20th World Summit on Nanotechnology and Expo

October 05-06, 2018 | Los Angeles, USA

Multifunctional materials for textronics: Polymeric composites as wearable Joule heaters and supercapacitors

Helinando P de Oliveira, Jose Jarib Alcaraz-Espinoza, Fernando AG da Silva Jr and **Ravi MAP Lima**
Federal University of Sao Francisco Valley, Brazil

The development of wearable and multifunctional devices for textronics represents a prerequisite for the development of smart textiles with potential application in energy storage, thermal treatment, and antibacterial activity. In this work, we have developed a new electrical conductive cotton yarn based on chemical modification of a substrate by incorporation of functionalized carbon nanotubes followed by chemical (interfacial polymerization) of polypyrrole doped with camphor sulphonic acid. The resulting material presents strong flexibility and conductive/electrochemical properties that favor its application as an electrode of supercapacitor and active component in Joule heater devices. The high conductivity of the flexible composite returns strong variation in temperature under the low electric field, reaching 70°C with the field in order of 5V/cm. In terms of electrochemical properties, a flexible supercapacitor was developed using modified fibers as electrodes. The separator was established as a thin layer of poly(vinyl alcohol) and phosphoric acid, providing an adequate condition for charge separation at interfaces. The results reveal a capacitance in order of 30F/g and electrochemical properties that are maintained after mechanical efforts and repeated washing cycles in association with promising capacitance retention (80%) after 2000 cycles of use. These results confirm the possibility of incorporation of carbon nanotubes/doped polypyrrole in textiles, providing an adequate condition for the integration of sensors with supercapacitors.

Biography

Helinando Pequeno de Oliveira has completed his PhD from the Federal University of Pernambuco and postdoctoral studies from Massachusetts Institute of Technology. He is a professor at Federal University of Sao Francisco Valley (Brazil). He has published more than 76 papers in reputed journals and has been serving as an editorial board member and reviewer of different journals.

helinando.oliveira@univasf.edu.br

Notes: