STUDY OF THE SUPERCAPACITIVE BEHAVIOR OF CARBON-NANOTUBES BASED ELECTRODES PREPARED BY CVD AND PECVD

Toygan Mutlu, Burak Caglar, Eric Jover, Roger Amade, Enric Bertran
FEMAN Group, IN2UB, Department of Applied Physics and Optics, Universitat de Barcelona, c/Martí i Franquès 1,E-08028, Barcelona
ebertran@ub.edu

Supercapacitors store electrical energy through double-layer charging and/or faradaic processes. They fill the gap between batteries (low specific power and high specific energy) and conventional capacitors (high specific power and low specific energy), i.e. they have a specific power as high as conventional capacitors and a specific energy close to that of batteries [1].

Due to their outstanding properties (mechanical, electrical, thermal…), carbon nanotubes (CNTs) have been used in an increasing range of applications. In fact, applications related to supercapacitors have already been reported [2-4]. However, the influence of the morphological (CNTs length, diameter and alignment) and functionalization properties of the CNTs has not been studied yet.

In this work, we have prepared CNTs by means of Chemical Vapour Deposition (CVD) and Plasma Enhanced Chemical Vapour Deposition (PECVD) in order to control their alignment (see Figure 1). Other parameters such as catalyst thickness layer, temperature, deposition time have been optimised to tune CNTs length and diameter. Obtained electrodes were further modified to enhance their response by means of plasma techniques. As a dielectric layer of the supercapacitor MnO_2 was added to the surface of the CNTs.

Obtained electrodes were characterized by means of Cyclic Voltametry, Chronopotentiometry and SEM measurements. The two electrochemical methods permit to evaluate the efficiency of the developed electrodes and the SEM results are used to assess the morphology of the CNTs. In this way, we will be able to correlate the CNTs characteristics with the efficiency of the electrodes.

References:

[1] Peng, C., Zhang, S., Jewell, D., Chen, G.Z., Progress in Natural Science, **18** (2008) 777-788.

[2] Chen, J.H., Li, W.Z., Wang, D.Z., Yang, S.X., Wen, J.G., Ren, Z.F., Carbon, **40** (2002) 1193-1197.

[3] Li, C.S., Wang, D.Z., Liang, T.X., Wang, X.F., Ji, L., Materials Letters, **58** (2004) 3774-3777.

[4] Lee, C.Y., Tsai, H.M., Chuang, H.J., Li, S.Y., Lin, P., Tseng, T.Y., Journal of the Electrochemical Society, **152** (2005) A716-A720.

Figures:

A **B**

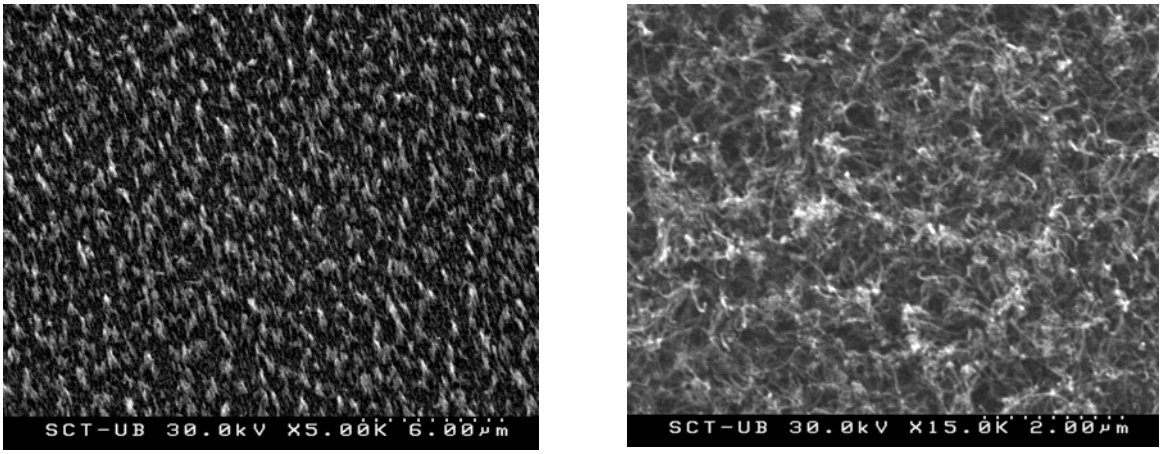

Figure 1. A: Electrode based on aligned CNTs grown by PECVD. B: Electrode based on CNTs grown by CVD.