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An effective strategy to enhance mechanical, electrical, and electromagnetic shielding effectiveness of chlorinated polyethylene-carbon nanofiber nanocomposites

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Abstract

Chlorinated polyethylene (CPE) filled with functionalized heat treated carbon nanofiber (CNF) nanocomposites was prepared using two different techniques like melt mixing and solution cum melt mixing. A better dispersion of CNFs in nanocomposite was achieved by solution cum melt mixing compared to only melt mixing process. The effect of mechanical, electrical conductivity (σ), and electromagnetic interference shielding effectiveness (EMI SE) were studied. Nanocomposites prepared by solution cum melt mixing process showed higher mechanical properties, electrical conductivity (σ), and electromagnetic interference shielding effectiveness (EMI SE) compared to that of melt mixing process. 1 wt% CNFs filled nanocomposites prepared by the solution followed by melt mizing showed 124% higher tensile strength whereas at the same percentage of CNFs, melt processed nanocomposite exhibited 58% higher in tensile strength compared to neat CPE. The EMI SE and σ of both types of nanocomposites were increased with increasing CNFs loading. At 10 wt% CNFs loading, solution cum melt processed nanocomposite showed EMI SE 24 dB; whereas at the same wt% of CNFs loading, melt processed nanocomposite showed 22 dB. Thermogravimetric analysis was carried to investigate the thermal stability of CPE/CNF nanocomposites.

Keywords: Chlorinated polyethylene, functionalized heat treated carbon nanofibers, mechanical property, electrical conductivity, electromagnetic interference shielding.

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