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Spectroscopic ellipsometry study and variability of optical parameters for blend polymer(PVA:POT)thin films

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ABSTRACT

The third-order nonlinear susceptibility of blend poly (O-Toluidine-Vinyl Alcohol) were studied as a function of photon energy. The measurement of refractive index (n) and extinction coefficient (k) showed variation in their amount with incident light. In addition, the some optical parameters of the prepared blended polymers were calculated. The optical and electrical conductivity have been measured as a function of photon energy as well as.

Introduction

Thin film fabrication technology is a well-founded materials technology. The request of the desired materials to keep pace with the evolution at twenty-first century, like nanostructured materials and/or handmade super lattices; it is as yet developing on a daily basis. Thin film material technology is both an old and a recent time considered as an important key for material technology studies. Thin film materials and deposition processes with unique properties have been explained in several articles and books. However, there are different technique methods available for thin films fabrication on a single crystal substrate, such as thermal evaporation, spin coating, chemical decomposition, spray pyrolysis and the evaporation of fundamental materials through the radiation of energetic or photons [1, 2]. The studies of the organic conducting polymers started in the last few years for employ in several electronic applications. Especially, the electronic and electrical properties of poly aniline and poly (O-Toluidine) were thoughtful massively [3, 4]. Increasing usage of conducting polymers has quickened studies on polymer applications in recent years. Conducting polymers with long π -conjugated structures have unique properties, such as flexibility, thermal and electrical stability, ease of preparation and immovability [5]. The study of the optical properties for thin films considered as a used tool to understand and explain the behavior of the photonic device applications [6]. In this study of polyvinyl alcohol

(PVA) and blend polymers (PVA:POT) are investigated by using UV-visible spectrophotometer (Cary 50 scan VARIAN) and then the optical and electrical conductivity of polymers are calculated. While the optical constants of polymers, such as refraction index (n), extinction coefficient (k) and third-order nonlinear susceptibility determined by using spectroscopic ellipsometry.

Optical studies

The optical constants of prepared polymers (Refractive index (n) and extinction coefficient (k)) are characterized by using Ellipsometry spectroscopy through performing theoretical fitting of the measured ellipsometry data. The Cauchy model has been used to extract the parameters of the polymers in this work. The ration of light velocity in vacuum (C) to it's velocity inside the material (v) known as refractive index. Depending on the reflectance (R) and extinction coefficient (k) the value of refractive index (n) was determined as following [8,9]:

$$n = \left[\left(\frac{4R}{(R-1)^2} \right) - k^2 \right]^{1/2} - \frac{R+1}{R-1} \dots (1)$$

Where, the reflectance expressed by the following relation:

$$R = \frac{(n-1)^2 + k^2}{(n+1)^2 + k^2} \dots (2)$$

In general, The extinction coefficient refers to several different measures of the light absorption in a medium. In physics, the extinction coefficient is the imaginary part of the complex index of refractive related to light absorption as well. The imaginary part