OMICS International
conferenceseries.com

Matthew E Edwards, J Material Sci Eng 2015, 4:5
http://dx.doi.org/10.4172/2169-0022.C1.028

4th International Conference and Exhibition on
Materials Science & Engineering
September 14-16, 2015 Orlando, USA

Physical mechanisms of temperature dependent surface resistivity outcomes of doped nanoparticles, and single-wall or multi-wall carbon nanotubes polyvinyl alcohol thin films

Matthew E Edwards
Alabama Agricultural & Mechanical University, USA

Recently, through using the combined Keithley Model 6517 Electrometer and Keithley Model 8009 resistivity test fixture, we have measured and subsequently reported surface resistivity temperature dependent measurements of in-house, produced pristine, multi-wall carbon nanotubes or silver nanoparticles doped, organic polyvinyl alcohol (PVA) thin films and commercial paper thin films. As dielectric composites, our measurements have shown a characteristic behavior for the surface resistivity as initially decreasing from a beginning value at 22°C, reaching a minimal resistivity and then continuing to increase monotonically as the temperature was raised to 40°C, which is the temperature upper-limit of our measurement system. In this regard, ten different physical mechanisms have been suggested as the cause of such resistivity versus temperature measurements.Of these mechanisms, two are based on classical behavior and the other eight on quantum mechanical behavior. The ten mechanisms, with the first four being of electrode-limited conduction mechanisms kind and the remaining six of bulk-limited mechanisms kind are: 1) Schottky emission, 2) Fowler-Nordheim tunneling, 3) Direct tunneling, 4) Thermionic-field emission, 5) Poole-Frenkele emission, 6) Hopping conduction, 7) Ohmic conduction, 8) Space-charge limited conduction, 9) Ionic conduction, and 10) Grain-boundary-limited conduction. Here, we give the interpretation of our measured results for the causes of the temperature dependent surface resistivity of these composite materials. In addition, for comparison opportunity and greater clarity of our observed surface resistivity results, we give our first time measurements of doped single-wall carbon nanotubes PVA thin films, as they relate to previously measured multi-wall carbon nanotubes thin films.

Biography

Matthew E Edwards, since January 2002, has held the position of Professor of Physics in the Department of Physics, Chemistry and Mathematics at Alabama A&M University, Normal, AL and served as Dean, of the School of Arts and Sciences, from 2007 to 2011, a period of 4.5 years. He is a Condensed Matter Physicist with research expertise in (1) materials of electrooptics, (2) pyroelectric/resistivity/dielectric properties of crystals and nano-particles doped organic thin films, (3) the production of large organic thin films, (4) Solitons wave theory, and (5) STEM Education research and problem solving.

matthew.edwards@aamu.edu

Notes: