Laser Rastering and Photoprocessing to Create Graphene Sheets

Bench-top production of graphene sheets via laser rastering and photoprocessing of graphite oxide

The inventors have developed a method to produce macroscale graphene from graphite oxide sheets or extended films. The method uses synthetic methods and laser excitation/irradiation in both pulsed or continuous wave excitation mode. The laser induced processes do not require high power densities. The process is easily scalable and can be done under ambient conditions. The required lasers are commercially available and the starting material, graphite oxide is inexpensive and can be synthesized via standard known methods. The large-scale production of graphene from graphite oxide is achieved by simple rastering of the laser beam across the surface of a graphite oxide foil or by using broad beam irradiation. Alternatively, if a pattern of graphene is desired, conventional lithographic techniques can be used to produce the pattern.

Summary Bullets

- Large-scale production of graphene
- Can be performed in a variety of environments from ambient to inert.
- Patterned graphene features readily and easily achieved

Solution Advantages

- Large-scale production of graphene
- Can be performed in a variety of environments from ambient to inert.
- Patterned graphene features readily and easily achieved
- Photoprocessed graphene can be directly deposited on any substrate
- Starting material is an easily synthesized bulk, macroscale material
- Overall method is scalable
- Does not require harsh chemicals or high temperatures

Potential Commercial Applications

- The development of components with high strength to weight ratio for such uses as windmill blades or aircraft components

- High frequency transistors.
- Electronic device display screens
- Graphene sheets: ultracapacitors that store electrons on graphene sheets show better performance than batteries

Background and More Information

Graphene is a one-atom thick, two-dimensional, hexagonal, planar sp2 hybridized carbon network. Despite its simple chemical structure, graphene exhibits a myriad of unique electrical properties, including ballistic transport of electrons and high electron mobility. Additionally, although it has a simple structure, graphene is challenging to produce. Reproducible, inexpensive growth strategies for graphene continue to be pursued, as an alternative to methods that require vacuum pressures or clean room facilities.

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