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IRON OXIDE DEPOSITED ON ACTIVATED CARBON FELT FOR APPLICATIONS AS A SUPERCAPACITOR ELECTRODE

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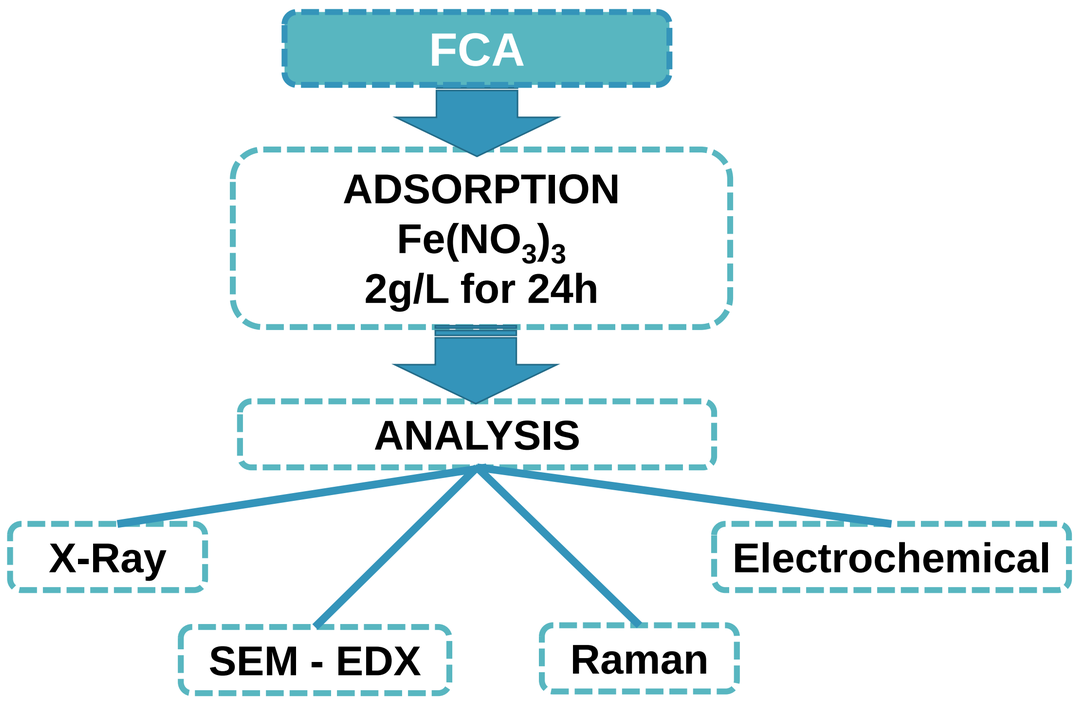
ABSTRACT

The activated carbon fibers from polyacrylonitrile (PAN) has high surface area, distribution of appropriate pores for various applications, specially as active material for supercapacitor electrodes. Recent studies show a combination of electric properties, double-layer capacitive and pseudo-capacitive on iron oxide, which are important for electrode supercapacitor. The aim of this work is to characterize the activated carbon felt with iron oxide particles for electrode supercapacitor applications.

MATERIAL AND METHODS



- **The activated carbon felt was immersed in deionized water and $Fe(NO_3)_3$ solution for 24 hours;**
- **The activated carbon felt-iron oxide composite obtained were characterized by x-ray diffraction (XRD), scanning electron microscopy equipped with energy dispersive x-ray (SEM-EDX) and Raman spectroscopy;**
- **The materials were tested as a supercapacitor electrode in a two-electrode Swagelok®-type cell using 2M H_2SO_4 aqueous solution as electrolyte.**

