New carbon nanotube production method with the possibility of scale up to large industrial levels

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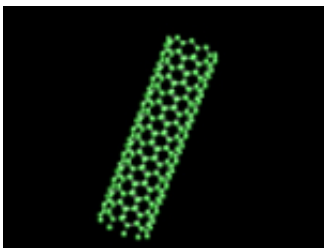

McGill University researchers have developed a new method for producing carbon nanotubes that has great commercial promise. The work of Professor Jean-Luc Meunier and doctoral student David Harbec, both of the Department of Chemical Engineering, is the subject of a patent application, and the findings of their team have just been published in the Journal of Physics D: Applied Physics.

Carbon nanotubes (CNTs), discovered in 1991, are seamless cylinders composed of carbon atoms in a regular hexagonal arrangement, closed on both ends by hemispherical endcaps. They exhibit remarkable mechanical and electronic properties. Applications include high-strength composites, advanced sensors, electronic and optical devices, catalysts, batteries, and fuel cells.

The current low-volume production methods and high production costs are the limiting factors in the CNT high-growth market. The McGill researchers developed a new method and apparatus to produce CNTs with the possibility of scale up to large industrial levels that is based on thermal plasma technology. Plasmas form the fourth state of matter after gas, while the term "thermal plasmas" refers to their typical state of almost thermal equilibrium between electrons, ions, atoms and molecules. Thermal plasmas typically have temperatures between 4,000°C and 25,000°C, and are created by electric arcs or magnetic induction discharges.

"The use of carbon nanotubes in advanced materials is not only limited by their price, but more importantly by their unavailability in large quantities," notes Prof. Meunier. "This method using thermal plasmas brings production towards industrial levels at megawatt powers, and Quebec is an important player worldwide in thermal plasmas."

Meunier and Harbec are the authors, along with McGill researchers Liping Guo, Raynald Gauvin and Nadine El Mallah, of the article "Carbon nanotubes from the dissociation of C2Cl4 using a dc thermal plasma torch," appearing in the July 14 issue of Journal of Physics D: Applied Physics.

McGill University is currently seeking licensees to its patent-pending technology for producing CNTs, and the McGill researchers have just received an Idea to Innovation grant from the Natural Sciences and Engineering Research Council of Canada to help bring their technology closer to market.

Dr. Meunier is a member of the Plasma-Québec Network and of the Plasma Technology Research Centre, a McGill University and Université de Sherbrooke collaboration in the field of thermal plasmas. In terms of scientific manpower and funding, Quebec's contribution

exceeds 50% of the total Canadian contribution to plasma technologies.

The original press release is available here