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MORPHOLOGICAL AND STRUCTURAL CHARACTERIZATION OF Fe DEPOSITION IN ACTIVATED CARBON FIBERS FELT

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ABSTRACT

Interest in renewable energy sources based on readily available materials and low-cost technologies has led to new studies on energy storage systems. The ability to increase the energy transmitted from clean energy generation systems with high life cycle, high power and energy density, and the functionality of devices with simple configuration justify the interest in the research associated with the materials used in supercapacitors. Taking into account the increase in energy density in supercapacitor devices, the microporosity presented by carbonaceous materials has been studied for application in electrodes. Carbon fibers have high adsorption capacities, and other attractive characteristics for this application. The aim of this work is to study of the deposition of iron in an activated carbon fiber felt (ACF) with different oxidation conditions, for application as electrode for supercapacitor. With the spontaneous deposition of iron, from saline solutions of the metal, the improvement of capacitive effect is sought. The deposition influence of metallic particles, as well as their interaction with the felt, was analyzed.

MATERIAL AND METHODS

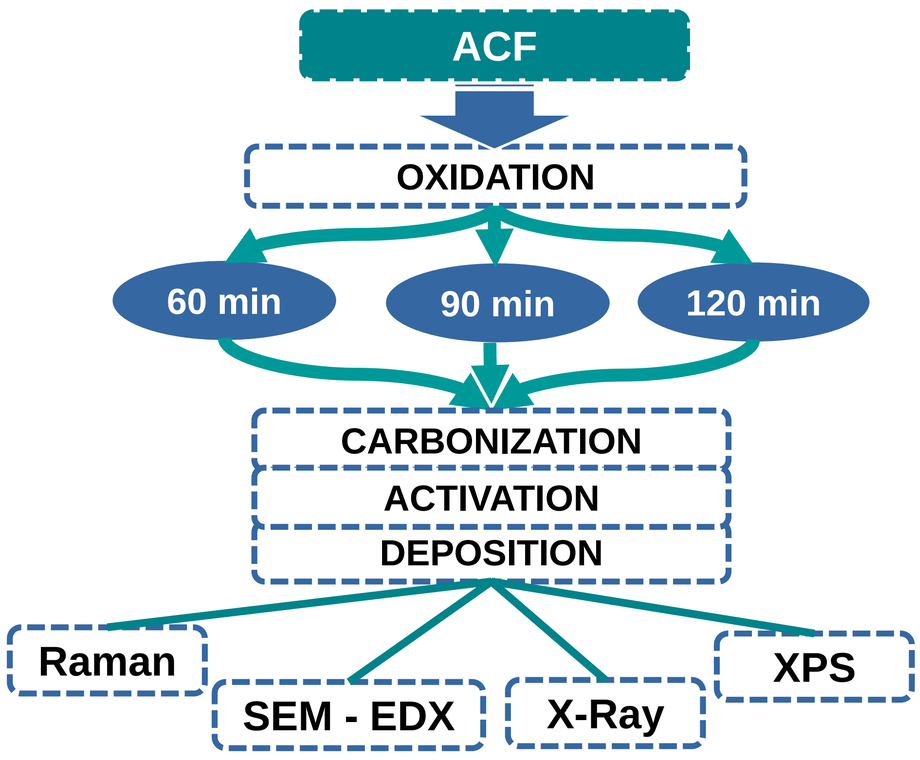

Figure 1: Preparation scheme of samples.

The carbon fiber was immersed in a mixture of deionized water and inorganic salt for 24 hours.

RESULTS AND DISCUSSION

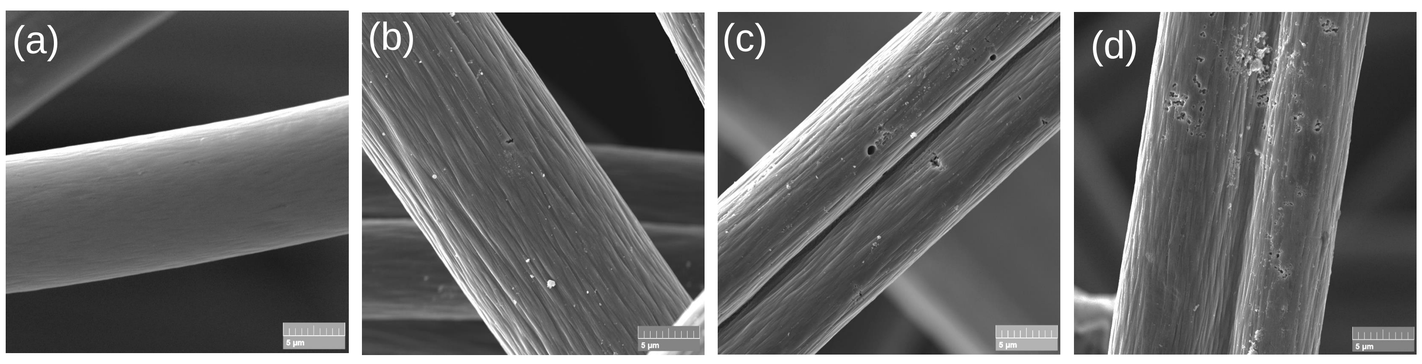

Figure 2: Micrographs of ACF (10 000 X) (a); ACF+Fe at 60 min (b); 90 min (c); and (d) 120 min.

A change in the morphology of the activated fiber is clearly shown in micrographs, confirming the presence of metal found in EDX.

