

Dielectric Properties of PANI/h-BN Composites

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Abstract : Polyaniline (PANI), the most studied member of the conductive polymers, has a wide range of uses from several electronic devices to various conductive high-technology applications. Boron nitride (BN) is a boron and nitrogen containing compound with superior chemical and thermal resistance and thermal conductivity. Even though several composites of PANI was prepared in literature, the preparation of h-BN/PANI composites is rare. In this work PANI was polymerized in the presence of different amounts of h-BN (1, 3 and 5% with respect to PANI) by using 0.1 M solution of $\text{NH}_4\text{S}_2\text{O}_8$ in HCl as the oxidizing agent and conductive composites were prepared. Composites were structurally characterized with FTIR spectroscopy and X-Ray Diffraction (XRD). Thermal properties of conductive composites were determined by thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC). Dielectric measurements were performed in the frequency range of 106-108 Hz at room temperature. The corresponding bands for the benzenoid and quinoid rings at around 1593 and 1496 cm^{-1} in the FTIR spectra of the composites proved the formation of polyaniline. Together with the FTIR spectra, XRD analysis also revealed the existence of the interactions between PANI and h-BN. Glass transition temperatures (T_g) of the composites increased with the increasing amount of PANI (from 87 to 101). TGA revealed that the char yield of the composites increased as the amount of h-BN was increased in the composites. Finally the dielectric permittivity of 3 wt.%h-BN-containing composite was measured and found as approximately 17. This work was supported by Marmara University, Commission of Scientific Research Project.

Keywords : dielectric permittivity, h-BN, PANI, thermal analysis

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