Effect of Two Concentrations SiO_2 Nanoparticles on Molecular Mobility and Dielectric Response of Single Component Resin Based on Polyesterimid

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Abstract. This study aims to present the influence of two weight concentrations of Silicone Oxide (SiO_2) nanoparticles on the dielectric properties of ingle component impregnantig resin based on polyesterimid (PEI) (UP 343 from Elantas producent). In this study the SiO_2 nanoparticles were dispersed into PEI (with 0.5 and 1.0 wt.%) to prepare nanocomposites. Application of the capacitance method based on the three-electrode measurement method the frequency dependence of the real and imaginary parts of complex permittivity was measured within the frequency range of 1 mHz to 1 MHz at temperature range of all conventional rotating and stationary windings from (+20 °C to +120 °C). The presence of SiO_2 nanoparticles in matrix of UP343 caused an increase of the real permittivity at higher temperatures compared to the pure matrix due to higher mobility of polymer chains. Its decrease at low temperatures was caused by the presence of highly immobile polymer chains in the interfacial regions around nanoparticles. The presence of different weight concentration of nanoparticles in the PEI resin has impact on the segmental dynamics of the polymer chains and changed a charge distribution in the given system. The shift of local relaxation peaks to lower eigenfrequency in the spectra of imaginary permittivity of investigated nanocomposites was observed.