



Fabrication, structural, thermo-mechanical and opto-electrical behavior of anthranilamide compound

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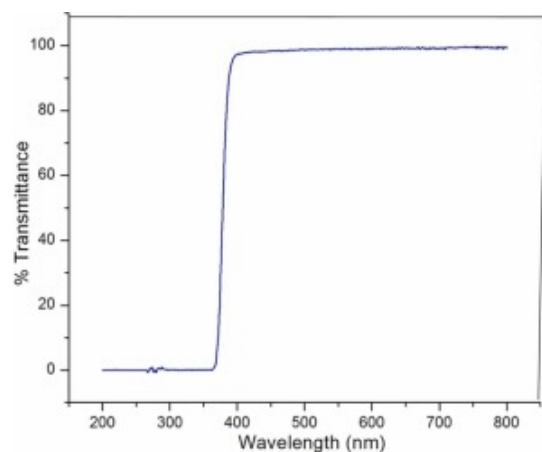
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Abstract

Anthranilamide (AAM) compound were fabricated via an alcoholic solvent assisted slow evaporation at room temperature for investigating the multi functional device applications. The solubility test was performed with different concentrations of AAM salt dispersed in 100mL ethanol solvent to understand the crystallization process of fabricated material. The cell parameters, and diffraction peaks of the title compound were collected through nondestructive tool like single crystal XRD and powder XRD studies, and thus results showed the monoclinic structure. The fabricated material's functional group, thermal stability, and hardness behavior were tested by various tool viz FT-IR, TG-DTA, and Vickers hardness analysis. With the aid of UV-vis-NIR spectrum, and frequency conversion test technique, optical transmittance and double harmonic generation efficiency values are detected to be 92% and 4.1 mV. Using electrical studies, the dielectric parameters and specific conductance of the title compound values are varied by applying a low frequency to a high frequency region at different temperatures (313, 323, and 333K).

Graphical Abstract



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UV-Vis transmittance spectrum of AAM material.

Introduction

Nonlinear optical crystals that are inorganic, semi-organic, and organic have a wide range of utilization in information technology, optoelectronics, light transmission storage devices, frequency conversion, and mixing etc. [1], [2], [3], [4], [5], [6], [7], [8]. Especially, organic material exhibits much higher frequency conversion efficiencies, and faster response in opto-electric based switches than their inorganic material, and thus leads to applicable for light sensing devices [7], [8]. In this present work, the optical transmittance spectrum, mechanical hardness test, and electrical study revealed that synthesized AAM material have a 92% optical transmittance in the visible light, acceptable optical transmission quality and stability, moderate hardness, low dielectric loss, and conductivity. The above-mentioned feature of the title compound can be used in multifunctional device applications. Jin et al. [9], Hergett et al. [10], Hu et al. [11], Mythili et al. [12], and Liang et al. [13] used solution growth, slow evaporation, optical floating zone method, microwave plasma chemical vapor deposition, Czochralski pulling technique, and melt growth assisted single crystal to tested the NLO and electro-optics related device applications. The slow evaporation route is chosen for the following reasons: low operating temperature, without using any instruments or tedious process applying pressure and high temperature [7], [8].

In the current work, AAM are fabricated from ethanol solvent assisted slow evaporation technique followed by characterized various instruments like single crystal XRD, powder XRD, FT-IR, UV, SHG, thermal, mechanical and electrical analysis. The above-mentioned title compound characterization outcomes are explained in elaborated. The synthesized AAM material exhibits good transmittances in the visible region, as confirmed by the UV spectrum analysis. According to electrical studies, dielectric loss, dielectric constant, and AC conductivity values are tuned depending on the applied frequency and a set of different temperatures. The above -mentioned properties are suitable for electro-optic device

applications. The synthesized AAM material has been tested by Kurtz and Perry powder route with solid-state laser (Nd:YAG) for investigation frequency conversion applications.

Section snippets

Experimental

Anthranilamide (AAM) compound were developed through mixing of anthranilamide salt with an ethanol solvent followed by slow solvent evaporation technique. The commercially available anthranilamide solid was cleaned with ethanol by several times repeating crystallization process, consequently it was taken as a purified precursor for fabricate of the title compound. 100mL ethanol solvent was preserved in a beaker and a certain amount of purified precursor was gradually added under magnetic...

Results and discussion

The six parameters of unit cell (length of each side (a, b, c), interfacial angles (α , β , γ)), as well as the cell volume of the fabricated compound can be collected using single crystal XRD analysis, and the obtained values are mentioned in Table 1. Further, collections of unit cell parameters from Table 1 reveals that the synthesized AAM material has respect to formation of a monoclinic crystal system with the space group $P2_1/c$ (ICDD code No.00–004–0435).

The presence of a few strong intensity...

Conclusion

Anthranilamide compound were synthesized through an alcoholic solvent slow evaporation technique. The AAM material belongs to the monoclinic system, according to the single crystal XRD and powder XRD analyses. Using optical transmittance spectrum analysis of the synthesized AAM material, optical transmittance has found to be constant in the visible region. Vibrational bands and thermal stability of the AAM material were examined with the FT-IR and TGA/DTA analysis. The title compound's SHG...

CRedit authorship contribution statement

S. Dinakaran: Methodology, Investigation, Writing – original draft. **J. Gajendiran:** Investigation, Writing – original draft, Writing – review & editing, Conceptualization. **S. Gokul Raj:** Investigation, Writing – original draft, Writing – review & editing. **S. Gnanam:** Investigation, Writing – original draft, Writing – review & editing. **J. Ramana Ramya:** Writing – review & editing. **S Rafi Ahamed:** Formal analysis. **C. Esther Jeyanthi:** Formal analysis....

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: S. Gokul Raj reports a relationship with C Kandaswami Naidu College for Men that includes: funding grants. S. Dinakaran reports a relationship with University College of Engineering Thirukkuvalai that includes: non-financial support....

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