Study of Triglycine Potassium Halides: A Semiorganic Non Linear Optical Crystals

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***Abstract*—**The synthesis of of novel and efficient frequency conversion materials has resulted in the development of semi-organic materials, which possess large non linearity, high resistance to laser induced damage, low angular sensitivity and good mechanical stability [1-3]. Amino acids are interesting organic materials for NLO applications as they contain zwitterions, which create hydrogen bonds. Glycine is the simplest amino acid. Glycine with inorganic salts is Lithium sulphate [4], Sodium Mitrate [5], Potassium Sulphate [6] and Zinc Chloride [7] that forms NLO semiorganic crystals. The present paper deals with the growth of Truglycine Potassium Halides like Triglycine Potassium Chloride, Triglycine Potassium Bromide and Triglycine Potassium Iodide by slow evaporation solution growth technique and characterization by powder XRD, UV , NLO and Dielectric studies.

Triglycine Potassium halides were synthesized by dissolving AR grade Glycine and Potassium Halides in the ratio of 3:1 in the triple distilled water by continuous stirring. The impurity content of the crystals was minimized by recrystallization process. The grown crystals were optically transparent. The grown single crystals were subjected to powder X-ray diffraction. The lattice parameters obtained from the data of powder XRD pattern using UNITCELL software package and are found tobe in good agreement with the literature.

A Transmission Spectrum is very important for any NLO materials because a nonlinear optical material can be of any practical use if it has a wide transparency window. In the present study we have recorded the UV-Vis NIR transmission spectrum in the range of 200-1100 nm. From the spectrum it is observed that the crystals have a lower cutoff wavelength of 329 and 335nm. The spectrum further indicates that the crystals has a wide optical window and are good for SHG studies and other related optoelectronic applications.

The second harmonic generation of the Triglycine potassium Halides were examine by the Kurtz Powder technique [8]. The Second Harmonic Generation behavior was confirmed from the emission of green light. SHG efficiency of the Triglycine potassium Bromide is 1.4 times and Triglycine potassium Iodide is 1.3 times that of the standard KDP crystal.

Dielectric properties are correlated with electro-optic property of the crystals [9]. The dielectric constant is the measure of how easily a material is polarized in an external electric field. [10]. The dielectric study on crystals is carried out using HIOKI3532-50 LCR HITESTER. The capacitance and the dielectric loss are measured in the frequency range of 100Hz to 5MHz. The dielectric constant is calculated and graph of dielectric constant versus log(frequency) is plotted. From the graph it is observed that dielectric constant decreases with frequency. The lower values of dielectric constant are a suitable parameter for the enhancement of the SHG efficiency.

The above characterization confirms that the grown crystals are suitable for the fabrication of various optoelectronic devices.

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