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Effects of γ -irradiation and heat treatment on structural, spectral and optical parameters of pyronine G(Y) thin films

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Abstract

The structural properties of both powder and thermally evaporated pyronine G(Y) thin films have been investigated, using X-ray diffraction technique as well as scanning electron microscope and Fourier transformation infrared FTIR. The powder diffraction pattern has been indexed for the first time. The spectral and the optical parameters have been investigated by using the spectrophotometric measurements of both transmittance and reflectance at normal incidence of light in the wavelength range 200-2500 nm. All the optical investigations have been carried out for the as deposited, annealed (at 393 K/2 h under vacuum) and γ -irradiated does (by total dose 150 kGy) thin films. Some of the important spectral parameters, namely molar extinction coefficient, oscillator strength and electric dipole strength of the principle optical transitions have been evaluated. The fundamental and the onset indirect energy gaps have been also estimated. The refractive index as a function of wavelength has showed an anomalous dispersion in the absorption region as well as normal dispersion in the transparent region. From analysis of the dispersion curves in the non-absorbing region, the dielectric constants and the dispersion parameters have been obtained. The temperature dependence of the electrical resistivity gives two activation energies related to the extrinsic and intrinsic conduction that depend on the temperature range. © 2009 Elsevier B.V. All rights reserved.

Author Keywords

γ -Irradiation; Pyronine G(Y); Thin films

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