



Contribution ID: 1747 Type: **CLOSED - Oral (Student, In Competition) / Orale (Étudiant(e), inscrit à la compétition)**

Electrical and mechanical properties of polymer nanocomposites

Tuesday, 30 May 2017 08:15 (15 minutes)

We study the electrical and mechanical properties of poly(ethylene oxide)/multiwalled carbon nanotube (PEO/MWCNT) composites made by melt mixing and compression molding. The dielectric properties of the PEO/MWCNT composites have been studied in the frequency range from 100 mHz to 1 MHz as a function of temperature and filler concentration. Dielectric relaxation times and DC conductivity were extracted from the data by fitting to existing models. The percolation transition of the MWCNT in the composites occurs for a MWCNT concentration between 2 and 3 wt%. Storage and loss moduli and the mechanical relaxation time were examined as a function of MWCNT concentration and temperature using a shear rheometer. We examined the dispersion of the MWCNT in the PEO matrix using atomic force microscopy and scanning electron microscopy. The results of these experiments provide information about the microstructure of the nanocomposite and the interactions between the polymer molecules and the CNTs.

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Session Classification: T1-1 Soft Matter and Polymers (DCMMP) | Matière molle et polymères (DPMCM)

Track Classification: Condensed Matter and Materials Physics / Physique de la matière condensée et matériaux (DCMMP-DPMCM)