RESULTS

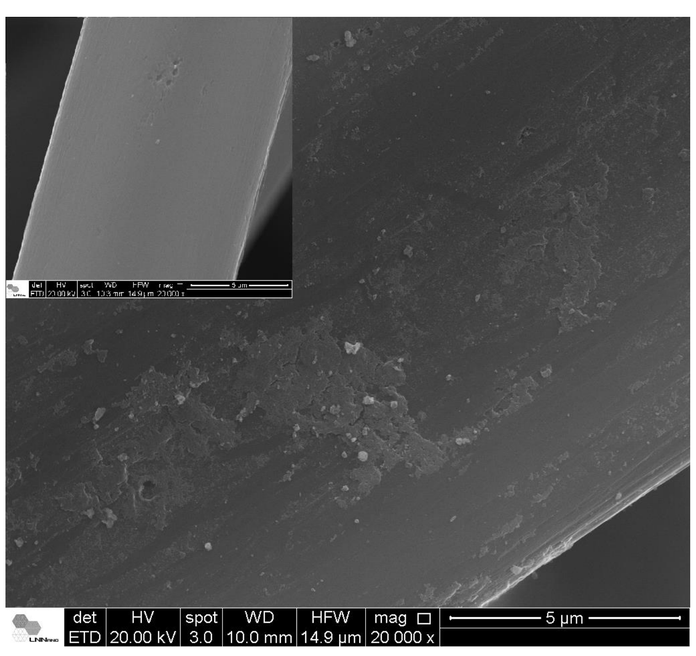


Figure 1: Activated carbon felt with particles of iron oxide Inset: activated carbon felt.

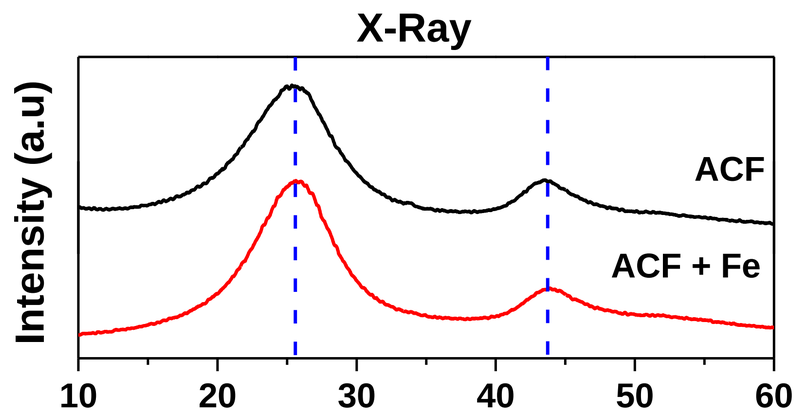


Figure 2: X-Ray diffraction of ACF and ACF+Fe. 26° and 44° are typical carbono peaks.

