



A novel azo compound derived from ethyl-4-amino benzoate: synthesis, nonlinear optical properties and DFT investigations

Qusay M. A. Hassan¹ · Rafid H. Al-Asadi^{2,1} · H. A. Sultan¹ · Hasanain A. Abdullmajed² · Asaad A. Ali² · C. A. Emshary¹

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Abstract

A novel azo dye compound, Ethyl (E)-4-((5-hydroxy-3,4-bis(hydroxyl methyl)-6-methylpyridin-2-yl)diazenyl)benzoate (EAB), have been synthesized by the coupling reaction and characterized by FT-IR, ¹H- and ¹³C-NMR, Mass, and UV–visible spectroscopies. The nonlinear optical (NLO) properties of the EAB compound via the finding of the nonlinear refractive index (NRI) using continuous wave (cw), low power 473 nm, TEM₀₀ mode laser beam have been studied via the diffraction patterns (DPs) and the Z-scan. Effect of power input of the laser beam, types of beam wavefront and temporal variation of the DPs are discussed. The all-optical switching (AOS) using two laser beams is proved to occur in this compound.

Keywords Novel azo dye · DFT · DPs · Z-scan · All-optical switching

1 Introduction

Recently, vast number of researchers are interested in finding and/or preparing systems of high quality that behave nonlinearly towards laser light beams since the index of refraction becomes intensity dependent as it is exposed to electric field of high values. The laser beam interaction with nonlinear materials leads to variety of effects in the transverse dimensions viz., self-focusing (SF) and defocusing (SDF), spatial ring formation, self-phase modulation, etc., (Villafranca and Saravanamuttu 2012; Saeed et al. 2020; Elias et al. 2019, 2018; Emshary et al. 2021a; Ali et al. 2020; Jassem et al. 2021; Shabeeb et al. 2020; Sultan et al. 2021; Mutlaq et al. 2021; Abdullmajed et al. 2022a). Materials having high nonlinear optical (NLO) third-order properties and ultra-fast response time led to considerable scientific activities for their potential applications viz., optical computing, optical phase conjugation,

✉ Qusay M. A. Hassan
qusayali64@yahoo.co.in

¹ Department of Physics, College of Education for Pure Sciences, University of Basrah, Basrah 61001, Iraq

² Department of Chemistry, College of Education for Pure Sciences, University of Basrah, Basrah 61001, Iraq