INCREASE OF ELECTRICAL CONDUCTIVITY BY METAL DEPOSITION IN BRASILIAN ACTIVATED CARBON FELT

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1. Introduction

Activated carbon fibers from polyacrylonitrile (PAN) have a variety of applications in industry and have been increasingly studied to exploit their various characteristics. Because of their high specific surface area, chemical and thermal stability, pore size distribution and conductivity is largely used in energy storage devices [1]. Recent studies show that is possible to increase the conductivity of carbon materials with a deposition of metal oxides [2]. The aim of this work is to deposit various metals to improve electric conductivity of an activated carbon fiber obtained from polyacrylonitrile textile.

2. Experimental

The activated carbon felt were immersed in deionized water with a solution of $AgNO_3$, $Cu(NO_3)_2$, $Fe(NO_3)_3$, $NiSO_46H_2O$ and $PdCl_2$ for 24 hours. After the spontaneous process of deposition, the samples were washed and dried in a vacuum oven at 100 ºC for 2 hours. The composite obtained of activated carbon felt and the metals (ACF, ACF + Ag, ACF + Cu, ACF + Fe, ACF + Ni and ACF + Pd) were characterized by Field Emission Gum (FEG), thermal gravimetric analysis (TGA) curves, x-ray photoelectron spectroscopy (XPS) and DC electrical resistivity.

3. Results and Discussions

After the deposition of metals on activated carbon felt, the surface changed significantly, in some cases forming a film that it covered the entire surface of the fiber filaments and in other cases metallic particles of various sizes are distributed homogenously. The TGA analyses show that it the quantity adsorbed on the surface of the ACF was low, less than 10 %. On the other hand, this quantity of metal adsorbed on the surface was enough to change the structure of the material in question and in all cases increased the felt conductivity, how is it possible observer in Tab. 1. XPS analyses showed that it the way the metals were deposited varied in each case, made of metallic particles (silver sample) and oxides films.

Tab. 1. *Data from resistance, resistivity and conductivity of samples obtained by DC electrical resistivity.*

Sample	RS (Ω)	Resistivity (Ω.m)	Conductivity (S/cm)
ACF	2.434	$2.07\ 10^{-03}$	4.83
ACF + Ag	1.127	$9.58\ 10^{-04}$	10.44
ACF + Cu	1.641	$1.39\ 10^{-03}$	7.17
ACF + Fe	1.341	$1.14\ 10^{-03}$	8.77
ACF + Ni	2.131	$1.81\ 10^{-03}$	5.52
ACF + Pd	1.183	$1.01\ 10^{-03}$	9.94

The sample that it showed significant conductivity improvement was ACF + Ag. In Fig. 1a is possible view the metal clusters on the surface of the ACF. This sample presents the greater quantity of metallic particles and few in oxide form, which possibly explains their significant improvement of conductivity.

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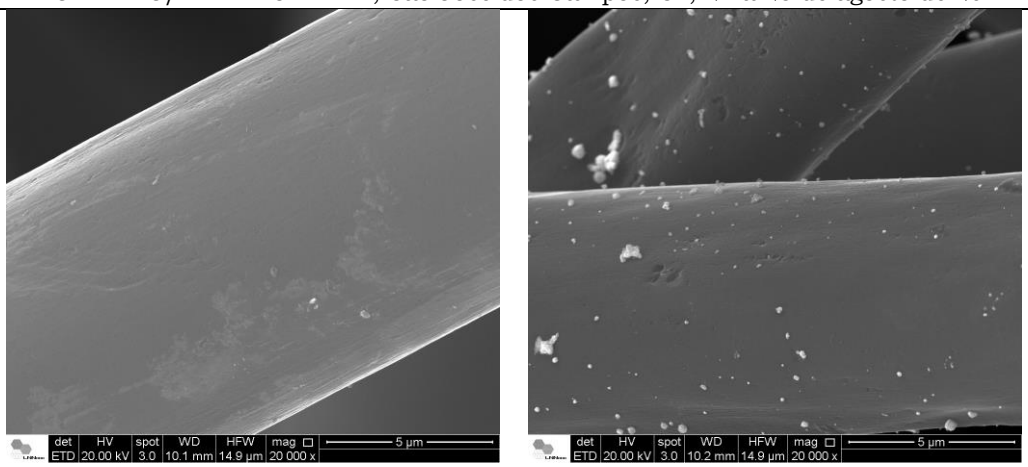

a) b)

Fig. 1. *a) Activated carbon felt and b) activated carbon felt with particles of silver*

4. References

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