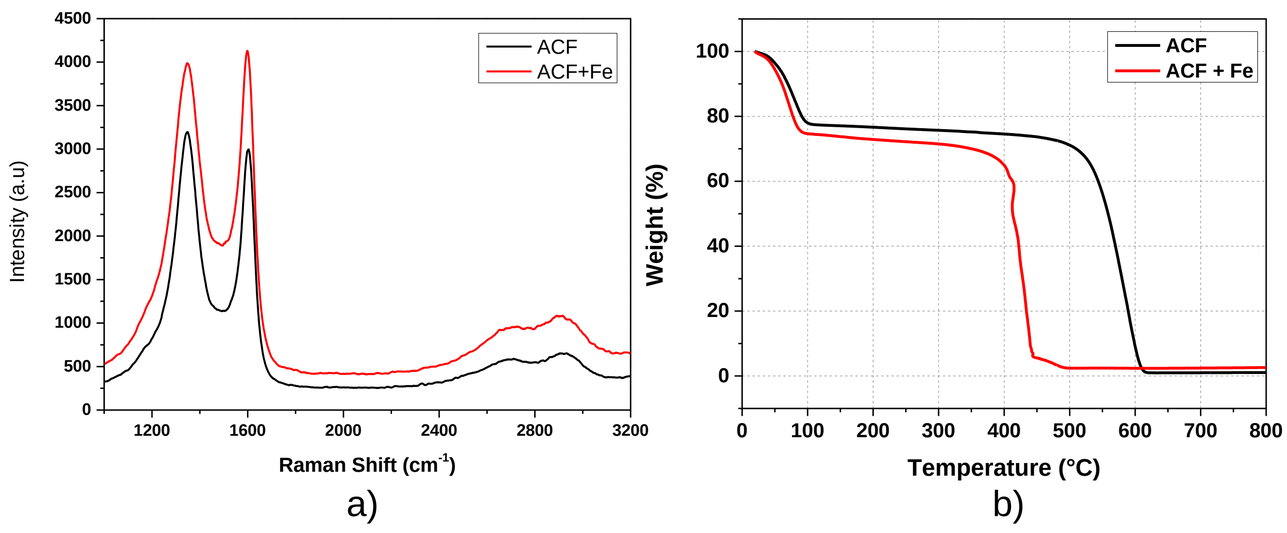


Figure 3: a) Raman spectra of ACF and ACF+Fe, b) TGA curves for ACF and ACF+Fe.

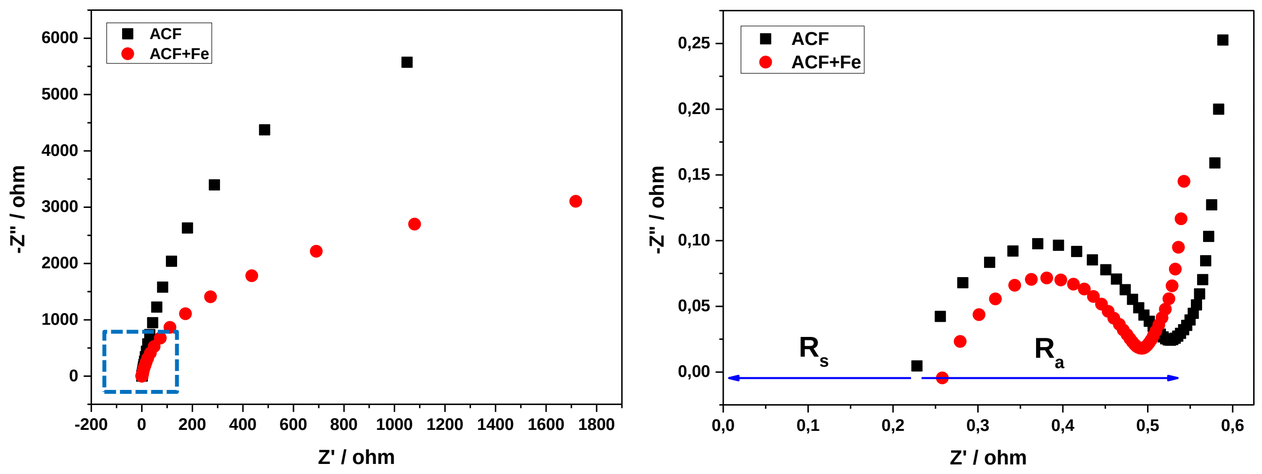


Figure 4: a) nyquist Diagram for ACF and ACF+Fe, b) detail of region (a).

Sample	R_s (Ω)	R_a (Ω)	R_T (Ω)
ACF	0,26	0,23	0,49
ACF+Fe	0,22	0,29	0,51

Table 1: values of resistance (R_s, R_a, R_T). R_a is the arc resistance, R_s is the electrolyte bulk resistance and R_T is total resistance.

CONCLUSION

It was observed that activated carbon fiber showed good adsorption capacity for the metal used. The process of adsorption does not change the fiber structure and morphology. The activated carbon fiber have a high specific surface area, this area is related to metallic fraction incorporated into the fiber, about 3,5%wt of Fe and water content. Tests using the electrochemical cell showed a low total resistence (R_T) of the activated carbon fibers with Fe particles, which confirms that the studied electrode is very good to be used as supercapacitor.