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Development of electrodes with nanostructured porosity and controlled chemical properties to be used as electrochemical capacitors

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In this work we report the development of low cost electrodes with potential to be used in supercapacitors using industrial residues and acrylic fibres. The materials were directly produced in the monolithic shape in one step without the need for a pos-production step, which can be considered an advantage over other materials.

The tested materials were prepared in our laboratory using two different precursors. Commercial acrylic textile fibres used to prepare activated carbon fibres (ACF) by activation with CO_2 at 900ºC [1]. Coffee endocarp used to prepare activated carbons (AC) by CO_2 and KOH activation [2, 3].

The produced materials have controllable porosity and chemical surface groups depending on the method used. The main functional groups were quinone, lactone, Si-H, phenol, hydroxyl, carbonyl and ether for AC samples and amine, amide, pyrone, lactone, carbonyl and hidroxyl for ACF samples. Beside all materials have mainly micropores in their nanostructure the BET surface area and the pore volume given by α_s method range from 89 to 1050m^2g^{-1} and 0.04 to 0.50cm^3g^{-1}, respectively.

The tested materials in 1M sulphuric acid media present a very good characteristics to be used in supercapacitors, as determined by the techniques classic cyclic voltammetry, chrono potentiometry, chrono amperometry and electrochemical impedance spectroscopy. The higher specific capacitance was 176F/g.

We will also present some results from ongoing work which involves the use of non-aqueous solvents and other electrolytes.

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