Various Synthesis Technologies and Applications of Nanostructured Allotropes of Carbon

C. Côté, R. Nouar, R. Porter, **A. Sarkissian**, S. Wolfe, Plasmionique Inc, Varennes, QC, Canada

M. Ionescu, NRC, London, ON, Canada,

K. Voon, K.D. Chowdhury, A.Nojeh, UBC, BC, Canada

G.R. Bigras, L. Stafford, University of Montreal, QC Canada

Potential applications of nanostructured carbon allotropes have drawn considerable attention from various industrial fields, due to their potential applications stemmed from their outstanding electrical, mechanical, and optical properties. Example of applications in nanoelectronics, nano-electromechanical system (NEMS), flexible electronics, advanced energy production and storage devices, like batteries and fuel cells and super capacitor, as well as gas and chemical sensors, to name a few, are driving the global interest. Their unique characteristics placed them among the most promising molecular building blocks in nanotechnology. However, various applications require structures with different building blocs; therefore, it is necessary to develop specific strategies for selective growth, with excellent control over the size, electrical, mechanical and optical characteristics, in order to fully exploit their potentials. Moreover, some applications, particularly those related to nanoelectronics and NEMS, will require doping of these molecular structures with various dopants in order to modify their electrical properties.

There are variety of techniques used for fabrication of various allotropes of carbon nanostructures. Plasma- and vacuum assisted synthesis techniques have been used as a strategy to assist the synthesis at lower temperatures, since plasma-assisted dissociation of precursors used for synthesis, facilitate the nanomaterial growth at low temperatures [1]. Plasma techniques have also been used to dope graphene and CNT with nitrogen [1,2], an important step for nanoelectronic applications. In this presentation we will discuss various synthesis strategies and their specific advantages. We will also present characteristics of some samples produced from different techniques, and finally will present example of applications related to energy production using thermoelectric convertors [4] and development of gas sensors.

[1] M. Ionescu, et al. ESC Transactions, 25,8, (2009), 737-748 ; [2] J-B. Kpetsu, et al. Nanoscale Res. Lett. 4;5, 3, (2010), 539-544 ; [3] Y. Ayadi, et al. MicroNano 2015 conference proceedings ; [4] K.D. Chowdhury,et al., IVNC proceedings, 2016