Characterisation of the structure of graphene

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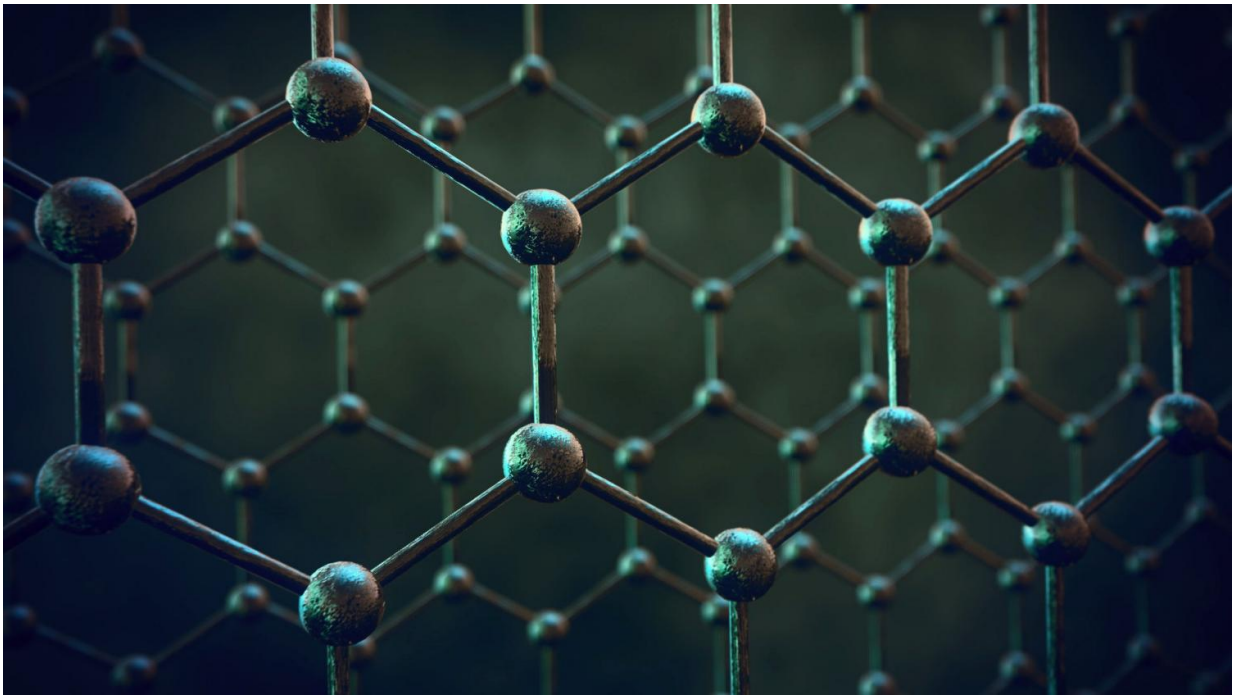

This visualisation shows layers of graphene used for membranes. Credit: University of Manchester

Graphene, the world's first two-dimensional material, is many times stronger than steel, more conductive than copper, lightweight, flexible and one million times thinner than a human hair.

Graphene is set to improve the quality of life for many across the globe. Potential applications include inexpensive water purification systems;

greener, more efficient cars and planes; flexible phones and even biomedical applications such as wound healing and cancer treatments.

Graphene's commercial adoption will be accelerated by answering two key questions: 'What are the characteristics of commercially-supplied graphene' and 'how can they be used to best effect'. The establishment of common industrial metrics, regarding for example the number of layers or flake size, is crucial for the uptake of graphene-based technologies.

The National Graphene Institute at the University have partnered with NPL to produce a guide, as part of NPL's good practice guide series, that aims to tackle the ambiguity surrounding how to measure graphene's characteristics.

Titled "Characterisation of the Structure of Graphene," the guide provides producers and users of graphene with an understanding of how to reliably measure the structural properties of graphene.

Material standardisation is crucial for industry uptake. There are many early adopters of graphene but without standardisation it is difficult for industry to be assured of the quality and properties of its graphene samples.

This guide seeks to address this gap and brings together the accepted measurement techniques in this area. It describes the high-accuracy and precision required for verification of material properties and will enable the development of other faster quality control techniques in the future.

Intended to form a bedrock for future interlaboratory comparisons and international standards, the guide will accelerate the development of graphene-enabled technology and improve the ability to produce graphene in a reliable and repeatable way.

Dr Andrew Pollard, lead author of the guide and Senior Research Scientist at NPL, commented: "Although there are many ways to measure the properties of different types of commercially-available 'graphene', industry needs a standardised set of measurements. This will enable companies to select the type of material best suited to their needs by reliably comparing key characteristics, supporting the development of innovative new technologies based on graphene. This guide is the first step in this process, and as the basis of international measurement standards currently being developed, will provide measurement protocols that can be used in the interim."

James Baker, Graphene Business Director at The University of Manchester said: "This good practice guide has been developed by the NGI and NPL teams to allow the nascent graphene industry to perform accurate, reproducible and comparable measurements of commercially supplied graphene. This will address this important commercialisation barrier by providing users with a consistent approach to the structural characterisation of graphene whilst international measurement standards are being developed".

More information: The guide is available online: www.npl.co.uk/publications/gui … ructure-of-graphene/

Provided by University of Manchester