

Electrical Characterization on PVDF-Graphene samples

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In recent years there is a great interest on graphene based polymer nanocomposites [1,2]. In this paper permittivity and resistivity measurements on PVDF-Graphene samples are discussed. Six sets of samples were prepared using Polyvinylidene fluoride (PVDF) as host polymeric matrix and Graphene nano-inclusion additives ranging from 0.1 up to 1 wt.%. Permittivity measurements were carried out by means of a high-resolution broadband spectrometer (Novocontrol – Alpha Analyzer) in the frequency range 10^{-2} up to 10^6 Hz [3]. Resistivity was calculated using the slope of the J-E curves obtained through I-V tests in a vacuum chamber using a high resistivity meter (Keithley 6517A) while the applied electric field was varied up to 1kV/cm. The J-E characteristics of the measured samples show ohmic behaviour for applied electric field values up to 1KV/cm. To ensure proper fitting in the sample cell and avoid electrode polarization both sides of the samples were painted with silver conductive paint.

Figure 1 shows the behaviour of resistivity ρ , with respect to the corresponding graphene content. Note that 0 wt.% graphene corresponds to pure PVDF sample without graphene content. A resistivity peak value is found for 0.2 wt.% that is in agreement with the existing literature [2]. This behavior may be attributed to the sample preparation process, since the impact of the preparation technique is recorded as a critical parameter for the electrical characteristics of similar samples [1]. Figure 2 shows the permittivity (real part ϵ') as a function of the wt.% graphene for two representative frequencies, 10 mHz and 10 kHz. Permittivity increases with the increase of wt.% graphene. At lower frequency (10 mHz) permittivity values are higher compared to the ones at higher frequency (10 kHz).

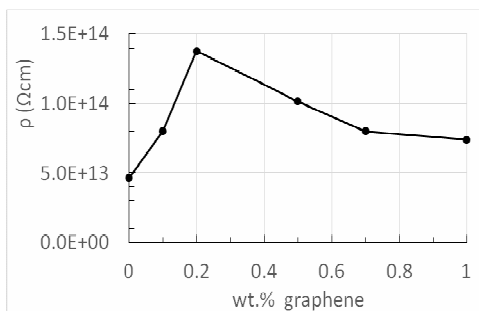


Figure 1: Resistivity ρ (Ωcm) as a function of wt.% graphene for PVDF-Graphene samples.

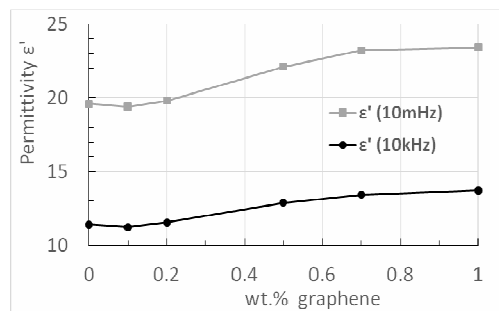


Figure 2: Permittivity (real part ϵ') as a function of wt.% graphene for PVDF-Graphene samples for 10 mHz and 10 kHz.

References

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