Dielectric Properties of PANI/h-BN Composites

Authors: Seyfullah Madakbas, Emrah Cakmakci

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 NH₄S₂O₈ 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 (Tg) 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

Conference Title: ICSRD 2020: International Conference on Scientific Research and Development

Conference Location: Chicago, United States

Conference Dates: December 12-13, 2020