OPTICAL AND DIELECTRICAL PROPERTIES OF SOME POLYSULFONE/NICKEL FERRITE COMPOSITES

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Polymer nanocomposites containing inorganic particles can be prepared by incorporation of modified nanoparticles into polymer matrices in order to obtain improved physical, mechanical or electrical characteristics. The properties of polymer nanocomposites depend on some parameters namely the grain size of nanoparticles, preparation procedure of composite and on the dispersion degree of the nanoparticles in polymer matrix. Polysulfone (PSF) was selected as polymer matrix due to its good chemical resistance, high thermal stability and excellent mechanical properties. In this work polysulfone/nickel ferrite composites were investigated and the influence of nickel ferrite loading on optical, thermal and dielectric properties was explored.

The PSF/nickel ferrite composites were obtained by solution casting method. **T**he XRD pattern of the PSF composites presents the characteristic peaks of nickel ferrite nanoparticles with an average size in the range of 25-35 nm. Transmission electron microscopy images confirm the formation of nanometric ferrite particles with an uniform grain size distribution and average particle diameters of 17-30 nm. The emission spectra reveal the presence of an intense band at about 370 nm and some weak emission bands in the visible range. The main emission band around 370 nm (λ_{ex} = 300 nm) can be attributed to near-band edge emission and the visible bands can be connected to deep-level defects such as vacancies and oxygen interstitials [1]. The dielectric response given by permittivity (ε') and dielectric loss (ε'') has been studied in a broad range of frequency and temperature. The temperature dependence of dielectric loss at different frequencies shows the presence of secondary γ- and β-relaxation processes in PSF/ferrite composites (Image 1). The dipolar relaxations exhibit intense dielectric peaks that shift to higher frequencies as the temperature increases indicating that the dipolar processes are thermally activated.

The PSF/nickel ferrite composites including different loadings of ferrite were obtained and characterized in term of emission spectra, transmission electron microscopy and dielectric data. The increase in dielectric constant and dielectric loss were observed by the incorporation of nickel ferrite nanoparticles in the polymer host. Permittivity decreased slowly with the increase in frequency and AC conductivity increased with increasing frequency and ferrite content.

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[1] L.C.K. Liau, Y.H. Lin., J. Luminesc., **181** (2017) 217.