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Original research article

Benzenesulfonamide-thiazole system bearing an azide group: Synthesis and evaluation of its optical nonlinear responses

Hamsa Hussein Al-Hujaj [a], Qusay M.A. Hassan [b,*], Faeza Abdulkareem Almashal [a], H.A. Sultan [b], Adil Muala Dhumad [a], Ahmed Majeed Jassem [a], C.A. Emshary [b]

[a] Department of Chemistry, College of Education for Pure Sciences, University of Basrah, Basrah 61001, Iraq
[b] Department of Physics, College of Education for Pure Sciences, University of Basrah, Basrah 61001, Iraq

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ABSTRACT

Objective: The current study aims to find a material that has high nonlinear optical properties to be used in photonic applications.
Methods: The synthesis and characterization of benzenesulfonamide-thiazole compound containing an azide group: 4-azido-*N*-(thiazol-2-yl) benzenesulfonamide **5** ($C_9H_7N_5O_2S_2$) via four steps are described. ^1H and ^{13}C NMR, FTIR, and mass spectroscopies are used in the study of the synthesized compound **5**, together with UV–visible analysis to determine its linear absorption coefficient.The density function theory calculations are used to obtain the compound **5** optimized structure.
Results: The optical nonlinear properties of the compound **5** are studied using continuous wave laser beam via the determination of its nonlinear refractive index and the coefficient of nonlinear absorption based on the diffraction ring patterns and the Z-scan respectively. All-optical switching property is tested using two continuous wave laser beams viz., 473 nm and 532 nm.

1. Introduction

In the recent years, there has been extensive deal of interest in the nonlinear optical (NLO) properties of inorganic and organic molecules [1–11], both from an essential perspective and due to their potential exploitations in large number of photonic applications such as optical communications, electrooptical signal processing [12], optical limiting [13–17], electro-optical and optical devices, data storage [18–21], optical phase conjugation [22] and all-optical switching [23]. Interestingly, the organic molecules have mainly become as targets for the previous applications because of their large ability to give desired physicochemical properties [24]. NLO molecules, particularly various organic molecules have recently attracted vast attention as they can offer potential benefits such as ease for processing, low cost, and large electro-optical (EO) coefficients in comparison with inorganic molecules [25]. As the organic molecules possess multichromophore dendrimers, they have been further demonstrated to improve poling efficiency in the NLO properties [26]. These molecules comprise active EO, and dipolar chromophores which are covalently bound to construct a dendritic structure. The chromophore moieties tethered to the covalent core by flexible covalent bonds therefore, these moieties are free to rotate as well as they can be isolated from one another by the same core. Decreasing the dipole–dipole interactions will greatly increase the number density of active chromophore in the articulation of an EO molecule, thus accentuating NLO response [27]. Although, the

* Corresponding author.
E-mail address: qusayali64@yahoo.co.in (Q.M.A. Hassan).

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