Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Archives of Applied Science Research, 2012, 4 (4):1804-1810
(http://scholarsresearchlibrary.com/archive.html)

ISSN 0975-508X
CODEN (USA) AASRC9

Linear and nonlinear optical properties of I and $NaBH_4$ doped Malachite green thin films

Hussain S. Shaaker , *Hussain A. Badran and Waleed A. Hussain

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

---

ABSTRACT

The optical properties and spectral behavior for pure and doping thin films of Malachite green were studied using Cecil Reflecta-Scan CE-3055 Reflectance Spectrometer measurements of the transmissivity and reflectivity at normal incidence of light in the wavelength range 300–1000 nm in steps of 2 nm. The refractive index, n, and absorption index,k, were calculated and it was found that they are dependent on film doping in the thickness 1 μm. The absorption spectra in the UV–VIS region has been analyzed in terms of both molecular orbital and band theories. The direct energy gap was obtained and equals to 2.667 eV , 2.672eV, 2.678 eV , 2.638 eV and 2.627 eV for pure , Sodium borohydride (S2 and S3) and Iodine (S4 and S5) doping thin films, respectively. The real ε_1 and imaginary ε_2 parts of the dielectric constant, the optical conductivity σ_{opt}, electrical conductivity σ_e the third-order nonlinear optical properties $\chi^{(3)}$ and nonlinear refractive index were calculated for doping and pure Malachite green thin films.

***Keywords*:** organic dye, energy gab, nonlinear properties, thin films

---

INTRODUCTION

The application of Malachite green in any one of technological devices will certainly be provided as thin films. The optical constants of thin films provide us with information concerning microscopic characteristics of the material and its determination is very important for using it in any one of such devices. Davidson [1] investigated the effect of the central metal atom on the absorption spectra of thin films.The production of the majority of modern optoelectronic devices are based on the semiconducting behaviour of these materials in thin film form such as organic solar cells [2,3], in organic field effect transistors [4], in organic light emitting diodes in which Malachite green can be used as a hole transport layers [5,6] or emitting layers [7] and in gas sensors [8,9].

The nonlinear effects can be found also in many crystals [10,11], but the glasses have advantages over crystals in lower coast, better processing, very often in larger refractive non-linearity and in the possibility to include them easily into optical fiber and planar waveguide.

The aim of this study, is to investigate the optical constants of MG thin films such as real and imaginary parts of the dielectric constant, optical band gap E_g , optical conductivity σ_{opt} and third-order nonlinear optical properties. The effect of film doping on these quantities was studied.