

Title

BROADBAND DIELECTRIC SPECTROSCOPY OF VARIOUSLY CONDUCTING POLYANILINE PELLETS

Abstract text

Three types of variously conducting pressed (at 700 MPa) PANI pellets (conducting, prepared by oxidation of aniline hydrochloride with ammonium peroxydisulfate, non-conducting, prepared by its deprotonation and semi-conducting, prepared by oxidation of aniline with the cerium (IV) sulfate tetrahydrate in the presence of methansulfonic acid) were studied using various dielectric spectroscopic techniques from sub-Hz up to the infrared (IR) frequency range and from room temperature down to 10 K. The spectra show standard behaviour of nano-inhomogeneous conductors with the low-frequency room-temperature AC conductivity plateau, corresponding roughly to the DC conductivity measurements. The conductivity plateau is thermally activated and disappears at lower temperatures for the semi- and non-conducting sample. For the conducting sample its value could be reliably determined only below ~ 100 K, where it can be equally well fitted with the variable-range hopping and fluctuation induced tunneling model. At higher frequencies the conductivity increases reaching the THz values of ~ 0.1 and ~ 10 S/cm for the semi-conducting and conducting sample, respectively. Including the IR reflectivity data, the fit requires an additional oscillator to the Drude model, which accounts for the positive THz permittivity contribution. The results will be discussed using effective medium models considering the conducting and nonconducting parts in the PANI structure.

Keywords

POLYANILINE, DIELECTRIC SPECTROSCOPY, INFRARED SPECTROSCOPY, EFFECTIVE MEDIUM APPROXIMATION, AC CONDUCTIVITY, THZ SPECTROSCOPY

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