Short Communication

Investigation of the Dielectric Characteristics of Banana Residue-Reinforced Epoxy Resin

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Banana (*Musa acuminata*) peel and leaf fiber composites were reinforced with epoxy resin. A hand layup fabrication technique was used to improve the quality of a natural fiber-based dielectric material. The electrical characteristics of the banana peel and leaf fiber-reinforced epoxy resin composites were investigated for fiber loading, fiber treatment, and hybridization with epoxy fibers. Frequency and fiber loading caused the dielectric constant to drop. The dielectric constant was improved by Alkaline, benzoyl chloride treatment and hydrophobicity was reduced by chemical adhesion. The dielectric constant of the banana leaf fiber layered epoxy composites is better than the banana peel layered fiber composites. The dielectric constant is increased due to increasing the layers of the banana leaf fiber sheets. The dielectric constant of the banana leaf layered fiber composite increased as the frequency of loading decreased. Chemical treatments used on the fiber improve the resistivity of the composite. The loss factor was minimized by chemical treatments and the use of hybrid composites. Epoxy resin was deployed to bond the banana fiber molecules together. Polymer coupled composites are likely to reduce the absorption of moisture levels through the encapsulation of the fiber material by a polymer matrix. The bonding strength of banana fiber molecules is enhanced by chemical adhesives. It increases the dielectric strength of the banana fiber composite due to decreased hydrophobicity. The dielectric properties of the banana fiber composite were studied, such as dielectric constant ($\tan \delta$), dissipation factor (ϵ'), and loss factor (ϵ''). The surface and bonding structure of the test sample was scanned by Field Emission Scanning Electron Microscopy (FESEM). Banana leaf fiber layered composites are suitable for electrical insulation applications in high voltage applications.

Keywords: Dielectric properties, banana peel and leaf, alkaline treatment, benzoyl chloride treatment, and FESEM analysis.

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