Effect of ZnO Nanoparticles on the Dielectric Properties of Polyurethane and Epoxy Resins

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Abstract. This study aims to present the influence of Zinc Oxide (ZnO) filler on the dielectric properties of two types of commercial potting compounds. For this purpose, the methods of dielectric spectroscopy were used to measure the changes in dielectric responses of polyurethane and epoxy by 1.0 wt. % ZnO over the frequency and temperature range, respectively. Two representatives of polyurethane and epoxy mixtures (VUKOL 022 and EPOXYLITE 3750 LV), that are commercially used in industry for filling cavities of all kinds (construction of electrical equipment), were used for this investigation. The ZnO nanoparticles in EPOXYLITE 3750 LV caused an increase, and in VUKOL 022 a decrease of the real permittivity compared to the pure matrix. Its decrease was most likely caused by the presence of highly immobile polyurethane chains in the interfacial regions around nanoparticles. The shift of a low relaxation maximum to higher frequencies for nanocomposite base on EPOXYLITE 3750 LV was affected by a smaller local electric field and electric double layers around the nanoparticles.