

Synthesis and characterization of graphene nanowalls / carbon nanotubes hybrid nanostructures

J. Marti-Gonzalez^{1,2}

F. Pantoja^{1,2}, A. Musheghyan-Avetisyan^{1,2}, I. Alshaikh^{1,2}, R. Amade^{1,2}, J.L. Andújar^{1,2}, E. Pascual^{1,2} and E. Bertran-Serra^{1,2}

¹ ENPHOCAMAT (FEMAN) Group, Dep. Applied Physics, Universitat de Barcelona, C/ Martí i Franquès, 1, 08028 Barcelona

² Institute of Nanoscience and Nanotechnology (IN2UB), Universitat de Barcelona

jmartigonzalez@ub.edu

In this work we propose a new method to obtain hybrid structures of carbon nanotubes (CNTs) and graphene nanowalls (GNWs). Both are carbon-based nanostructures that present high specific surface, high electric conductivity, chemical inertness and thermal and mechanical stability. These properties made them good candidates for several applications, such electrodes in supercapacitors [1, 2]. CNTs are obtained directly on stainless steel surface by plasma enhanced chemical vapor deposition (PECVD), without use of diffusion barrier and using the internal alloys elements of the substrate as a catalyst. With this approach is possible to obtain low resistance contact between the CNTs and the substrate [3]. GNWs obtained by inductively coupled plasma chemical vapor deposition (ICP-CVD) present catalyst free growth, so virtually they can be grown on every substrate that withstands the synthesis temperature. As a result, hybrid structures of GNWs-CNTs can be synthesized. The aim of the present work is to obtain different types of carbon hybrid nanostructures by combining GNWs and CNTs and to determine their properties. Characterization shows that various samples of independently CNTs, GNWs, and combination of CNTs-GNWs morphologies have been obtained.

References

- [1] R.A. Fisher, M. R. Watt, and W. Jud Ready, ECS Journal of Solid State Science and Technology, vol. 2, no. 10, pp. M3170–M3177, 2013.
- [2] Y. Chi, C.Hu, K. Huang, H. Shen, R. Muniyandi, Electrochimica Acta, vol 221, pp. 144-153, 2016.

- [3] Y. Wang, D. Li, W. Sun, G. Li, H. Zang, Z. Xi, X. Pei, Y. Li, Y. Cheng. Vacuum, vol. 149, pp. 195–199, 2018.

Figures

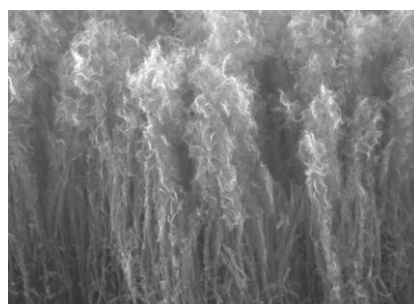


Figure 1. SEM image of GNWs grown on top of CNTs.

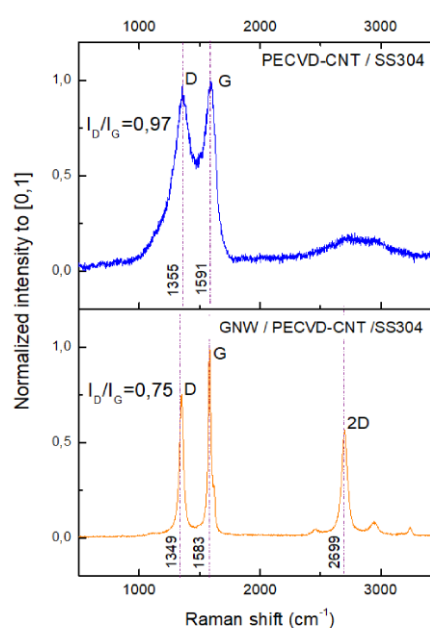


Figure 2. Raman spectra comparison of CNTs (Blue) and GNWs/CNTs (Orange). In GNW/CNTs spectra the characteristic peaks and ratios of GNWs can be appreciated.