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Interactions Involving Particle Beams and Laser Light Scattering: Novel Laser-light Interactions

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Editorial

The use of organics as nonlinear optical materials for photonic switching and optical limiting applications has piqued the interest of numerous researchers over the last decade, with significant implications for information technology and industrial applications. Photonic applications in particular include all-optical switching, three-dimensional optical devices, all-optical limiting, medical science, and other optical areas. The known broad range of organic compounds and the inherent flexibility in creating such compounds with desired qualities make organic materials the most appealing. The nonlinearity in these molecules is caused by a substantial delocalization of -electrons along the length of the molecule. We can construct organic systems with enhanced nonlinear properties via molecular engineering, and we can examine the linear and nonlinear equations [1].

Increased conjugation length increases the distance over which charge can be transferred, creating a donor-acceptor-donor motif by substitution, increasing the extent of charge transfer from the ends of the molecule to the centre, and reversing the sense of symmetric charge transfer by substituting electron acceptors and donors, resulting in acceptor-donor-acceptor compounds.

The hydrazine derivatives investigated in this article were synthesised using the above technique, with the purpose of improving their nonlinear optical response by changing the fundamental structure by substituting various electron donating and electron withdrawing groups. Hydrazine is an effective organic material class for nonlinear optics. Because the hydrazine backbone is an asymmetric transmitter, it significantly increases molecular nonlinearity for electron donating and withdrawing group substitutions. The and groups are electron donors, whereas the group accepts electrons. Tests such as Z-scan pump probe and four waves mixing experiments are often used to identify effective nonlinear optical materials [2-3].

To examine the third-order nonlinear optical properties of these materials, the single beam Z-scan technique is used. With nanosecond laser pulses, the compounds exhibit noticeable third-order nonlinearity and strong optical limiting. They cannot, however, be employed directly in practical devices since they are not as flexible as polymers and deteriorate when exposed to powerful laser beams. To address this issue and make these materials usable in devices, the chemicals were doped into the matrix. Nonlinear optical polymer that is hard, rigid, and transparent, with a glass transition. It has a molecular weight of on average [4]. Significantly greater physical durability than other thermoplastics and is harder than polystyrene. is the material of choice for designing components.

The Z-scan approach is used to investigate the third-order properties, and the structure-property relationship of hydrazine-based pure compounds in host is reported utilising nanosecond laser pulses at 532 nm. Additionally, optical limiting investigations were carried out [5]. It is explored the relationship between molecular structure and observed NLO behaviour. In comparison to previously reported works on the nonlinear optical coefficient of the system and poly, the third-order nonlinear optical coefficient observed in this work is one order of magnitude larger.

Conflict of Interest

None.

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