PO4067

**Functionalization of CNT arrays and ribbons by atmospheric pressure plasma**

David DUDAY[1], Rémy MAURAU[1], Nicolas BOSCHER[1], Jérôme GUILLOT[1], Gilles FRACHE[1], Patrick CHOQUET[1], Jean Christophe LAMBRECHTS[1], Mark SCHULZ[2], Vesselin SHANOV[2]

[1]CRP Gabriel Lippmann, BELVAUX, Luxembourg [2]University of Cincinnati, Cincinnatti, United States

duday@lippmann.lu

Synthesis of long carbon nanotube (CNT) arrays and the process for growing them fast in dense arrays is inherently scalable, can be used on different substrates and all this opens range of new applications [1]. From CNT arrays, different macroscopic structures can be processed such as yarns and ribbons [2]. Yarn is obtained by spinning, drawing and twisting CNTs from an array. Drawing without twisting produces ribbons [2]. The chemical functionalization of these CNT macroscopic structures can be useful for a lot of applications such as sensor, electrodes, actuators, energy storage devices, etc. One promising approach reported here is to functionalize them by plasma teratment at atmospheric pressure because it offers a good compromise between the high control and flexibility of the processes and a low cost compared with low pressure processes [3].
In this paper, the functionalization and decoration of CNT arrays and ribbons by dielectric barrier discharge processes is investigated. Two different kinds of functionalization are studied: chemical group grafting and decoration with oxide clusters. We discuss the influence of the substrate (arrays, ribbons) as well as of the different deposition parameters (power, discharge mode, gas mixture, duty cycle, electrode configuration) on the density, size, shape and chemical state of the grafted groups or clusters. The effects of the plasma treatments on the CNTs are also studied.
[1] Zhang, X.; Li, Q.; Holesinger, T.; Arendt, P.; Huang, J.; Kirven, P.; Clapp, T.; DePaula, R.; Liao, X.; Zhao, Y.; Zheng, L.; Peterson, D.; Zhu, Y., Advanced Materials 19 (2007) 4198-4201.
[2] I. J. Beyerlein, P. K. Porwal, Y. T. Zhu, K. Hu and X. F. Xu, Nanotechnology 20 (48), 485702.
[3] T.I.T. Okpalugo, P. Papakonstantinou, H. Murphy, J. Mclaughlin, N.M.D Brown, Carbon 43 (2005) 2951-2959.

**Keywords**
carbon nanotube
DBD
functionalization
XPS
TEM