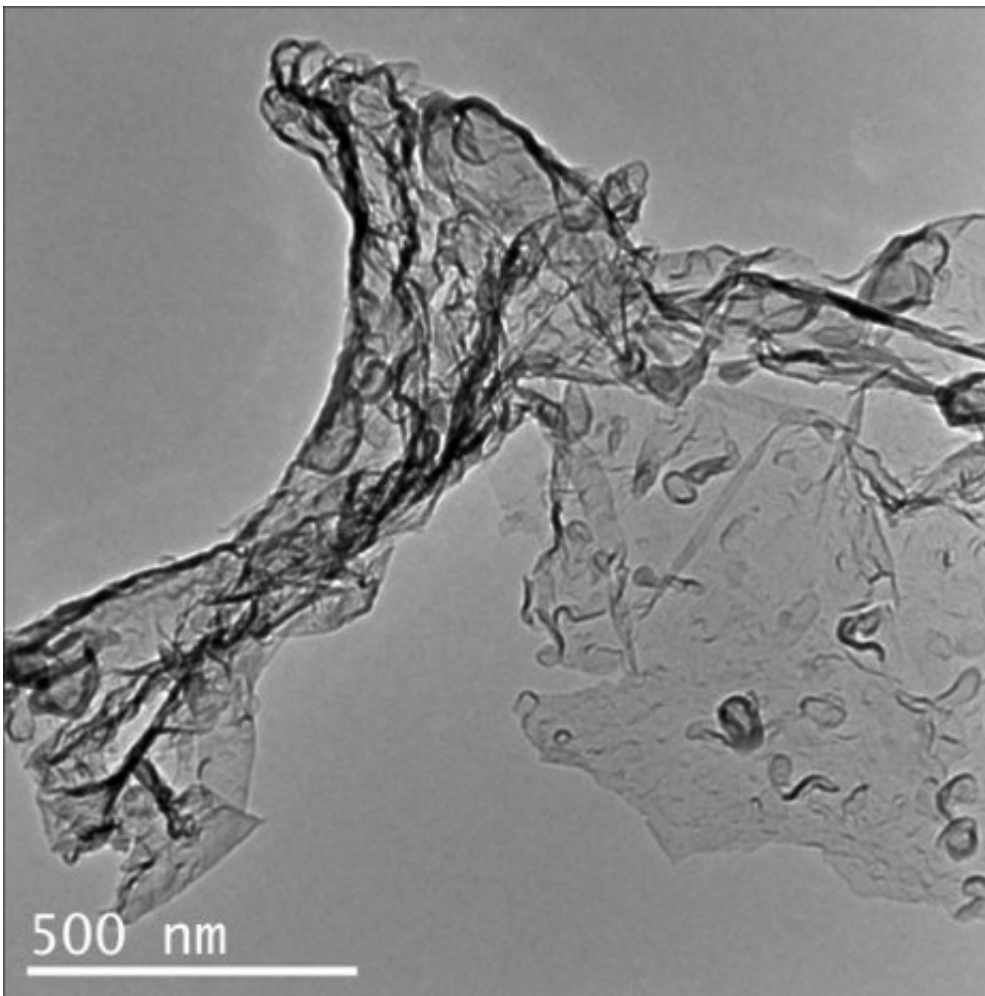


From lemons to lemonade: Reaction uses carbon dioxide to make carbon-based semiconductor

May 21 2012, By Marcia Goodrich



Transmission electron microscopy image of carbon nitride created by the reaction of carbon dioxide and Li_3N .

(Phys.org) -- A materials scientist at Michigan Technological University has discovered a chemical reaction that not only eats up the greenhouse gas carbon dioxide, it also creates something useful. And, by the way, it releases energy.

Making carbon-based products from CO_2 is nothing new, but carbon dioxide molecules are so stable that those reactions usually take up a lot of energy. If that energy were to come from fossil fuels, over time the [chemical reactions](#) would ultimately result in more carbon dioxide entering the atmosphere—defeating the purpose of a process that could otherwise help mitigate climate change.

Professor Yun Hang Hu's research team developed a heat-releasing reaction between carbon dioxide and Li_3N that forms two chemicals: amorphous carbon nitride (C_3N_4), a semiconductor; and lithium cyanamide (Li_2CN_2), a precursor to fertilizers.

"The reaction converts CO_2 to a solid material," said Hu. "That would be good even if it weren't useful, but it is."

And how much [energy](#) does it release? Plenty. Hu's team added [carbon dioxide](#) to less than a gram of Li_3N at 330 degrees Celsius, and the surrounding temperature jumped almost immediately to about 1,000 degrees Celsius, or 1,832 degrees Fahrenheit, about the temperature of lava exiting a volcano.

Hu's work is funded by the National Science Foundation and detailed in the article ["Fast and Exothermic Reaction of \$\text{CO}_2\$ and \$\text{Li}_3\text{N}\$ into C–N-Containing Solid Materials."](#) authored by Hu and graduate student Yan Huo and published in the *Journal of Physical Chemistry*.

Provided by Michigan Technological University

Citation: From lemons to lemonade: Reaction uses carbon dioxide to make carbon-based semiconductor (2012, May 21) retrieved 20 March 2024 from

<https://phys.org/news/2012-05-lemons-lemonade-reaction-carbon-dioxide.html>

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