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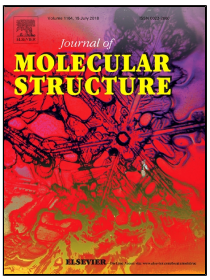

Optical properties of ZnO nanoparticles Dispersed in PMMA/PVDF Blend

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Optical properties of ZnO nanoparticles Dispersed in PMMA/PVDF Blend

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Abstract

Blend films based on PMMA /PVDF(80/20 wt %) undoped and doped with different concentration of ZnO nanoparticles ranging from (5-20) wt % were prepared by casting technique. Characteristics of the nanocomposites were examined using XRD and UV-Vis optical spectroscope in the wavelength range (200-800) nm. Complexation has been confirmed using XRD. The refractive index n and extinction coefficient k were observed to increase with increasing concentration of ZnO nanoparticles. Analysis of the absorption coefficient data reveal that the rule of direct transition predominates. It has been found that the optical energy gap decreases with increasing ZnO content, while the width of the tails in the gap have an opposite behavior. Other optical parameters, oscillator energy, dispersion energy, the loss factor, the volume, the surface energy loss functions and the optical conductivity as a function of ZnO content are also studied and discussed.

Keywords: PMMA / PVDF blend, ZnO; Nanocomposites; X-ray diffraction (XRD); Optical study.

1. Introduction

For new properties in polymeric materials, number of polymers are mixed together to create a group of materials with better properties than individual polymers. The polymer blend is easy to prepare and simple to control its physical properties. However, the dominant and superior properties of the polymer blend are due to the miscibility between the components of the polymer[1]. Poly(methyl methacrylate) PMMA, has acquired unlimited interest and great features owing to its individual properties like Lower optical absorption due to its high transparency in the visible region, low refractive index rigid, hard, thermal capacity, electrical performance, good mechanical properties and simple synthesis. PMMA is used to design anything [2,3] due to its thermoplastic properties, good outdoor weather resistance and resistance to hydrolysis. Polyvinylidene fluoride PVDF has several characteristics like, outstanding dielectric properties, elevated mechanical strength and thermal stability [4]. Some reports show the crystalline structures of PVDF and show five