carbon nanotubes or stacked into 3D graphite.



Variety of applications

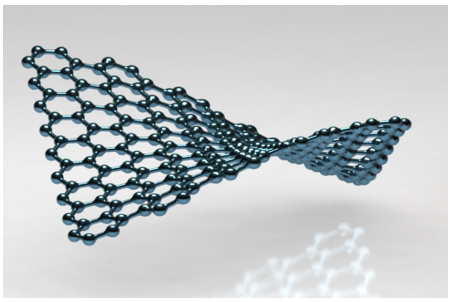
If graphene becomes available in larger dimensions than is common at this moment, graphene has a wide variety of applications, for instance field-effect transistors and photonic or optoelectronic devices such as solarcells and flexible LCD- and touchscreens.
In the past various production methods of graphene have been developed. Prior art graphene however is not clean, has lots of contamination and cracks. Moreover the dimensions of the developed graphene are too small to use in specific applications in a practical manner. Last but not least the most promising existing methods are non-reproducible and not fit for mass-production of graphene.

High conductivity

Multilayer graphene has strong mechanical properties and an extremely high thermal conductivity. For instance it is more than 200 times stronger than steel and more than 100 times faster than silicon. The result of the latter is that application of graphene in electrical devices leads to a substantial reduction of power use.

Control size and shape

By changing one of several parameters, such as the hydrogen flow rate, the TU Delft scientists succeed in controlling both size and shape of the graphene, that is produced. Last but not least the invention of TU Delft scientists comprises a method to transfer and store the graphene, which guarantees that the unique characteristics of the produced graphene are conserved for a timeframe of several years.
The outstanding results so far



make this invention very interesting for furnace companies, electro-chemical polishing companies as well as for surface coating companies and wafer manufacture companies.

Advantages

- No contamination and free of cracks
- Production of large layers of graphene
- Size- and shaped controlled production
- Safe transfer- and storage method conserves unique characteristics

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