SYNTHESIS AND CHARACTERIZATION OF POLY(3,4-ETHYLENEDIOXYTHIOPHENE) (PEDOT) AND BIOWASTE-BASED ACTIVATED CARBON COMPOSITES FOR ELECTROCHEMICAL ENERGY APPLICATIONS.

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Here, we report the synthesis of poly(3,4-ethylenedioxythiophene) (PEDOT) via in-situ polymerization process using iron(III) tosylate as the oxidizing agent. Activated carbon (AC) was prepared from brewery bagasse by two steps: firstly, pre-treatment of dried bagasse powder at 300 °C followed by 6.0 M KOH impregnation and thermal treatment at 850 °C for 1 h. Afterward, AC-PEDOT composite was prepared through in-situ polymerization in the presence of AC and characterized by scanning electron microscopy (SEM), Raman spectroscopy, X-ray diffraction spectroscopy (XRD) and Fourier transform infrared spectroscopy (FTIR). SEM analysis reveals that the PEDOT particles are formed on the surfaces of the graphitic layers of the porous activated carbons; FTIR analysis show the presence of sulfur and oxygenated functional groups, which could serve as active sites for faradaic processes. From electrochemical characterization, activated carbon showed a specific capacitance of 80 F g^{-1} at 5 mVs^{-1}, while the AC-PEDOT composite presents 200 F g^{-1} at 5 mVs^{-1}, given about a 250 % increase. Likewise, the AC attained an energy density of 11 Wh Kg^{-1} and power density of 94 W Kg^{-1} at 0.5 A g^{-1} while the AC-PEDOT composite showed an energy density of 26 Wh Kg^{-1} and power density of 4836 W Kg^{-1} at 0.5 A g^{-1}. The results show promising properties both for the AC-PEDOT and the AC for their application as supercapacitors or batteries.

Keywords: PEDOT, activated carbon, polymer composites

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