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Investigation of Temperature Dependent Transport Characteristics of Polyaniline Films Modified with Gold Nanoparticles

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The present work investigates the modification of the electrical properties of polyaniline with the introduction of gold nanoparticles to the polymer matrix. The nanocomposites of polyaniline and gold nanoparticles have been successfully synthesized using conventional chemical polymerization technique, where gold nanoparticles have been added in different successive weight percents. The dielectric studies as a function of temperature have been carried out on these composite samples in the frequency range 20 Hz-1 MHz. The dielectric relaxation characteristics of the synthesized samples have been examined by analyzing dielectric spectroscopy, dielectric loss and electrical conductivity spectroscopy. Perusal of the dielectric data depicts that the dielectric permittivity of the samples increases with an increase in the temperature and nanoparticles content. The frequency dependent ac conductivity has been analysed using Jonscher's universal power law relation. The power law exponent(s) has been observed to be composition and temperature dependent. The decrease in s with an increase in temperature suggested that the ac conduction mechanism of these samples follows the correlated barrier hopping (CBH) model. The improved dielectric constant of nanocomposite suggests its increased ability to store electric potential energy under the impact of alternating electric field.