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Electrical transport phenomenon and variable range hopping conduction in reduced graphene oxide/polystyrene composites

El Hassan Mounir

Ibn Tofail University, Morocco

In this work, we investigate the temperature dependence of the electrical conductivity of reduced graphene oxide (RGO)/ polystyrene (PS) composites. We re-analyzed, in our investigation, the experimental measurements of RGO/PS composites with different RGO concentrations obtained by W. Park et al. We show using two different methods: the Zhabrodskii method and a numerical method based on the calculation of the percentage deviation; that the electrical conductivity follows, in the beginning, the Efros-Shklovskii Variable Range Hopping regime (ES VRH) with $T^{1/2}$. This behavior showed that long-range electron-electron interaction reduces the Density Of State of carriers (DOS) at the Fermi level and creates the Coulomb gap (CG). When the RGO concentration increases, we noticed that the temperature dependence of the electrical conductivity tends toward $T^{1/3}$, which may suggest a possible crossover from the ES VRH regime to the Mott VRH regime for high RGO concentration values. We also, calculated and represented the Density Of State (DOS) per energy and per area function $g\delta E_P$ for each sample. We noted that the width of parameter D representing the half of CG width decreases by increasing the RGO concentration and

the function $g\delta E_P$ tends toward the constant g_0 corresponding to the Mott VRH

Recent Publications

1. el Oujdi, Abdellatif & Ennaji, Driss & El Kaaouachi, Abdelhamid & Mounir, El Hassan & Echchel, Adil & Dlimi, Said. (2021). Positive magnetoconductivity and inelastic scattering time at low temperatures with magnetic field in InSb semiconductor. *Molecular Crystals and Liquid Crystals*. 1-9.
2. Ennaji, Driss & El Kaaouachi, Abdelhamid & Echchel, Adil & el Oujdi, Abdellatif & Mounir, El Hassan & Ait Hammou, Brahim & Dlimi, Said. (2021). Study of electrical conductivity in metallic n-type InP semiconductor at low temperature in presence of the strong magnetic field. *Molecular Crystals and Liquid Crystals*. 1-9.

Biography

El Hassan Mounir is a Ph.D. graduate of the Université Ibn Tofaila Laboratory of Energetic Engineering and Materials, Faculty of Sciences in Ibn Tofail, Kenitra, Morocco. He has contributed many innovative prototypes in his research interest of graphene conductivity. He also participated in many conferences and conventions.

elhassan.mounir@uit.ac.ma