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Effect of Aluminum Nitride Concentration on Different Physical Properties of Low Density Polyethylene Based Nanocomposites

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Abstract: In this study, blends of low-density polyethylene (LDPE)/aluminum nitride (AlN) ceramic nanocomposites have been prepared through melt blending technique. Increased loading of AIN leads to reduction in tensile properties but improvement in rheological property (storage modulus). The rheological behavior tends to become unique at higher frequencies ($\geq$ 10 rad/s). Differential scanning calorimetry (DSC) results show that the total crystallinity has decreased with the increase in AlN loading in the composites. It is seen that there is an improvement in electrical conductivity, dielectric constant, and flammability properties with the addition of AlN in the nanocomposites. The experimental data of tensile modulus, electrical conductivity, and dielectric constant have been fitted with some available theoretical models to check the models' applicability for the present composite systems. Results show that only Nicolais-Nicodemo model, McCullough model, and Rahaman-Khastgir model are applicable for predicting the tensile modulus, electrical conductivity, and dielectric constant of the composites, respectively.

Keywords:
Aluminum nitride, dielectric properties, LDPE, nanocomposites, thermally conductive polymer

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