Accepted Manuscript

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PII: S0013-4686(18)30794-1

DOI: 10.1016/j.electacta.2018.04.063

Reference: EA 31630

To appear in: *Electrochimica Acta*

Received Date: 10 November 2017

Revised Date: 3 April 2018

Accepted Date: 8 April 2018

Please cite this article as: J.J. Alcaraz-Espinoza, H.P. de Oliveira, Flexible supercapacitors based on a ternary composite of polyaniline/polypyrrole/graphite on gold coated sandpaper, *Electrochimica Acta* (2018), doi: 10.1016/j.electacta.2018.04.063.

Flexible supercapacitors based on a ternary composite of polyaniline/polypyrrole/graphite on gold coated sandpaper

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Abstract

Developing low-cost and efficient flexible supercapacitors is an important step towards the production of new energy storage systems for efficient wearable electronic devices. In this work, we report a simple and cost-effective approach to produce flexible electrodes for supercapacitors. The system consists of a complex ternary structure of hierarchical polyaniline (PAn) assembled on a polypyrrole (PPy) layer deposited on graphite pencil traces (Grt) in sandpaper. The proposed ternary composite PAn-PPy-Grt-Sp assembled in a device offered a maximal areal capacitance of 55.35 mF cm^{-2} at 0.3 mA cm^{-2}, a higher value when compared to its counterparts of PAn-Grt-Sp (31.8 mF cm^{-2}) and PPy-Grt-Sp (19.75 mF cm^{-2}). The ternary composite also exhibited a higher energy (4.92 μWh cm^{-2}) and power density (87.09 μW cm^{-2}) at a current density of 0.3 mA cm^{-2} producing a more equilibrated supercapacitor device. The response to mechanical efforts returned negligible variation in electrochemical properties while cyclability remains as 80% of initial value after 3000 cycles.

Keywords: Supercapacitors, hierarchical structures, polyaniline, polypyrrole

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