



HAL
open science

P3MT/VACNT/Al Nanocomposites Electrodes With High Capacitance For Supercapacitor

T Vignal, L Darchy, A Boisset, H. Hauf, J. Descarpentries, Q Mestre, M. Pinault, M. Mayne-L'Hermite, P Banet, P H Aubert

► **To cite this version:**

T Vignal, L Darchy, A Boisset, H. Hauf, J. Descarpentries, et al.. P3MT/VACNT/Al Nanocomposites Electrodes With High Capacitance For Supercapacitor. First Transpyrenean Encounter on Advanced Materials (Publié dans Materials and Devices, Vol. 2, n°1, p. 21 (2017), Jul 2017, Sète, France. 10.23647/ca.md20170407 . cea-02340812

HAL Id: cea-02340812

<https://cea.hal.science/cea-02340812>

Submitted on 31 Oct 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



P3MT/VACNT/Al Nanocomposites Electrodes With High Capacitance For Supercapacitor

T. Vignal,^{a,b} L. Darchy,^b A. Boisset,^b H. Hauf,^b J. Descarpentries,^b Q. Mestre,^c M. Pinault,^c M. Mayne-L'Hermite,^c P. Banet,^a P.H. Aubert^a

^a LPPI, EA 2528, 5 MAIL Gay Lussac, Université de Cergy-Pontoise, France

^b NAWATEchnologies SA, 190 avenue Célestin Coq-ZI, ROUSSET, France

^c NIMBE, CEA, CNRS, Université Paris-Saclay, CEA Saclay, Gif-sur-Yvette, France

Corresponding author: pierre-henri.aubert@u-cergy.fr

Keywords : POLY(3-METHYLTHIOPHENE), CARBON NANOTUBES, ELECTRODE MATERIALS, SUPERCAPACITORS

Supercapacitors are desirable for applications requiring high power densities. Among the various types of supercapacitors, electrochemical ones based on electronically conducting polymers (ECP) as electrode material are particularly interesting because of their high capacitance (1). However, their energy densities and their electrochemical stability are still limited (2,3). In order to improve the capacitance and the energy density of such pseudo-capacitive supercapacitors, our strategy consists in making nanocomposite electrodes of poly-3-methylthiophene (P3MT) in ionic liquid media. These depositions were made on the surface of nanostructured electrodes composed of very dense carpet of vertically aligned carbon nanotubes ($10^{11} - 10^{12}$ CNT/cm²) on an aluminium collector (VACNT/Al). In this study, different electropolymerizations methods (cyclic voltammetry, galvanostatic, potentiostatic, pulsed methods (3,4)) were used to optimized the deposition and the storage properties of P3MT. Thus, nanocomposites with weight ratios of P3MT/(P3MT+CNT) ranging from 5 to 90% were obtained and characterized by electrochemistry (CV and EIS) and microscopy. The results show that conformal depositions of polymers were obtained. In the case of the best nanocomposites, the electrodes capacitance increase from 32 mF/cm² to 1300 mF/cm². Finally, stability tests of electrodes and coin cells assembly were studied and their performances will be presented.

References:

- [1] Mastragostino M. et al., Adv. Mater. 1996, 8, 331.
- [2] Schnoor T. I.W. et al., Carbon 2013, 60, 229.
- [3] Lagoutte S. et al., Electrochimica Acta 2014, 130, 754.
- [4] Sharma R.K. et al., Electrochem. Commun. 2008, 10, 268.