

Dielectric, Electrical and Magnetic Properties of Elastomer Filled with in situ Thermally Reduced Graphene Oxide and Spinel Ferrite NiFe₂O₄ Nanoparticles

Authors : Raghvendra Singh Yadav, Ivo Kuritka, Jarmila Vilcakova, Pavel Urbanek, Michal Machovsky, David Skoda, Milan Masar

Abstract : The elastomer nanocomposites were synthesized by solution mixing method with an elastomer as a matrix and in situ thermally reduced graphene oxide (RGO) and spinel ferrite NiFe₂O₄ nanoparticles as filler. Spinel ferrite NiFe₂O₄ nanoparticles were prepared by the starch-assisted sol-gel auto-combustion method. The influence of filler on the microstructure, morphology, dielectric, electrical and magnetic properties of Reduced Graphene Oxide-Nickel Ferrite-Elastomer nanocomposite was characterized by X-ray diffraction, Raman spectroscopy, Fourier transform infrared spectroscopy, field emission scanning electron microscopy, X-ray photoelectron spectroscopy, the Dielectric Impedance analyzer, and vibrating sample magnetometer. Scanning electron microscopy study revealed that the fillers were incorporated in elastomer matrix homogeneously. The dielectric constant and dielectric tangent loss of nanocomposites was decreased with the increase of frequency, whereas, the dielectric constant increases with the addition of filler. Further, AC conductivity was increased with the increase of frequency and addition of fillers. Furthermore, the prepared nanocomposites exhibited ferromagnetic behavior. This work was supported by the Ministry of Education, Youth and Sports of the Czech Republic - Program NPU I (LO1504).

Keywords : polymer-matrix composites, nanoparticles as filler, dielectric property, magnetic property

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