Graphene: Making a wonder material more wonderful

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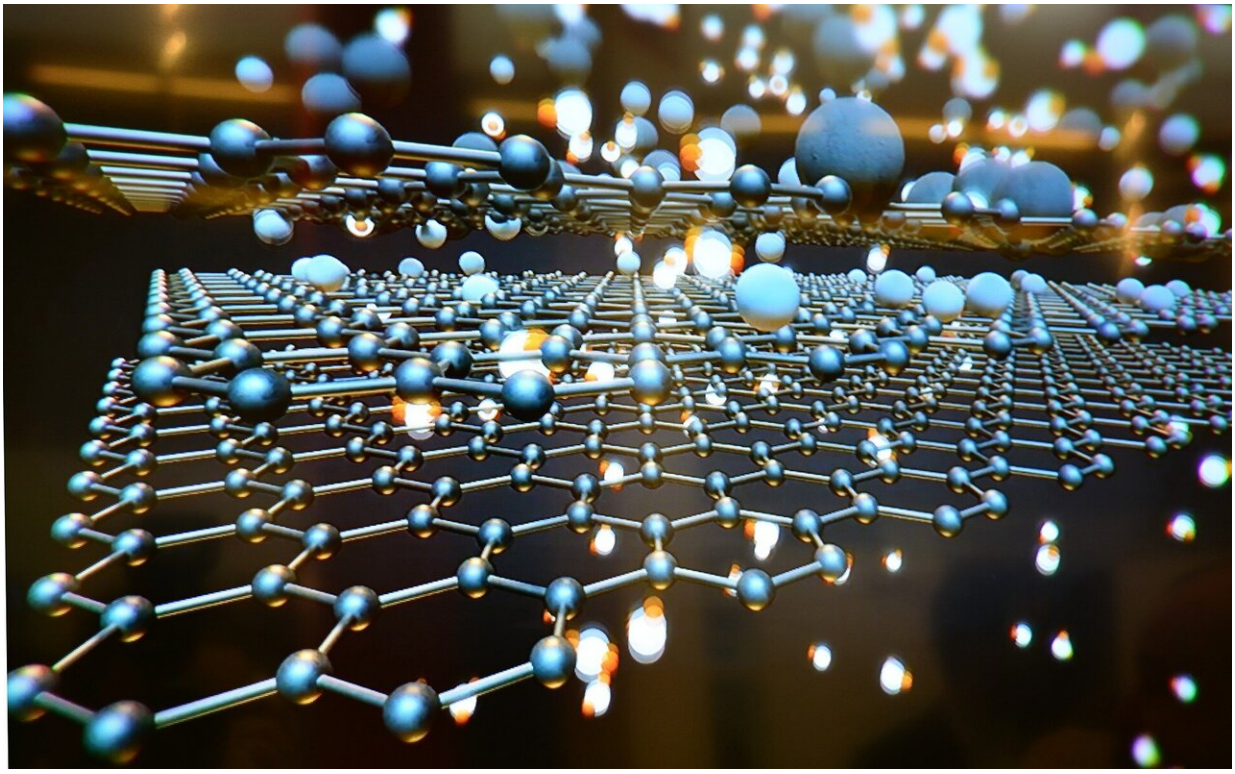

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Graphene is a form of the chemical element carbon. Well-known forms of carbon include the world's hardest material, diamond, and the soft black material known as the "lead" in a pencil, which is graphite. Graphite can be visualized as layers of carbon atoms stacked together in

sheets with each sheet resembling a hexagonally woven chicken wire fence or a very thin honeycomb. Graphene is to all intents and purposes a single sheet from one of those stacks. It is thus one of the thinnest materials known, an atomic monolayer of carbon atoms.

It has become the focus of much research in recent years with its potential to weave the fabric of a future of molecular electronics devices because of its unique chemical, optical, and electronic properties.

Now, writing in the *International Journal of Biomedical Nanoscience and Nanotechnology*, a team from Malaysia reports on advances in how graphene sheets might be modified for different applications by attaching different chemical groups to the sheets. Geoffrey Ijeomah and Fahmi Samsuri of the Universiti Malaysia Pahang, Felix Obite of the Universiti Teknologi Malaysia, and Mohamad Adzhar Md Zawawi of the Universiti Sains Malaysia, discuss the chemical functionalization of graphene with a view to its development as sensor materials for environmental monitoring, biomedical research, and medical diagnostics as well as in other areas.

An important conclusion from their review is that among the fundamental synthetic methods for the fabrication of graphene, such as chemical vapour deposition, mechanical exfoliation, reduction of graphite oxide, thermal deposition, and unzipping carbon nanotubes are sensitive to the exact conditions used and that affects the reproducibility when functional, chemical groups, are attached to the graphene layers.

"An improved understanding of the workings of graphene at the molecular level will ultimately advance graphene surface engineering and its applications in sensor development and technology," the team concludes.

More information: Geoffrey Ijeomah et al. Recent advances in

chemical functionalisation of graphene and sensing applications, *International Journal of Biomedical Nanoscience and Nanotechnology* (2020). DOI: 10.1504/IJBNN.2020.107177