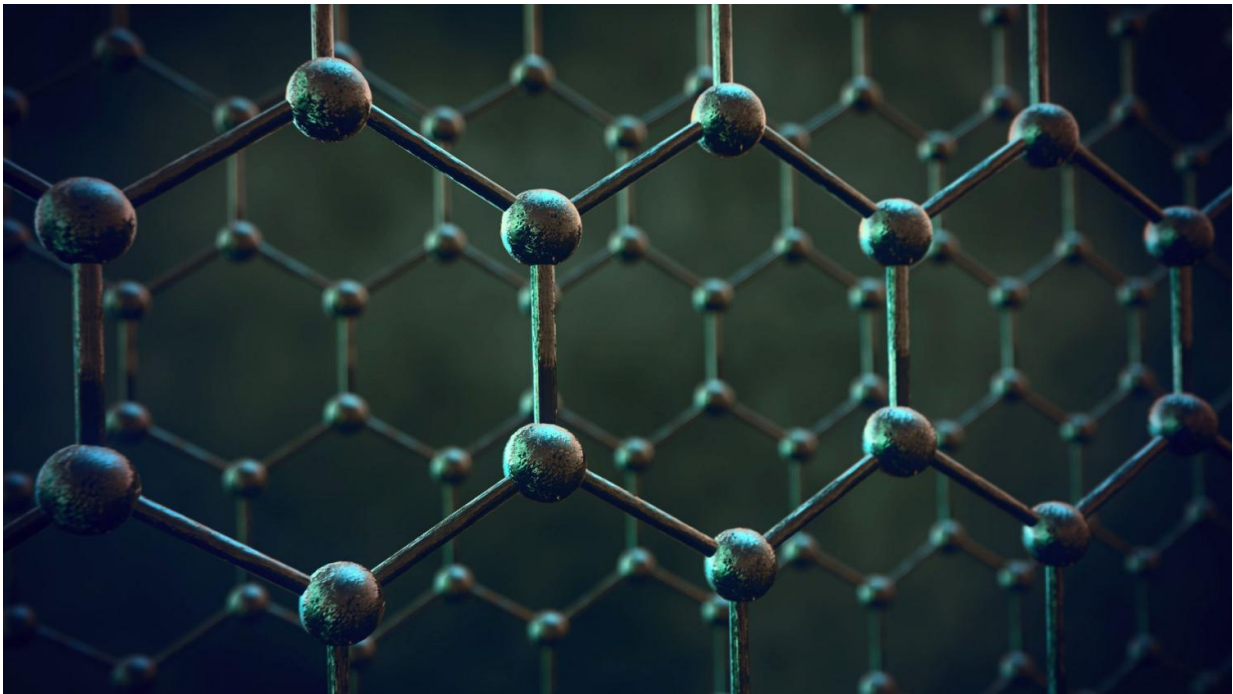


Twisting graphene into spirals—researchers synthesize helical nanographene

March 30 2018



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

It's probably the smallest spring you've ever seen. Researchers from Kyoto University and Osaka University report for the first time in the *Journal of the American Chemical Society* the successful synthesis of hexa-peri-hexabenz[7]helicene, or helical nanographene. These graphene constructs previously existed only in theory, so successful

synthesis offers promising applications including nanoscale induction coils and molecular springs for use in nanomechanics.

Graphene, a hexagonal lattice of single-layer carbon atoms exhibiting outstanding charge and heat transport properties, has garnered extensive research and development interest. Helically twisted graphenes have a spiral shape. Successful synthesis of this type of [graphene](#) could have major applications, but its model compounds have never been reported. And while past research has gotten close, resulting compounds have never exhibited the expected properties.

"We processed some basic chemical [compounds](#) through step-by-step reactions, such as McMurry coupling, followed by stepwise photocyclodehydrogenation and aromatization," explains first author Yusuke Nakakuki. "We then found that we had synthesized the foundational backbone of helical graphene."

The team confirmed the helicoid nature of the structure through X-ray crystallography, also finding both clockwise and counter-clockwise nanographenes. Further tests showed that the electronic structure and photoabsorption properties of this compound are much different from previous ones. "This helical nanographene is the first of its kind," concludes lead author Kenji Matsuda. "We will try to expand their surface area and make the helices longer. I expect to find many new physical properties as well."

The paper, titled "Hexa-peri-hexabenz[7]helicene: Homogeneously π -Extended Helicene as a Primary Substructure of Helically Twisted Chiral Graphenes," appeared 19 March 2018 in the *Journal of the American Chemical Society*.

More information: Yusuke Nakakuki et al, Hexa-peri-hexabenz[7]helicene: Homogeneously π -Extended Helicene as a

Primary Substructure of Helically Twisted Chiral Graphenes, *Journal of the American Chemical Society* (2018). [DOI: 10.1021/jacs.7b13412](https://doi.org/10.1021/jacs.7b13412)

Provided by Kyoto University

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