

Effect of multi-walled carbon nanotubes on PTC/NTC behaviors of carbon blacks-dispersed HDPE composites

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In this work, the addition of multi-walled carbon nanotubes (MWCNTs) on the positive temperature coefficient (PTC) characteristics of conventional carbon blacks (CBs) and high density polyethylene (HDPE) composites was investigated. To reduce negative temperature coefficient (NTC) behaviors, the nano-structured CBs and MWCNTs reinforced HDPE were irradiated with electron beam (EB) in a dosage of 250 kGy. Electrical resistivities of the MWCNTs/CBs/HDPE composites were measured by using a digital multimeter. As experimental results, the resistivity of the composites was increased abruptly near the crystalline melting temperature of the HDPE used as matrix, which could be attributed to the destruction of conductive network by the thermal expansion of HDPE. It is interesting to note that the addition of MWCNTs in CBs/HDPE composites could lead to the increase in PTC intensity and reproducibility than that of CBs/HDPE composites. This results indicates that the MWCNTs in the composites could play as an interlocking agent between the CBs and HDPE, resulting in preventing the formation new network of CBs in the composites at high temperatures.