RELATIVE RESISTANCE VARIATION WITH STRAIN IN LLDPE/MWCNTS NANOCOMPOSITES UNDER TENSILE LOADING

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When electrically conductive particles, such as carbon black or carbon nanotubes, are incorporated into an insulating polymeric matrix, they form a conducting network resulting in an electrically conductive material along with enhanced mechanical behavior. Consequently, the polymer acquires new properties making it suitable for a wide variety of applications, such as structural health monitoring by sensing material strain and damage. The elongation of the nanocomposite under stress gradually destroys the conducting network decreasing its conductivity. Thus, the deformation levels of critical parts of a structure can be measured by monitoring the changes in their electrical resistance [1-2]. This measurement method is non-invasive and non-destructive. In the present work materials composed of LLDPE (linear low density poly-ethylene) reinforced with MWCNTs (multi-walled carbon nanotubes) were experimentally studied. Scanning Electron Microscopy (SEM), Dielectric Relaxation Spectroscopy (DRS), Dynamic Mechanical Analysis (DMA) and uniaxial tensile measurements were employed to study the impact of the nanofiller content on the mechanical and electrical properties of the nanocomposite and its potential use for strain sensing.

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[2] L. Bokobza, C. Belin, Effect of Strain on the Properties of a Styrene–Butadiene Rubber Filled with Multiwall Carbon Nanotubes, J. Appl. Pol. Sci. 105 (2007)2054–2061.