

STUDY OF THE LINEAR OPTICAL PROPERTIES AND SURFACE ENERGY LOSS OF 5',5"-DIBROMO-O-CRESOLSULFOPHTHALEIN THIN FILMS

HUSSAIN A. BADRAN*, MOHAMMED F. AL-MUDHAFFER, QUSAY M. A. HASSAN, ALAA Y. AL-AHMAD

Department of Physics, College of Education, University of Basrah, Basrah, Iraq

The optical constants such as (refractive index n , extinction coefficient k and absorption coefficient α) were calculated for 5',5"-dibromo-o-cresolsulfophthalein (BCP) thin films by using spectrophotometer measurements of the transmittance, absorbance and reflectance at normal incidence in the spectral range 350–900 nm. The obtained values of both n and k were found to be dependent of the film thicknesses. The refractive index has anomalous behaviour in the wavelength range 350–900 nm besides a high energy transition at 2.385 eV. The optical parameters (dispersion energy E_d , oscillation energy E_o and the high frequency dielectric constant ϵ_∞) were calculated using Wemple and Didomenico method. The volume energy loss (VELF) and the surface energy loss (SELF) functions are also investigated.

(Received November 13, 2012; Accepted December 7, 2012)

Keywords: Optical constants, energy loss, electrical conductivity, Tin films.

1. Introduction

Optical properties of thin films have been the subject of intense study during the last decades and great efforts have been made to develop the mathematical formulation describing the transmittance and reflectance of different optical systems [1,2]. Among the existing methods for determining the optical constants of those based exclusively on the optical transmission spectra at normal incidence have been applied to different crystalline and amorphous materials deposited on transparent substrates in the form of thin films [3-7].

The study of the optical constants of materials has been interesting for many reason. First, the use of materials in optical fibres and reflected coating requires accurate knowledge of their optical constants over wide range of wavelength, second, the optical properties of all materials are related to their atomic structure, electronic band structure and electrical properties. The structural bonding between the neighbours determines the optical properties, such as absorption and transmission of the amorphous material [8].

In the present work we determine the optical constant and dispersion parameters also the volume energy loss (VELF), surface energy loss (SELF) functions for 5',5"-dibromo-o-cresolsulfophthalein (BCP) thin films with deferent thickness. The optical properties of thin films were determined by using transmission, absorbance and reflection data spectrum in the wavelength range 350-900nm.

2. Materials and preparation

5',5"-dibromo-o-cresolsulfophthalein (BCP), with molecular mass= 540.22 g mol⁻¹, has been selected for our experiments as shown in Fig. 1. BCP dye was supplied from Aldrich Company with purity 96%. In our experiment, the host material is Poly (methyl methacrylate) (PMMA) and the ratio of dyes in PMMA by weight is 0.05, 0.1, 0.2 and 0.4 respectively.

*Corresponding author: badran_hussein@yahoo.com