Boron Carbide polymer composites: dielectric properties and energy storage.

E.C.Senis, A.C.Patsidis, G.C.Psarras

Department of Materials Science, University of Patras, 26504 Rion, Greece

In the last few decades polymer matrix composite materials filled with inorganic ceramic inclusions have been in the centre of the scientific and industrial interest In the present study composite systems of epoxy resin and ceramic B_4C (Boron carbide) particles with mean diameter less than 10 microns, have been prepared varying the volume fraction of the inclusions [1,2,4]. The dielectric response of the composites was studied in a wide frequency and temperature range. Broadband Dielectric Spectroscopy (BDS) has been proved to be a powerful tool for the investigation of molecular mobility, phase changes, conductivity mechanisms and interfacial effects in polymers and complex systems. The dielectric response of composites was examined by means of Broadband Dielectric Spectroscopy (BDS) in the frequency range 10^{-1}–10^7 Hz and temperature interval from 30°C to 160°C. Experimental results include relaxation phenomena arising from both the polymeric matrix and the filler [3]. Three distinct relaxation modes were recorded in the spectra of all systems. They were attributed to interfacial polarization, glass transition (α –relaxation) and motion of small polar side groups (β - relaxation) of the polymer matrix. The energy density was also calculated in order to determine the amount of stored energy.
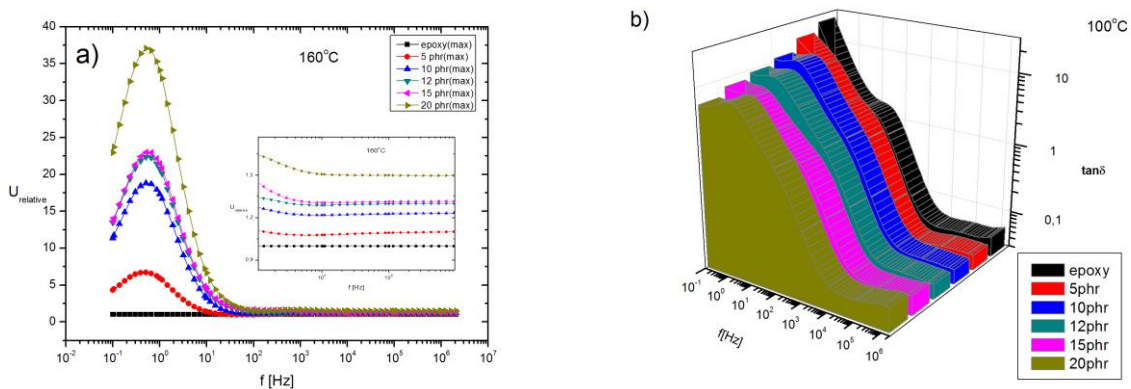

Figure 1: **a)** $U_{relative}$ plot for all specimens at 160°C, **b)** comparative plot for the loss tangent for all specimens at 100°C.

References

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*   ecsenis@upatras.gr, G.C.Psarras@upatras.gr