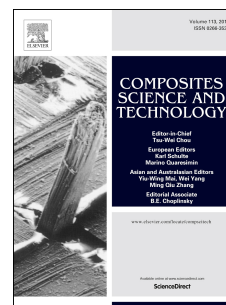


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Improved Dielectric Properties of Polypropylene-based Nanocomposites via Co-filling with Zinc Oxide and Barium Titanate

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Abstract: Tetra-needle-shaped zinc oxide whiskers (T-ZnOw) and barium titanate (BT) nanoparticles were embedded into polypropylene (PP) matrix to construct ternary nanocomposites with improved dielectric properties. The nanocomposites were fabricated via a melt blending and subsequent compression molding approach. The microstructure, crystallization behavior, and dielectric properties of as-fabricated nanocomposites were investigated in detail. Results reveal that the selecting processing approach could afford isotropic nanocomposites with T-ZnOw and BT nanoparticles homogeneously dispersed throughout the PP matrix. The T-ZnOw/PP binary composites exhibited typical characteristics of percolation system with a relatively small threshold of 13 vol%. When the content of T-ZnOw approaching the percolation threshold, the dielectric constant and loss tangent of the binary composites were dramatically enhanced. After introducing BT nanoparticles, the resultant ternary composites showed further improved dielectric performance. For the ternary T-ZnOw/BT/PP with the BT content of 15 vol% and T-ZnOw content of 9.76 vol%, dielectric constant and loss tangent at 1 kHz reached 11 and 0.04, respectively.

Keywords: Polypropylene; Composites; Dielectric Properties.

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