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Electrical Impedance Spectroscopic Study of CNT/Ethylene-alt-CO/Propylene-alt-CO Polyketones Nanocomposite

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Abstract: Impedance spectroscopy was utilized to investigate the dielectric properties, ac conductivity and charge transport mechanisms in propylene-alt-CO/ethylene-alt-CO (EPEC) random terpolymer filled with multi-walled carbon nanotubes (MWCNT) as a function of nanofiller content, frequency, and temperature. Equivalent resistor-capacitor (RC) circuit models were proposed to describe the impedance characteristics of the unfilled terpolymer and the nanocomposite at different temperatures. For the nanocomposites, the ac conductivity tended to be frequency independent at low frequencies. At high frequencies, the ac conductivity increased with frequency. The dc conductivity (i.e., plateau of the ac conductivity at low frequencies) at room temperature increased from 10?9 (??m)?1 for the unfilled polymer to l0?3 (??m)?1 for the 6 wt% MWCNT/EPEC nanocomposite. At low temperatures, the equivalent RC model for EPEC-0 and EPEC-2 was found to consist of a parallel RC circuit. However, for 6 wt% MWCNT/EPEC nanocomposite, an RC model consisting of an R/constant phase element (CPE) circuit and a resistor in series was required to describe the impedance behavior of the nanocomposite.