Breakthrough with New Technique for Graphene Production

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A new technique for growing graphene, called nanoCVD involves growing graphene in an industrial cold wall Chemical Vapor Deposition system. This breakthrough in graphene technology could have many applications for warfighter technologies.

Graphene is the thinnest substance capable of conducting electricity, but is also flexible and one of the strongest known materials. Because of these characteristics, scientists and engineers have dedicated years to adapting graphene to flexible electronics and other applications. Light weight, wearable electronics made from graphene are becoming more and more common and can help decrease the load burden for the warfighter, potentially providing chemical, biological, radiological and nuclear (CBRN) early warnings and medical monitoring in the field. These uses are currently hindered by costly and difficult graphene production, limiting its usefulness for potential defense applications. The ability to cost effectively manufacture high quality, large area graphene is essential for future graphene applications commercially and within the Department of Defense. Researchers from the University of Exeter discovered a new method for producing graphene that is less expensive and easier than previous methods. [1] This method allowed the researchers to make breakthroughs in graphene applications.

The new technique, called nanoCVD, involves growing graphene in an industrial cold wall Chemical Vapor Deposition (CVD) system that was recently developed by the UK graphene company Moorfield. [1] The method is based on a concept already used for other manufacturing processes in the semiconductor industry, and demonstrates, for the very first time, a way to mass produce graphene with present facilities. The researchers state that their method can grow graphene 100 times faster, reduce costs by 99 percent and enhance the electronic quality of the graphene. [2]

Professor Monica Craciun from Exeter said the new discovery could pave the way for “a graphene-driven industrial revolution.” [1]

"The extremely cost-efficient procedure that we have developed for preparing graphene is of vital importance for the quick industrial exploitation of graphene," said former Exeter professor Thomas Bointon. [2]

This breakthrough in graphene technology has significant implications for the warfighter. The research team used the technique to create and demonstrate several new applications for graphene:

- The first graphene-based transparent and flexible touch sensor: The sensors can be used to create more flexible electronics and a truly flexible electronic skin for use in robot manufacturing. [2]
- GraphExeter: The most transparent, lightweight and flexible material ever created that can conduct electricity was created by sandwiching molecules of ferric chloride between two layers of graphene. This could revolutionize wearable electronic devices and be used to create ‘smart’ mirrors or windows, with computerized interactive features. In addition, solar panel efficiency could improve more than 30 percent because of the material’s transparency over a wide light spectrum. [3] Advances in solar efficiency could assist the military in achieving the goal of at least 25 percent of its energy derived from renewable sources. [4]
- Embedding transparent, flexible graphene electrodes into textile fibers [5]: This is the first example of a textile electrode being embedded in yarn. “Monolayer graphene” has exceptional electrical, mechanical and optical properties, making it highly attractive as a transparent electrode for applications in wearable electronics. [5] This development brings sensors in clothing one step closer to reality.

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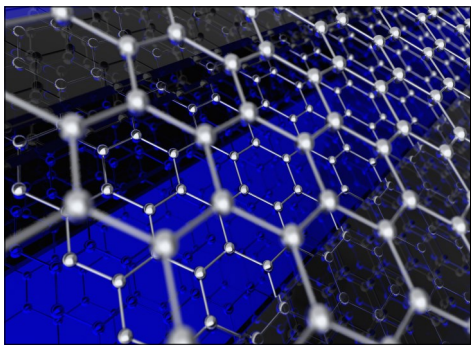

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