

Nonlinear optical properties of natural laccaic acid dye studied using Z-scan technique

S. Zongo , K. Sanusi , J. Britton , P. Mthunzi , T. Nyokong , M. Maaza , B. Sahraoui

Keywords:

Z-scan

NLO

Multiphoton absorption

Third-order nonlinear susceptibility

Optical limiting

Natural laccaic acid dye

Abstract:

We have investigated the nonlinear optical properties, including the optical limiting behaviour for five different concentrations of laccaic acid dye in solution and a thin film obtained through doping in poly (methyl methacrylate) (PMMA) polymer. The experiments were performed by using single beam Z-scan technique at 532 nm with 10 ns, 10 Hz Nd:YAG laser pulses excitation. From the open-aperture Z-scan data, we derived that the laccaic dye samples exhibit strong two photon absorption (2PA). The nonlinear refractive index was determined through the closed aperture Z-scan data. The estimated absorption coefficient b_2 , nonlinear refractive index n_2 and second order hyperpolarizability c were found to be of the order of 10^{-10} m/W, 10^{-9} esu and 10^{-32} esu, respectively. The Z-scan study reveals that the natural laccaic acid dye emerges as a promising material for third order nonlinear optical devices application.