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Electrical and Dielectric Properties of Poly (Vinyl Alcohol)/Starch/Graphene Nanocomposites

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Abstract: Electrical and dielectric properties of poly (vinyl alcohol) (PVA) films, and PVA/starch blend and its nanocomposites with graphene were investigated. The tested materials were prepared via solution mixing and an evaporative casting technique using glycerol as a plasticizer. Differential scanning calorimetric (DSC) measurement data was used to calculate the percentage of crystallinity and glass transition temperature (Tg.). Distribution of starch and graphene in the PVA matrix was determined from field emission scanning electron microscopy (FESEM). Effects of the plasticizer and graphene loading on the DC and AC electrical conductivities of the PVA/starch blend were studied. The impact of graphene loadings on the dielectric permittivity (e0), dielectric loss tangent (tan d), complex electric modulus (M), and complex impedance (Z) as a function of frequency were reported. The DC conductivity of PVA was increased with the addition of glycerol and starch. The permittivity of PVA films and PVA/starch/graphene nanocomposites showed a strong frequency-dependent behavior in a low frequency zone. The addition of graphene to the PVA/starch blend reduced the area under the semicircles of the Nyquist plot.

Keywords:
Nanocomposites, electrical conductivity, dielectric properties, electric modulus, electrical impedance.

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