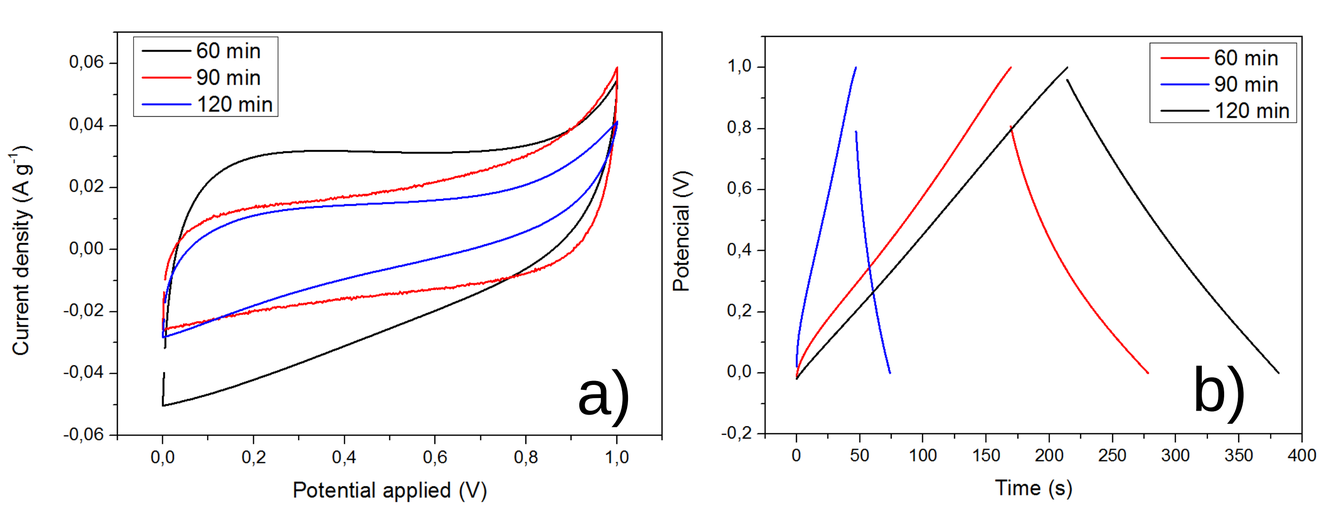

Figure 3: (a) Cyclic voltammetry at 1mV s^{-1} scan rate and (b) galvanostatic curves.

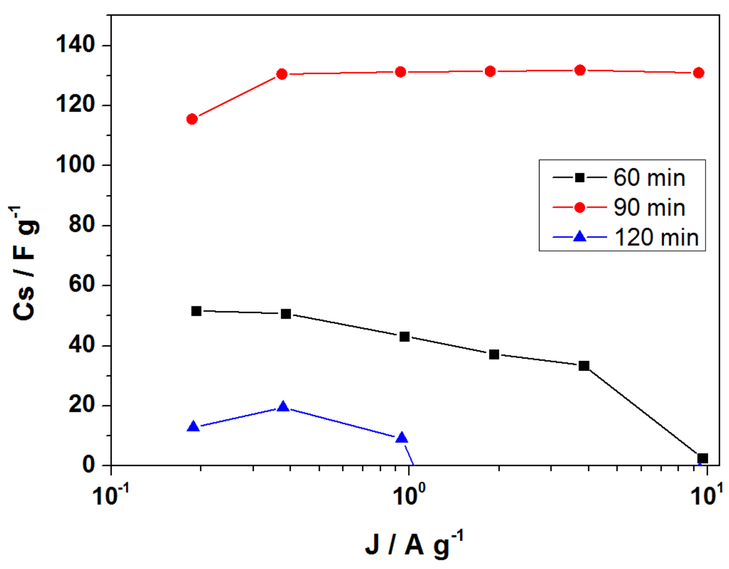

Figure 4: Specific capacity vs. current density.

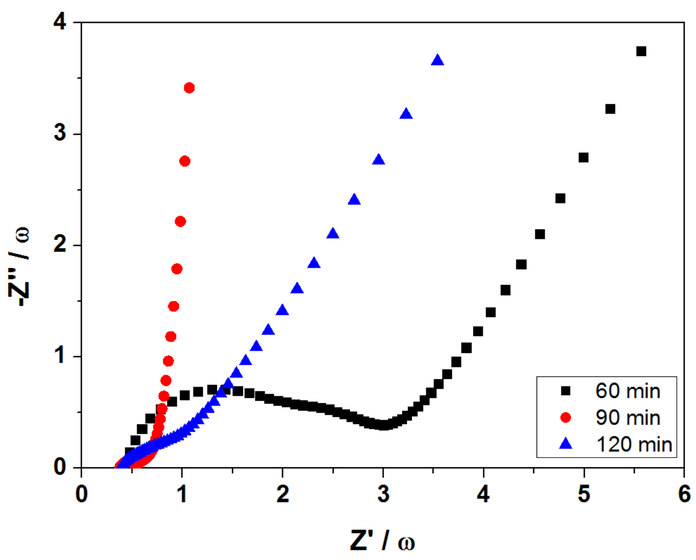

Figure 5: Nyquist diagrams of the samples.

CONCLUSION

It was observed that the oxidation time in the activated carbon fiber changed the morphological characteristic of the fibers. The metal fraction incorporated was about 1.0 %wt Fe. Micrograph images showed that the electroless technique might be used for metals incorporation in activated carbon fiber. The electrochemical results obtained with tests in two electrodes indicated a good performance as electrodes for supercapacitors reaching values up to 130 F g^{-1} for activated carbon fiber felt with 90 minutes of oxidation.