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Interfacial Polarization and Dielectric Properties of Epoxy/Graphite Flakes Composites

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Dielectric properties of composites based on bisphenol-A-epoxy resin loaded with various content of graphite flakes (GF) have been studied. The dielectric permeability, tangent loss and ac conductivity have been examined in wide temperature (170 – 370 K) and frequency (20 Hz – 200 kHz) range. In composites loaded with GF flakes up to 10 wt.%, the dominant conduction mechanism is tunneling of electrons, while loading of 15 wt.% gives rise to electron conduction through direct contacts between fillers. Dielectric properties of composites are largely determined by the nature of the filler/matrix interface, the filler surface area and the inherent conductivity of the fillers. At low electric field frequencies, dominates so-called *interfacial* (or space charge) polarization due to accumulation of free charges at the interfaces between two phases (filler and matrix), which differ in electrical conductivity.Influence of the filler surface chemistry have been studied for composites loaded with 5 wt.% graphite flakes obtained: (i) under wet milling, without (GF) or with (GF-Tr100x) adding Triton-100x as a surfactant, or (ii) under dry milling in the presence of KOH (GF-KOH). The surface treatment with KOH notable increased dielectric constant of the epoxy/GF-KOH5 composite, keeping low tangent loss, comparable to the counterpart, the epoxy/GF5 composite.

Keywords: dielectric properties, composites, graphite nanosheets