Effect of MgO Nanoparticles on Material Properties of Cold-Curing Epoxy and Polyurethane Mixtures

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Abstract. Potting compounds are an integral part of a large number of electrical devices, in which play the role of mainly mechanical or photosensitive protection. So-called cold-curing resins are one of the subgroups of potting mixtures. This article focuses on this type of potting compound based on epoxy (EPs) and polyurethane (PUs). In addition to the study of their electrical properties, structural properties are also introduced. The main focus of research is on the incorporation of nanometric magnesium oxide (MgO) in different weight ratios and the study of its effect on the properties of synthesized composites. The electrical properties analyses include the changes in relative permittivity, dielectric losses in the wide frequency range, and volume resistivity estimated at DC conditions. In terms of structural analyses, the effect of MgO incorporation on glass transition temperature changes was studied. From the performed investigations it is evident that the selected basic materials can be partially modified to improve their properties, especially in lower levels of filling, where there is a positive decrease of relative permittivity close to industrial frequency (≈3 % for EP+1MgO; ≈11 % for PU+1MgO). For investigated composites is also evident a trend in the growth of dielectric losses. MgO affects also the volume resistivity and glass transition temperature of EPs-MgO and PUs-MgO composites.