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

Aline Castilho Rodrigues[1]*, Elen Leal da Silva[2], Jossano Saldanha Marcuzzo[2], Emerson Sarmento Gonçalves[1], Andrés Cuña[3] and Maurício Ribeiro Baldan[2]

[1]*Instituto Tecnológico de Aeronáutica, São José dos Campos, SP, Brasil*

[2]*Instituto Nacional de Pesquisas Espaciais, São José dos Campos, SP, Brasil*

[3]*Cátedra de Fisicoquímica- Universidad de la República, Montevideo, Uruguay*

## 1. Introduction

The activated carbon fibers from polyacrylonitrile (PAN) has high surface area, distribution of appropriate pores for various applications, among which we can mention the use as active material for supercapacitor electrodes [1]. Recent studies show properties of combination electric double-layer capacitive and pseudo-capacitive on iron oxide, which are important for a supercapacitor electrode [2]. The aim of this work is to characterize the activated carbon felt with iron oxide particles for application as supercapacitor electrode.

## 2. Experimental

The activated carbon felt were 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.

## 3. Results and Discussions

After iron oxide adsorption on the surface of activated carbon felt there was a significant change in its surface, which can be seen in the figure 1. The SEM images revealed the presence of dark zones, grooves, and roughened surface differently pure fiber, which is smooth and without visible defects. The Raman spectroscopy and x-ray diffraction corroborate the fact that the adsorption process did not affect the morphological structure of the fiber.

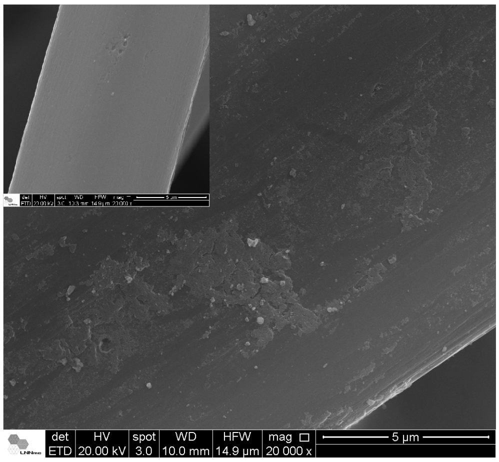


**Fig. 1.** *Activated carbon felt with particles of iron oxide Inset: activated carbon felt.*

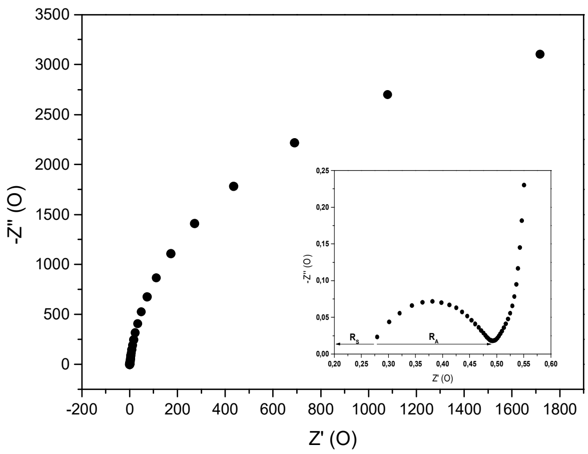


**Fig. 2.** *Nyquist diagram for the ACF-Fe cell. Inset: magnification of the high-frequency region.*

In Figure 2 inset, Rs is the ionic resistance of the electrolyte bulk and Ra is the arc resistance, the total resistance of the cell can be defined as the sum of two (Rs + Ra). The total resistance of the cell is 0,5 Ω, which is a very low resistance. The specific capacity of the material to 2 mA $cm^{-2}$ is 103 F $g^{-1}$.

## 4. References

[1]-G.B. Baur et al. Catalysis Today. Vol. 249, p. 252-258, 2015

[2]- I. Oh et al. Energy. Vol. 86, p. 292-299, 2015

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*Corresponding author: alinerodrigues_1@msn.com