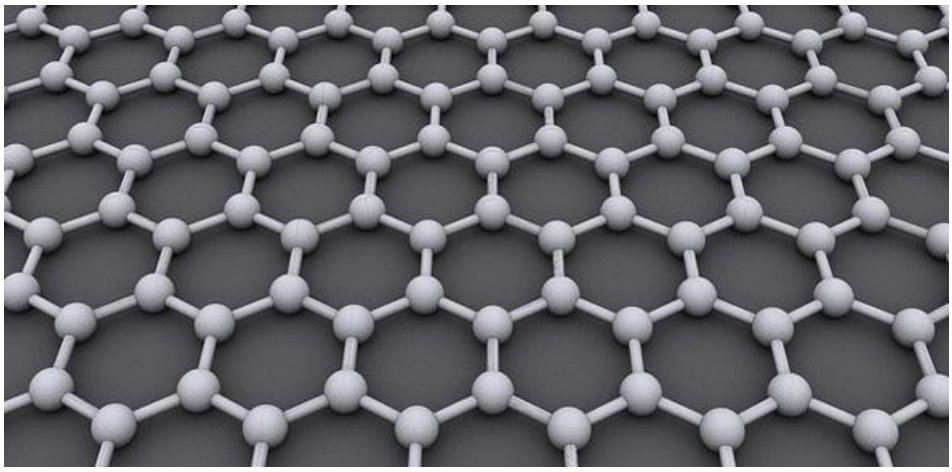
Research

Graphene's potential for energy conversion and storage



Scientists working with Europe's Graphene Flagship and the Cambridge Graphene Centre have provided a detailed and wide-ranging review of the potential of graphene and related materials in energy conversion and storage.

In a review article (http://www.sciencemag.org/content/347/6217/1246501.abstract?sid=550aff56-d31d-4492-a0a4-cf8bd12404c9) published recently in the journal *Science*, the researchers, led by Francesco Bonaccorso, a Royal Society Newton Fellow at the Cambridge Graphene Centre, note the substantial progress made in material preparation at the laboratory level. They also highlight the challenge of producing the materials on an industrial scale in a cost-effective manner.

Graphene and related materials have great promise in these areas

— Andrea Ferrari

Graphene - a two-dimensional material made up of sheets of carbon atoms – has many potential applications, among them energy conversion and storage. Graphene and related 2D crystals combine high electrical conductivity with physical flexibility and a huge surface to weight ratio. Such qualities make them suitable for storing electric charge in batteries and supercapacitors, and as catalysts in solar and fuel cell electrodes.

"The huge interest in 2D crystals for energy applications comes both from their physico-chemical properties, and the possibility of producing and processing them in large quantities, in a cost-effective manner," said Bonaccorso. "In this context, the development of functional inks based on 2D crystals is the gateway for the realisation of new generation electrodes in energy storage and conversion devices."

Bonaccorso added that the challenge ahead is to demonstrate a disruptive technology in which two-dimensional materials not only replace traditional electrodes, but more importantly enable whole new device concepts.

"Graphene and related materials have great promise in these areas, and the Graphene Flagship has identified energy applications as a key area of investment," said review co-author Andrea Ferrari, who chairs the Executive Board of the Graphene Flagship, and is director of the Cambridge Graphene Centre. "We hope that our critical overview will guide researchers in academia and industry in identifying optimal pathways toward applications and implementation, with an eventual benefit for society as a whole."

The Graphene Flagship, a pan-European 10-year, €1 billion science and technology programme was launched in 2013.

Adapted from Cambridge Graphene Centre news story (http://www.graphene.cam.ac.uk/news).

Media enquiries

Sarah Collins

Communications office

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Image

Model of graphene structure

Credit: CORE-Materials

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