Optical microscopes lend a hand to graphene research

November 15 2012

(Phys.org)—The remarkable properties and subsequent applications of graphene have been well-documented since it was first isolated in 2004; however, researchers are still trying to find a quick, cheap and efficient way of measuring its thickness.

A group of researchers from China appear to have solved this problem by devising a universal method using just a standard optical microscope.

In a study published today, 16th November 2012, in IOP Publishing's journal *Nanotechnology*, they have shown that the thickness of graphene, along with a host of other two-dimensional materials, can be obtained by measuring the red, green and blue components of light as they are reflected from the material's surface.

The study shows that the contrast of red, green and blue values between the substrate on which the sample is placed and the sample itself increases with the thickness of the sample.

The method is fast, easily operated and requires no expensive equipment.

The researchers, from the Harbin Institute of Technology at Weihai and Southeast University, believe this is a significant contribution to the fundamental research and potential applications of materials, such as graphene, as many of their remarkable properties are reliant on the thickness of the material itself.

"In the past, methods for identifying the thickness of two-dimensional materials have been very expensive and have had a slow throughput. Our technique combines a common microscope with a simple bit of software, making it a very fast, cheap and efficient way of measuring thickness," said co-author of the study Professor Zhenhua Ni.

The researchers tested their method by examining mechanically exfoliated graphene, graphene oxide, nitrogen-doped graphene and molybdenuym disulphide, all of which have attracted great interest due to their intriguing electrical, mechanical, thermal and optical properties.

A standard optical microscope was used to obtain optical images of the samples and a piece of software called Matlab was used to read the red, green and blue values at each pixel of the optical image.

Raman spectroscopy and atomic force microscopy were used to confirm the researchers' thickness measurements.

More information: "Thickness identification of two-dimensional materials by optical image" Ying Ying Wang et al 2012 *Nanotechnology* 23 495713 doi:10.1088/0957-4484/23/49/495713 , iopscience.iop.org/0957-4484/23/49/495713

Provided by Institute of Physics