

Effect of Filler Size and Shape on Positive Temperature Coefficient Effect

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Abstract : Two types of filler shapes (sphere and flakes) and three different sizes are employed to study the size effect on PTC. The composite is prepared using a mini-extruder with high-density polyethylene (HDPE) as the matrix. A computer modelling is used to fit the experimental results. The percolation threshold decreases with decreasing filler size and this was observed for both the spherical particles as well as the flakes. This was caused by the decrease in interparticle distance with decreasing filler size. The 100 μm particles showed a larger PTC intensity compared to the 5 μm particles for the metal coated glass sphere and flake. The small particles have a large surface area and agglomeration and this makes it difficult for the conductive network to be disturbed. Increasing the filler content decreased the PTC intensity and this is due to an increase in the conductive network within the polymer matrix hence more energy is needed to disrupt the network.

Keywords : positive temperature coefficient (PTC) effect, conductive polymer composite (CPC), electrical conductivity

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