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### Illinois Chemists Use Nanodroplets of Water to Shape Graphene

Dec 18, 2009

Chemists at the University of Illinois at Chicago (UIC) say molding graphene into desired shapes is possible using only a nanodroplet of water.

"Up until now, it wasn't thought we could controllably fold these structures," said Petr Král, assistant professor of chemistry at UIC. "But now we know how to shape graphene by using weak forces between nanodroplets carefully positioned on graphene sheets."

Král and two of his graduate students described the process in a recent article in *Nano Letters*, which is highlighted in *Nature's* "news and views" section on Dec. 17.

Engineers already cut graphene into narrow ribbons and other shapes, expanding the set of carbeneous systems such as fullerenes, carbon nanotubes and nano-diamonds. Using computer simulations, Král showed that weak molecular interactions called van der Waals forces between water nanodroplets and graphene can shape it into a wide variety of forms, without the water and graphene chemically binding.

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"Depending on the size of the water droplet and the shape and size of graphene flake used, we can fold it in different shapes for various applications," said Král. "It's similar to the way proteins are folded in biological cells with the help of chaperone proteins."

Král and his students discovered they could use water droplets to roll, bend, slide and shape graphene into different complex structures such as capsules, sandwiches, knots and rings — all potential building blocks of nanodevices with unique mechanical, electrical or optical properties. By using special techniques like atomic force microscopy and carefully guided microscopic needles, water droplets and other materials can be carefully positioned on graphene to shape it into desired forms, he says.

The article was co-authored by Niladri Patra, a UIC chemistry doctoral student and first author on the paper, and former UIC doctoral student Boyang Wang, now a post-doctoral fellow at Northwestern University.

Král's research is supported by the National Science Foundation.

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