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Explosive Percolation Phenomenon Of High Conductive Polyethylene Oxide/Titanium Nanocomposite Films

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This work investigated the percolation phenomenon and its effect on the electrical conductivity and other physical properties of polyethylene oxide/titanium nanoparticles (PEO/TiNPs) nanocomposite films. The electrical conductivity increases abruptly from 1.92×10−3 S.cm−1 to 86.66 S.cm−1 after percolation threshold, followed by constant values at the conductive zone, indicating the formation of conductive pathways through the PEO/TiNPs nanocomposite film. In addition, the localized surface plasmon resonance effect on the percolation phenomenon was investigated accordingly. Scanning electron microscopy images revealed the distribution and morphology of TiNPs in the PEO matrix. Finite element method simulations were used to understand the percolation phenomenon of the nanocomposite films. Fourier-transform infrared spectroscopy confirms the absence of any chemical bonds between TiNPs and PEO. On the other hand, X-ray diffraction and differential scanning calorimetry show that increasing TiNPs in the PEO matrix increases the crystallinity degree of the nanocomposites. The thermal properties of the PEO/TiNPs nanocomposite films were investigated. This study provides valuable insights into the design and fabrication of nanocomposite materials for electronic and optoelectronic applications.

Biography:

I am a Professor of Physics and Chemical and Materials Engineering working at Jordan University of Science and Technology, in the Department of Physics since 1996. Graduated from the University of Nebraska at Lincoln, USA. I am enrolled with the department activities socially, teaching and research works. My research interest focuses recently on various subjects including, semiconductor thin films, polymers, metal oxides, nanocomposites and their applications including surface plasma, surface coatings, catalytic, water splitting, hydrogen storage and production from catalysts. I established my research laboratory of Thin Films and Nanotechnology at the Department of Physics, where a big group of researchers and graduate students are working. More details could be found on may google scholar profile. Please see: Ahmad Ali Ahmad (Omari) - Google Scholar