

Graphene Sheets

Researchers in Hongjie Dai's lab have developed a low-cost method for making large scale, pristine, and functionalized graphene sheets for electronic and biological applications. The method produces single-layer graphene sheets that are stably suspended in organic solvents. These graphene sheets exhibit high electrical conductance and show metallic behavior and phase coherent electron transport at low temperatures.

Using this method, the inventors have prepared and functionalized single-layer biocompatible nano-graphene oxide (NGO) sheets down to a few nanometers in lateral width. These photoluminescent NGO sheets may be applied to live cell imaging in the infrared range with ultra-low background. In addition, pi-stacking is used for ultra-high drug loading for targeted cancer cell destruction.

Applications

- **Electronic** applications of graphene sheets:
 - semiconductors/integrated circuits
 - photovoltaic cells
 - transparent conducting electrodes
 - ultracapacitors
- **Biological** applications of graphene sheets:
 - live cell imaging
 - drug delivery
 - single molecule gas detection

Advantages

- **Scalable** - chemically derived pristine graphene sheets could lead to future scalable graphene devices

- **Low cost production**
- **Pristine sheets:**
 - high electrical conductance at room and cryogenic temperatures
 - high quality for use in solar cells

Publications

- Li, Xiaolin; Zhang, Guangyu; Bai, Xuedong; Sun, Xiaoming; Wang, Xinran; Wang, Enge; Dai, Hongjie. (2008) . [*Nature Nanotechnology* 3, 538-542.](#)
- Xiaoming Sun, Zhuang Liu, Kevin Welsher, Joshua Tucker Robinson, Andrew Goodwin, Sasa Zaric, Hongjie Dai. [*"Nano-Graphene Oxide for Cellular Imaging and Drug Delivery"* Nano Res, 1, 203-212 , 2008. PMCID: PMC2834318](#)
- [*"Pristine and Functionalized Graphene Materials"* \(U.S. Patent Application Publication No. 20100028681\)](#)

Patents

- Published Application: [20100028681](#)
- Issued: [9,991,391 \(USA\)](#)

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