VACNT based nanocomposite electrodes on Aluminium for innovative supercapacitors

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The aim of this work is to develop innovative electrodes materials with high specific capacitance based on vertically aligned carbon nanotubes (VACNT) to be included in supercapacitors. Catalytic chemical vapor deposition (CCVD) is the best method to grow VACNT but considering the aluminium melting temperature (c.a. 660°C), the synthesis of VACNT on such substrates requires a significant reduction in the growth temperature as compared to conventional substrates [1-2]. Our approach is first to identify the most relevant synthesis parameters to achieve VACNT growth at such a low temperature by using precursor mixtures more favourable for a decomposition at low temperature [3]. Our results show that, with a single-step aerosol assisted CCVD process; it is possible to obtain clean, long and dense VACNTs on Al current collectors, with a growth rate at the best level of the state of the art at such low temperature. VACNT are then used to develop new pseudocapacitive electrode materials based on VACNT modified with Electronic Conducting Polymers (ECP) and/or metal oxide electrodeposited in a controlled manner [4]. Nanocomposite electrodes of poly-3-methylthiophene (P3MT) in ionic liquid and manganese oxide in aqueous media both homogeneously deposited on VACNT have been elaborated and evaluation of storage properties will be presented. Finally, we select best nanocomposite configurations for their upscaling in prototype modules demonstrating the industrial feasibility of the approach.

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