

Impact of Ultrasonic Mixing on the Electrical Properties of PEI/SiO₂ Nanocomposites

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Abstract. The usage of nanoparticles in various applications is a widely discussed topic in the science community. One of these applications is dielectrics and the proposition of nanoparticles as modification of matrix material in composites. Epoxy resins are highly used resin material. However, a new type of resins composes of polyester-imide (PEI) is starting to take attention thanks to their advantageous base properties such as low viscosity under laboratory temperatures or electrical properties brought near the epoxy resins. This type of resin is still not examined as a matrix material with nanoparticles. This article deals with an experiment in which the main task was to determine the effect of SiO₂ nanoparticles added to Polyester-imide resin on the final composite properties. The effect of purely mechanical mixing was further investigated, followed by mixing using an ultrasonic tip. Based on the results of the experiment, it can be stated that the samples to which the ultrasonic tip was applied had visibly improved dielectric properties. Also, the production process was accelerated due to the reduction of air bubbles during sample casting. The investigated parameters were primarily frequency dependences of relative permittivity and dissipation factor. Electron microscope images are added to see the reduction of nanoparticle agglomerates.