

Synthesis, Characterization, Optical and Dielectric Properties of Polyvinyl Chloride/Cadmium Oxide Nanocomposite Films

Polymer Composites, volume 35, 2014, pp, 1842–1851

A.M. El Sayed, S. El-Sayed, W.M. Morsi, S. Mahrous and A. Hassen

Abstract

Nano-sized cadmium oxide (CdO) was synthesized using a sol-gel method and mixed with polyvinyl chloride (PVC). XRD and high-resolution transmission electron microscopy (HR-TEM) measurements indicated that the average particle size of the CdO is about 70.18 nm. Scanning electron microscopy (SEM) images revealed a good dispersion of CdO nanoparticles on the surface of the PVC films. The optical energy band gap (E_g) showed a decrease from 5.08 eV to 4.88 eV with increasing the CdO content. The refractive index dispersion of the nanocomposite films was found to obey the single oscillator model. The dispersion parameters were changed by CdO incorporation. According to the frequency and temperature dependence of the dielectric constant (ϵ'), the observed α_a -relaxation peaks were assigned to the micro-Brownian motion of the polymer main chains. The influence of CdO nanoparticles content on the ac conductivity and the activation energy of PVC nanocomposite films were discussed. It was found that both dielectric and optical properties were reinforced by the adding of CdO nanoparticles to the PVC matrix. Finally, the results of the present system are compared with those of similar materials.

Key words: CdO Nanoparticles; Sol-gel; Polymer Nanocomposites; Refractive index; Optical dispersion constants; Dielectric relaxation; Ac conductivity.

Corresponding author: e-mails: ams06@fayoum.edu.eg, and adel_sayed_2020@yahoo.com