




Second-order hyperpolarizability and nonlinear optical properties of novel organic compound-doped poly (O-methoxyaniline) polymer film

Hussain A. Badran^{1,*} , Hanan A. Al-Hazam², R. K. Fakher Alfahed³, and Khalid I. Ajeel¹

¹Department of Physics, College of Education for Pure Sciences, University of Basrah, Basrah, Iraq

²Department of Chemistry, College of Science, University of Basrah, Basrah, Iraq

³Al-Nahrain University, Al-Nahrain Nano- Renewable Energy Research Center, Baghdad, Iraq

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ABSTRACT

The structural characterization of a new organic compound (3, 5-bis (4-chlorophenyl)-4,5-dihydro-1H-Pyrazole) was analyzed experimentally by ¹HNMR and FTIR spectroscopic technique. The analysis of HOMO–LUMO and natural bond orbital are investigated to study the charge transfer interactions leading to the properties of nonlinear behavior. Linear optical properties of a new organic compound/Poly (O- Methoxyaniline) (POMA) film were studied using Wemple and Didomenico (WD) technique to estimate the refractive index n and other optical constants such as the oscillation energy E_0 , the dispersion energy E_d , and the lattice dielectric constant ϵ_∞ . Measurements of the thermally induced optical nonlinearity of novel organic compound (3, 5-bis (4-chlorophenyl)-4, 5-dihydro-1H- Pyrazole) in an organic solvent (N-methyl-2-pyrrolidone) NMP)) were studied through an excitation source (continuous-wave diode laser at the wavelength of 473 nm) in the case of the solution and a conducting polymer film. The Z-scan technique was used to measure the nonlinear refractive index(n_2) to obtain the optical response of the prepared material. The prepared sample illustrated negative and large n_2 values in the order of 10^{-7} cm²/W and reverse saturable absorption(RSA) with large values of the nonlinear absorption coefficient in the order of 10^{-3} cm/W. The nonlinear refractive index was determined and varied as a response to different concentrations. The determination of the figure of merit (W) and nonlinear coefficients indicate that the compound is a promising candidate for applications in the nonlinear optics field.

Address correspondence to E-mail: hussain_badran@yahoo.com