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Title:Electrical and optical properties of MWNTs/HDPE composites in Terahertz region
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Abstract:Optical and electrical properties of composites, prepared by filling of high density polyethylene (HDPE) with two kinds of multi-walled carbon nanotubes (MWNTs) differing in diameters, were explored by terahertz time-domain spectroscopy (THz-TDS) in the frequency range from 0.2 to 1.6 THz. It is found that composite with larger-diameter MWNTs possesses larger absorption coefficient and conductivity at the same concentration. The real part of the ac conductivity of the composites follows a power law dependence on frequency. And the power index is around 0.75 regardless of the MWNT concentration and diameter. The experimental data were analyzed with Cole-Cole equation under the assumption that the conductive clusters dispersed in the polymer matrix behave like dipoles and contribute mainly to the dielectric loss. It is found that both of the composites have similar values of relaxation time and distribution parameter. With increase of the MWNTs concentration, the relaxation time increases and tends to saturate at 0.7 Ps after passing through the percolation threshold.
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