INFLUENCE OF THICKNESS AND CARBON NANOTUBE ALIGNMENT ON THE PIEZORESISTIVE RESPONSE OF CARBON NANOTUBE/POLYSULFONE COMPOSITES

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The exceptional properties of carbon nanotubes (CNTs) have motivated their use as fillers for multifunctional polymer composites. As such, CNT/polymer composites have been widely reported in several technological fields due to their superior effective properties and multifunctionality. Among these properties, the piezoresistivity of the CNT/polymer composites (change of electrical resistance due to applied strain) has motivated the use of different types of mechanical sensors for structural applications, such as structural health monitoring. The performance of such piezoresistive sensors is governed by the morphology of the CNT interconnected network, which strongly depends on the fabrication process. Among the main parameters involved in the piezoresistive response, the CNT alignment with the loading direction is considered of high relevance. Here it is reported on the influence of the thickness of CNT/polysulfone specimens and the CNT alignment on the piezoresistive response of composites with 0.3 and 0.5 wt\%. Multiwall carbon nanotubes (MWCNTs) are dispersed and incorporated to dissolved polysulfone (DPSF) and an alternating current electric field is applied to the MWCNT/DPSF solution to align the MWCNTs along the direction of the field. The solvent is evaporated and solid MWCNT/polysulfone films with aligned CNTs are obtained. The thickness of the solid composites was controlled by means of the mass poured on the custom-made cell fabricated for the application of the electric field. The effect of the thickness of the samples and the alignment of the CNTs on the electromechanical sensitivity of the composites (gage factor) is evaluated. A better understanding on the parameters governing the electromechanical response of the composites may represent an important step towards the development of high performance CNT-based sensors. This work was supported by CONACYT grants No. 235905 (AIOA) and No. 220513 (FA).

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