

Camera flash turns an insulating material into a conductor

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An insulator can now be transformed to conduct electricity by an ordinary camera flash.

A Northwestern University professor and his students have found a new way of turning graphite oxide -- a low-cost [insulator](#) made by oxidizing graphite powder -- into graphene, a hotly studied material that conducts electricity. Scientists believe graphene could be used to produce low-cost carbon-based transparent and flexible electronics.

Previous processes to reduce graphite oxide relied on toxic chemicals or high-temperature treatment. The idea for a simple new process came in a burst of inspiration: Can a camera flash instantly heat up the graphite oxide and turn it into graphene?

The process, invented by Jiaxing Huang, assistant professor of [materials science](#) and engineering at Northwestern's McCormick School of Engineering and Applied Science, and his graduate student Laura J. Cote and postdoctoral fellow Rodolfo Cruz-Silva, was published in the Aug. 12 issue of the [Journal of the American Chemical Society](#).

Materials scientists previously have used high-temperature heating or chemical reduction to produce graphene from graphite oxide. But these techniques could be problematic when graphite oxide is mixed with something else, such as a polymer, because the polymer component may not survive the high-temperature treatment or could block the reducing chemical from reacting with graphite oxide.

In Huang's flash reduction process, researchers simply hold a consumer camera flash over the graphite oxide and, a flash later, the material is now a piece of fluffy graphene.

"The light pulse offers very efficient heating through the photothermal process, which is rapid, energy efficient and chemical-free," he says.

When using a light pulse, photothermal heating not only reduces the graphite oxide, it also fuses the insulating polymer with the graphene sheets, resulting in a welded conducting composite.

Using patterns printed on a simple overhead transparency film as a photo-mask, flash reduction creates patterned graphene films. This process creates electronically conducting patterns on the insulating [graphite oxide](#) film -- essentially a flexible circuit.

The research group hopes to next create smaller circuits on a single graphite-oxide sheet at the single-atom layer level. (The current process has been performed only on thicker films.)

"If we can make a nano circuit on a single piece of [graphite oxide](#)," Huang says, "it will hold great promise for patterning electronic devices."

Source: Northwestern University ([news](#) : [web](#))

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