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Abstract title: High energy ultracapacitor electrodes based on conventional and nitrogen doped vertically aligned carbon nanotubes

Abstract = The Aerosol Assisted Catalytic Chemical Vapor Deposition method allows the controlled growth of Vertically Aligned Carbon Nanotubes carpets (VACNT) on conductive substrates[1][2]. This process has been optimized for the growth of dense VACNT at low temperature (580 to 615°C) on aluminium foils, leading to a single-step process that meets industrial requirements to the development of low cost, highly conducting and light ultracapacitor electrodes[3]. VACNT can be used as a support for deposition of pseudocapacitive materials such as electronic conducting polymer (ECP). An electrodeposition of poly(3-methylthiophene) on VACNT was developed to improve the capacitance[4]. Homogenous deposition of ECP was achieved all along the carpet by pulsed chronoamperometry. To keep improving performances, our approach consists in modifying the properties of the VACNT by doping the carbon nanotubes with heteroatoms. Nitrogen doping should provide opportunities to increase the capacitance owing to the oxidation of the nitrogen sites and also the specific surface, in similar conditions of densities and diameters, because of their bamboo shape[5]. The wettability and electric conductivity should be improved by the doping[6][7]. The growth of nitrogen doped VACNT was achieved at 850°C on Si substrates by using ethylenediamine as N and C source. Such carpets exhibit a density of 4.10^{10} NTC/cm² of few walled nanotubes and a N content of 4.5% at (XPS). Their storage capacity will be presented.

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