# Binary composites based on polypyrrole/low cost textile carbon fibers for applications as supercapacitor electrodes

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Nowadays, more efficient energy storage systems have attracted worldwide attention due to growing interest in renewable and sustainable energy sources related to energetic security. In this context, the supercapacitors have played as important role since that they typically have high power density, long cyclic stability, fast charging/discharging rate. Despite of energy storage capacities to be several orders of magnitude higher those of conventional dielectric capacitors, the supercapacitors have much lower than those of batteries. To improve this capacity, the synergism effect of binary composites based on activated carbon fibers (ACF) and polypyrrole (PPy) have been investigated. When used as bulk electrodes, ACF has limited electric characteristics while the PPy suffer from a limited stability during cycling that reduces the initial performance. Based on these considerations, this work proposes the production of a binary composite based on ACF produced from a low cost precursor (textile polyacrylonitrile) and PPy deposited using chemical synthesis from a facile route of the pyrrole polymerization (PPy/low cost textile ACF composite). The morphological and structural characterizations by field emission scanning microscopy (FEG-SEM), Raman spectroscopy, X-ray diffraction spectroscopy (XRD) and fourier transform infrared spectroscopy (FTIR) techniques revealed a binary composite formed by a tridimensional network with the interconnection of the PPy on ACF. This resulting architecture was determinant to significantly increase the energy storage capacities when compared to bulk ACF electrode. From the galvanostatic charge and discharge curves, cyclic voltammetry and electrochemical impedance, the obtained composite had a specific capacitance about 350 F $g^{-1}$ associated to a low resistance and to a good density of energy and power.