

Electrically conductive carbon nanofiber/polyethylene composite: effect of melt mixing conditions

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Abstract: The effect of melt mixing conditions on the morphological, rheological, electrical, electromagnetic interference (EMI) shielding effectiveness (SE), and tensile properties of 7.5 vol% vapor grown carbon nanofiber (VGCNF)/polyethylene composites were investigated. 7.5 vol% VGCNF was used because such loading is required to obtain a composite with satisfactory EMI SE. The composites were compounded by melt mixing and the parts were prepared by hot-compression molding. The dispersion and distribution of nanofibers were enhanced by increasing the mixing energy, i.e. mixing time and/or rotation speed. The influence of mixing energy on the electrical and EMI SE properties was found to be a function of rotation speed, i.e. shear stress. For composites compounded at 20 rpm, increasing the mixing energy from 70 to 2300 J/ml decreased the EMI SE from 29.5 to 23.9 dB. However, for composites prepared at 100 rpm, increasing the mixing energy from 600 to 1700 J/ml decreased the EMI SE from 25.4 to 18.6 dB. No considerable influence on the yield stress, Young's modulus, and strain at break were found for different processing conditions.