NANOCOMPOSITES BASED ON CARBON NANOTUBES FOR GAS SENSING

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Nanotube based sensors possess a number of advantages including extreme sensitivity, good selectivity and fast response. Most of the sensors based on carbon nanotubes take advantage of their electrical properties to be used either as chemiresistor sensors or devices based in their electrochemical behaviour. Conventional gas sensors usually operate at high temperatures but chemiresistor sensors based on carbon nanotubes display high sensitivity and fast response time even at room temperature. Besides, carbon nanotube sensors are more stable than metal oxide sensors since they are not affected by chemical changes on the surface. Nanocomposites with carbon nanotubes are a candidate material for this purpose, since they are robust and can sense several types of VOCs [1,2].

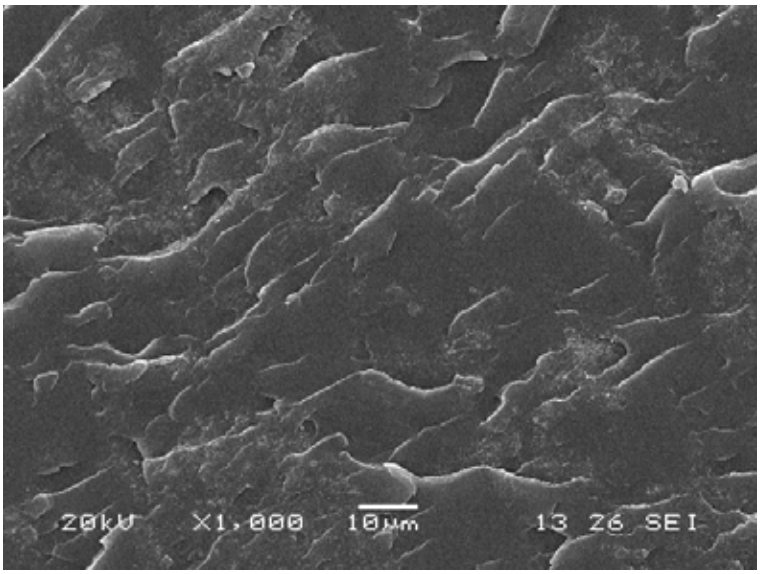
In the present work, nanocomposites have been fabricated incorporating multi and single wall carbon nanotubes into several polymeric matrices, (poly-(methyl-2-methylmetacrilate PMMA, epoxi resins, etc..). Functionalized and non-functionalized carbon nanotubes have been suspended in several solvents depending on the final sensing atmosphere (chloroform, dichloromethane...). Different concentrations of nanotubes have been studied to obtain the percolation threshold. The influence of the functionalization on the conductivity values of the nanocomposites has also been studied.

A process to fabricate films of carbon nanotubes/polymer composites has been developed. The samples have been electrically characterized by measuring the volume resistivity.

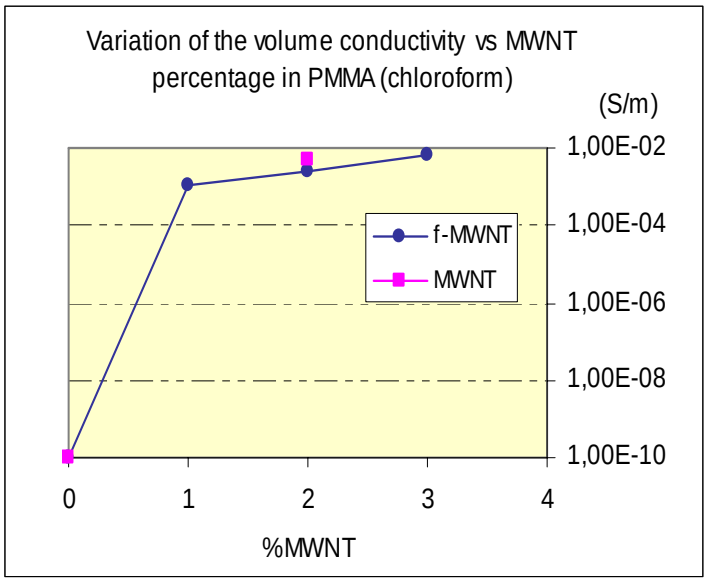
As an example, multiwalled carbon nanotube/PMMA composites have shown an increase of eight orders of magnitude in electrical conductivity compared to the pristine polymer. The percolation threshold was reached with approximately 1% of carbon nanotubes. There were no significant differences in the conductivity values between funtionalized and pristine carbon nanotubes. On the other hand, SEM micrographs have shown better dispersion in the polymer matrix with the functionalized carbon nanotubes.

The electrical resistivities of these nanocomposites are being studied under exposure to several gaseous atmospheres.

Figures:



SEM micrograph of 3% functionalized Multi Wall Carbon Nanotubes (MWNT) in PMMA



References:

[1] Thostenson E.T., Ren Z., Chou T-W., Composites Science and Technology, **61** (2005) 1899-1912.
[2] Abraham J.K., Philip B., Witchurch A. et al., Smart Materials & Structures, **13** (2005) 1045-1049.