Optimization and spectroscopic studies on carbon nanotubes/PVA nanocomposites

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Abstract

Nanocomposite films of polyvinyl alcohol (PVA) containing constant ratio of both single and multi-wall carbon nanotubes had been obtained by dispersion techniques and were investigated by different techniques. The infrared spectrum confirmed that SWNTs and MWNTs have been covalently related OH and CAC bonds within PVA. The X-ray diffraction indicated lower crystallinity after the addition of carbon nanotubes (CNTs) due to interaction between CNTs and PVA. Transmission electron microscope (TEM) illustrated that SWNTs and MWNTs have been dispersed into PVA polymeric matrix and it wrapped with PVA. The properties of PVA were enhanced by the presence of CNTs. TEM images show uniform distribution of CNTs within PVA and a few broken revealing that CNTs broke aside as opposed to being pulled out from fracture surface which suggests an interfacial bonding between CNTs and PVA. Maximum value of AC conductivity was recorded at higher frequencies. The behavior of both dielectric constant (epsilon') and dielectric loss (epsilon'') were decreased when frequency increased related to dipole direction within PVA films to orient toward the applied field. At higher frequencies, the decreasing trend seems nearly stable as compared with lower frequencies related to difficulty of dipole rotation. (C) 2016 The Author. Published by Elsevier B.V.

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