University of Maryland NSF-MRSEC Highlight

Poking Holes in Graphene Makes it Magnetic

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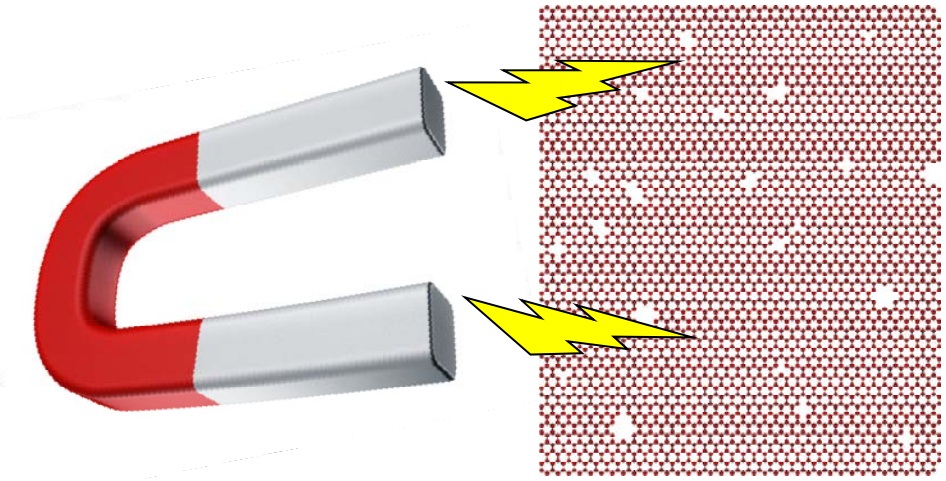

Magnetism is typically associated with "transition metal" elements such as nickel or iron, from the middle of the periodic table. These elements contain *d* electrons which are localized on the atoms, and have a "spin" or magnetic moment. Carbon contains no *d* electrons and is not normally magnetic. Maryland MRSEC researchers showed that removing a carbon atom from graphene, a single atom-thick layer of graphite, creates a localized spin, and this spin interacts strongly with conduction electrons in the graphene through the Kondo effect (see Figure), a key ingredient for producing ferromagnetism. The discovery could lead to new electronic or spintronic devices made entirely of carbon.

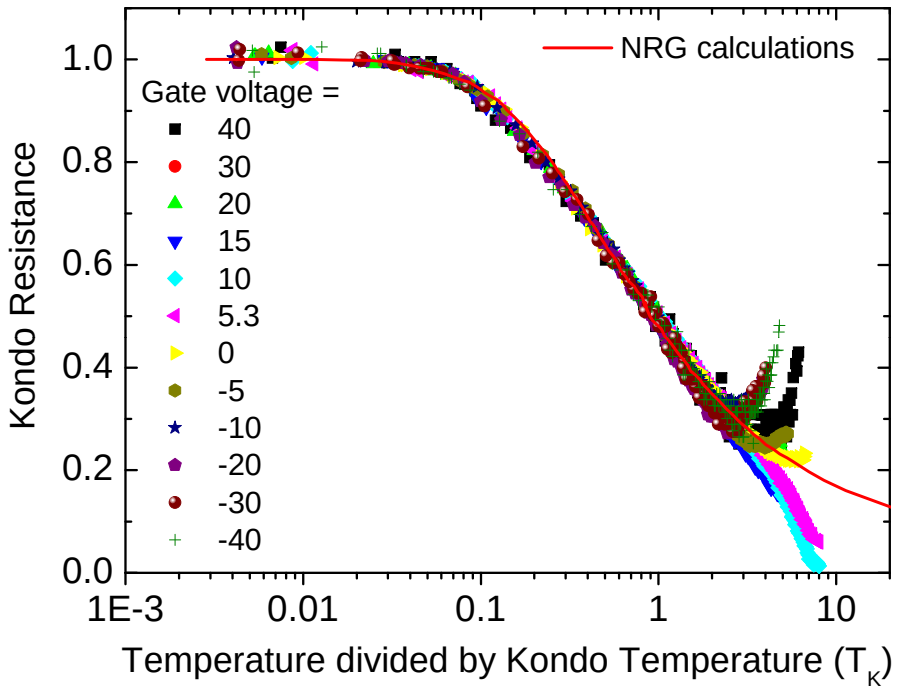

Figure Caption: Temperature dependence of the extra resistance due to defects in graphene. The curves can be scaled by a single parameter (the Kondo temperature (T_K) which ranges from 30 Kelvin to 90 Kelvin, and follow the theory of the Kondo effect (red line). The Kondo temperature is comparable to that found in metals with magnetic impurities, and indicates strong coupling of the electrons to the impurities.

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