

# The effect of $Zn_{0.95}Ni_{0.05}O$ nanoparticles on the physical properties of polyvinyl chloride, Polymer Bulletin

T. Abdel-Baset, S. El-Sayed, The effect of  $Zn_{0.95}Ni_{0.05}O$  nanoparticles on the physical properties of polyvinyl chloride, Polymer Bulletin (2021), doi.org/10.1007/s00289-021-03614-z

## Abstract

Nanoparticles of  $Zn_{0.95}Ni_{0.05}O$  (ZNO) were prepared by the coprecipitation technique and added to polyvinyl chloride (PVC) to get nanocomposite films. X-ray diffraction (XRD) was performed on nano-sized ZNO to test its crystal structure. Field emission-scanning electron microscopy (FE-SEM) was used to check the homogeneity of PVC and the dispersion of ZNO on the surface of the polymer matrix. The crystal size of ZNO is about 40.5 nm. Energy-dispersive X-ray spectroscopy (EDS) revealed the same element compositions of ZNO. The dielectric properties of ZNO/ PVC nanocomposite film were analyzed in details within the frequency and temperature ranges of 0.5–1000 kHz, and 303–430 K, respectively. The dielectric permittivity as well as the ac conductivity of pure PVC increased noticeably with adding ZNO nanoparticles. The dependence of both temperature and frequency of the dielectric modulus,  $M''$ , showed  $\alpha$ -relaxation due to the micro-Brownian motion of the main polymeric chains. The UV–vis spectroscopy revealed a pronounced increase in both absorbance and extinction coefficient by adding ZNO to PVC. Different optical parameters were calculated. The outcome results of this work were compared and discussed with similar nanocomposite films.