Scientists produce a novel form of artificial graphene

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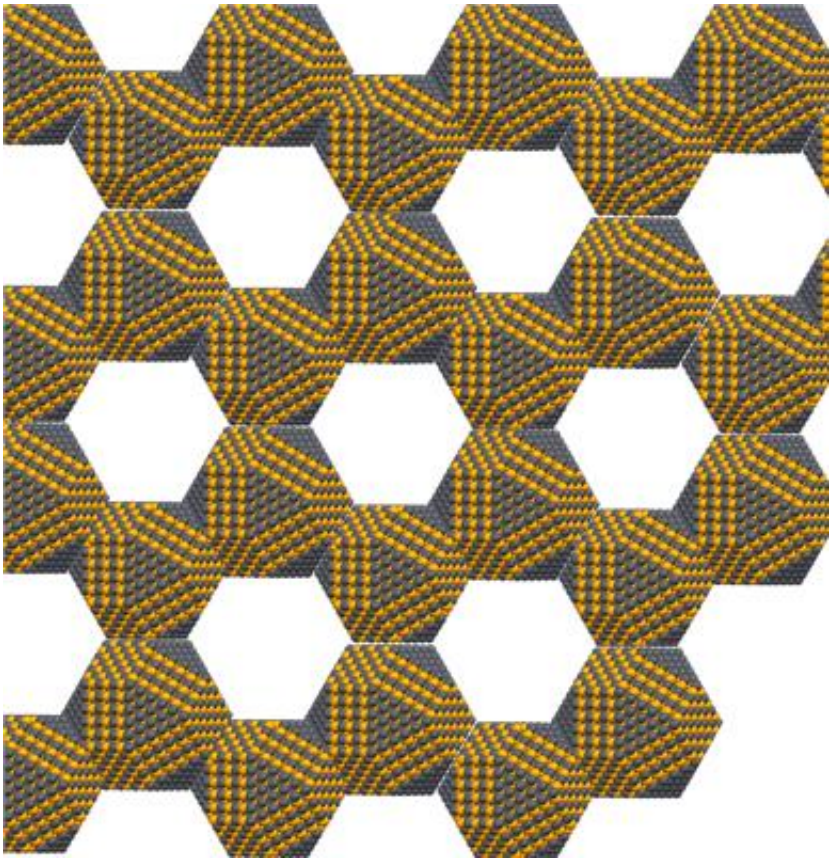

Artificial Graphene

A new breed of ultra thin super-material has the potential to cause a technological revolution. "Artificial graphene" should lead to faster, smaller and lighter electronic and optical devices of all kinds, including higher performance photovoltaic cells, lasers or LED lighting.

For the first time, scientists are able to produce and have analysed artificial graphene from traditional semiconductor materials. Such is the scientific importance of this breakthrough these findings were published recently in one of the world's leading physics journals, *Physical Review X*. A researcher from the University of Luxembourg played an important role in this highly innovative work.

Graphene (derived from graphite) is a one atom thick honeycomb lattice of carbon atoms. This strong, flexible, conducting and transparent material has huge scientific and technological potential. Only discovered in 2004, there is a major global push to understand its potential uses. Artificial graphene has the same honeycomb structure, but in this case, instead of carbon atoms, nanometer-thick semiconductor crystals are used. Changing the size, shape and chemical nature of the nano-crystals, makes it possible to tailor the material to each specific task.

The University of Luxembourg is heavily involved in cross-border, multidisciplinary research projects. In this case it partnered with the Institute for Electronics, Microelectronics, and Nanotechnology (IEMN) in Lille, France, the Debye Institute for Nanomaterials Science and the Institute for Theoretical Physics of the University of Utrecht, Netherlands and the Max Planck Institute for the Physics of Complex Systems in Dresden, Germany.

University of Luxembourg researcher Dr. Efterpi Kalesaki is the first author of the article appearing in the *Physical Review X* . Dr. Kalesaki said: "these self-assembled semi-conducting nano-crystals with a honeycomb structure are emerging as a new class of systems with great potential." Prof Ludger Wirtz, head of the Theoretical Solid-State Physics group at the University of Luxembourg, added: "artificial graphene opens the door to a wide variety of materials with variable nano-geometry and 'tunable' properties."

More information: Dirac Cones, "Topological Edge States, and Nontrivial Flat Bands in Two-Dimensional Semiconductors with a Honeycomb Nanogeometry." E. Kalesaki, C. Delerue, C. Morais Smith, W. Beugeling, G. Allan, D. Vanmaekelbergh. *Physical Review X* 4, 011010 (2014) (Received 18 July 2013; revised manuscript received 25 November 2013; published 30 January 2014)

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