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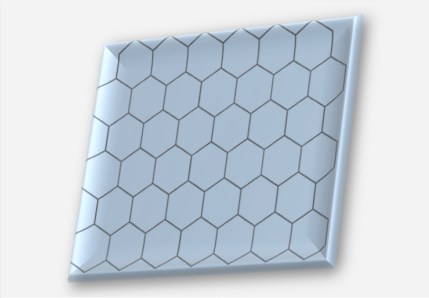
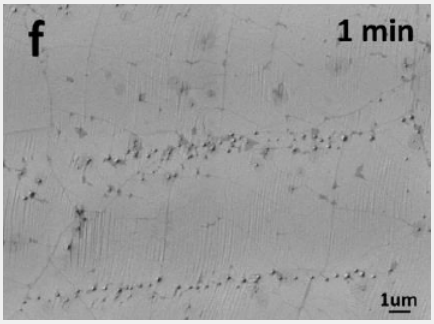
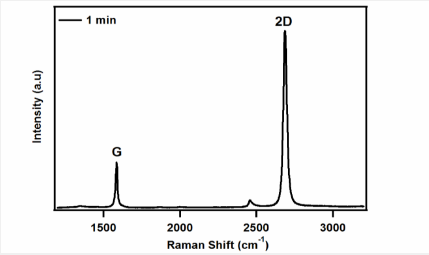
GROWING GRAPHENE BY CVD IN LESS THAN 1 MINUTE







Background

Graphene is attracting more and more attention in a number of fields thanks to its incredible electrical and mechanical properties. One of the obstacles hindering the broad adoption of graphene for commercial applications is the high cost and/or low scalability associated with most fabrication methods, especially in the case of large-area uniform graphene sheets. CVD growth on a copper substrates using carbon precursors such as methane has become a reference. However, the growth times of the order of 30 minutes remain too long to ensure profitability considering the high energy costs required for maintaining temperatures close to 1000°C during the reaction.

Technology

We are proposing a new CVD process allowing to reduce the growth time to less than one minute. The growth is performed on a copper substrate under a flow of methane and hydrogen using a standard setup except that purifiers are added on the gas lines in order to eliminate O_2 traces. The result is a uniform high quality graphene single layer covering the whole substrate after only one minute of CH_4 exposure and probably even less. The reaction automatically stops when full coverage is obtained without forming multi-layer islands. This approach is also applicable to other substrates and precursors.

Application

Many predict that graphene is the best possible candidate for replacing silicon in future electronics, which of course represents an enormous market. Many demonstrations of graphene FETs have already been made. There is also a lot of interest for graphene interconnects. Apart from micro-electronics, graphene has numerous other promising applications:

- Flexible displays,
- Photovoltaics,
- Sensing,
- Energy storage,
- Structural materials, and many more.

Competitive Advantages

- High throughput with growth time < 1 min;
- Reduction of energy costs;
- Requires minimal change to standard setup;
- Self-stopping process: no need for a tight control of the growth time;
- Complete uniform single layer without multi-layer islands;
- High quality, little defects as confirmed by Raman spectroscopy.

Patent

US Patent Application US 15/189,545 "METHOD OF GROWING A GRAPHENE COATING OR CARBON NANOTUBES OF A CATALYTIC SUBSTRATE"

Next Steps

The technology is available for licensing. We are looking for a partner interested in helping us further develop the technology in order to bring it to market. Our next step is to implement the technology in a roll-to-roll setting.

Contact

Chloe Archambault, Eng.
Project Manager, Business Development, Univalor
+1 (514) 340-8523
chloe.archambault@univalor.ca

Pierre Levesque, Ph.D.
Research Officer, Department of Chemistry, University of Montreal
+1 (514) 340-4711 ext. 7453
p.levesque@umontreal.ca

Université de Montréal

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