Rapidly rotating graphene is fastest-spinning macroscopic object ever

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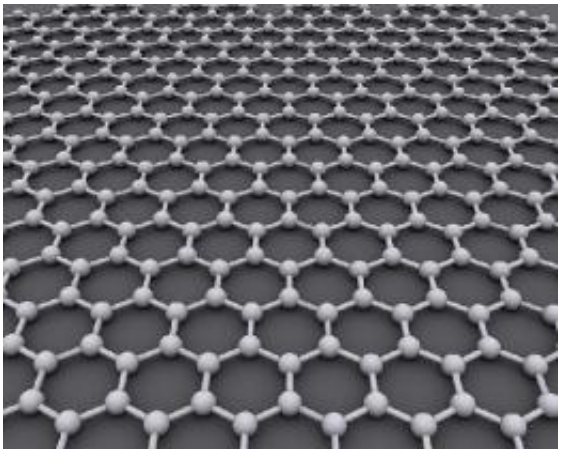

Made of a single sheet of carbon atoms, graphene can be spun at the fastest rate of any known macroscopic object. Image credit: Wikimedia Commons.

(PhysOrg.com) -- At 60 million rotations per minute, a two-dimensional sheet of graphene has become the fastest-spinning trapped macroscopic object ever. Graphene is known for its large strength, and it's this strength that enables the material to not be pulled apart into pieces when spun at such a high rate.

Physicist Bruce Kane of the University of Maryland in College Park has published his study on the spinning graphene in a recent issue of *Physical Review B*. His main ambition was to measure and modify graphene by suspending micrometer-sized flakes of the material in an ion trap. As

electric fields trapped and suspended the charged graphene flakes, Kane set up a circularly polarized light beam to transfer a large amount of angular momentum to the flakes, causing them to spin at a very high rotation frequency.

“This high rotation frequency, facilitated by the ability of graphene to withstand centrifugal tension during rotation, is, to the author's knowledge, the largest ever measured for a macroscopic trapped object,” Kane wrote in a paper posted at arXiv.org.

Kane also explained that the graphene flakes are spinning at only one-thousandth of their theoretical maximum rate, which is calculated based on graphene's estimated strength. Modifying the experimental set-up could enable the graphene to be spun even faster.

As Kane explained in his study, graphene, which was discovered in 2004, is the first truly two-dimensional system, meaning that its electronic, mechanical, and thermodynamic properties are all determined by the structure of a single sheet of carbon atoms. Since placing graphene on a substrate can interfere with measuring its properties, this new method of levitating and spinning graphene could allow researchers to investigate, grow, and manipulate sheets of graphene with greater ease.

More information: Bruce Kane. "Levitated spinning graphene flakes in an electric quadrupole ion trap." *Phys. Rev. B* 82, 115441 (2010). DOI:10.1103/PhysRevB.82.115441 . "Levitated Spinning Graphene." arXiv:1006.3774v1
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