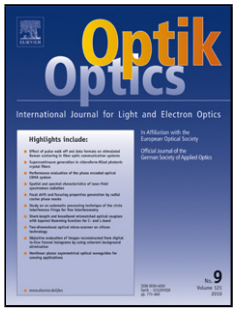

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Authors: A.A. Al-Muntaser, M.M. El-Nahass, A.H. Oraby, M.S. Meikhail, H.M. Zeyada

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Structural and optical characterization of thermally evaporated nanocrystalline 5,10,15,20-Tetraphenyl-21H,23H-porphine manganese (III) chloride thin films

A.A. Al-Muntaser[1,2,*], M.M. El-Nahass[3], A.H. Oraby[1], M.S. Meikhail[1], H.M. Zeyada[4]

[1]*Department of Physics, Faculty of Science, University of Mansoura, Mansoura, 35516, Egypt*
[2]*Department of Physics, Faculty of Education-Arhab, Sana'a University, Sana'a, Yemen*
[3]*Department of Physics, Faculty of Education, Ain Shams University, Cairo 11757, Egypt*
[4]*Department of Physics, Faculty of Science at New Damietta, University of Damietta, New Damietta, 34517, Egypt*

* Corresponding author address Tel: +201157962044; Fax: +20502246781;
E-mail address: almuntser2015@gmail.com

Abstract:

Thin films of 5,10,15,20-Tetraphenyl-21H,23H-porphine manganese (III) chloride, MnTPPCl, were successfully deposited by thermal evaporation technique. The structure of thin films was characterized using Thermal Gravimetric Analysis, TGA, Fourier Transform Infrared, FTIR, X-ray Diffraction, XRD, and Atomic Force Microscope, AFM, techniques. TGA showed that MnTPPCl films are thermally stable up to 623 K. FTIR analysis revealed that thermal deposition technique is a convenient one to obtain chemically stable MnTPPCl thin films. XRD patterns showed nanocrystallites dispersed in the amorphous matrix for the pristine and annealed thin films. Annealing temperature increased the crystallite size and improved crystallinity of films. The observed results obtained by XRD technique are in agreement with those observed by AFM technique. Optical constants (n and k indices) of MnTPPCl films were calculated from absolute values of transmittance and reflectance measured by spectrophotometric technique in the wavelength range 200–2500 nm. The dispersion curve showed anomalous dispersion in the wavelength range < 650 nm and normal dispersion in the wavelength range 650-2500 nm. The dispersion parameters of MnTPPCl films were calculated by applying single oscillator model in the transparent region of the spectrum. The molar extinction coefficient indicated the possibility of incorporating MnTPPCl films in devices fabrication. The absorption parameters of MnTPPCl films were calculated by applying band to band electron transition theory.