Analyzing the Effects of Metal Oxides on the Electrical Properties of Polymers With and Without the Presence of Multi-Walled Carbon Nano-Tubes

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Semiconductors are one of the main components of electronics. Silicon, and, less commonly Germanium, are the currently used semiconductors due to their availability. However, their prices have been increasing due to the increase in demand. Researchers have managed to synthesize semiconductors from polymers using various techniques, the most promising of which is the introduction of Nanofillers to the polymer matrix. Nevertheless, the synthesized composites were still expensive due to the cost of Nanofillers. Therefore, this research tried to use metal oxides to support Nanofillers in increasing the electrical conductivities of the polymers, to allow for the usage of fewer Nanofillers in the composites. The research also tested the effects of metal oxides without the presence of Nanofillers to check whether they suffice to increase the conductivity alone. The research used MWCNT for a Nanofiller and prepared the samples by melting the materials together. The samples prepared without MWCNT showed no significant change in electrical conductivity as the percentage of MgO changed. With the presence of MWCNT, the percentage of MgO did influence the electrical conductivity, as it dropped from 6.4E-6 with 0% MgO to 1.3E-3 with 2% MgO (both had fixed MWCNT, 1%). The influence of MgO on the conductivity can be credited to both the Mg ions and the O ions, as the Mg ions may have had less activation energy with the presence of MWCNT, and the O ions may have functionalized the MWCNT. The synthesized samples are semiconductors that cost much less than those currently used.

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