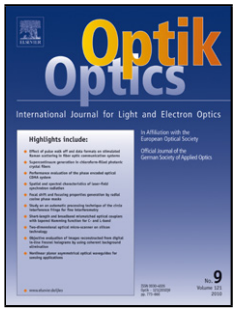

Title: Growth and Characterization of the Semi Organic Non Linear Optical Crystal: Diglycine ammonium sulphate

Author: B. Helina

PII: S0030-4026(15)01021-9
DOI: http://dx.doi.org/doi:10.1016/j.ijleo.2015.08.252
Reference: IJLEO 56176

To appear in:

Received date: 17-9-2014
Accepted date: 30-8-2015

Please cite this article as: B. Helina, Growth and Characterization of the Semi Organic Non Linear Optical Crystal: Diglycine ammonium sulphate, *Optik - International Journal for Light and Electron Optics* (2015), http://dx.doi.org/10.1016/j.ijleo.2015.08.252

Growth and Characterization of the Semi Organic Non Linear Optical Crystal: Diglycine ammonium sulphate

B.Helina

Department of Physics, St.Xavier's Arts and Science College, Palayamkottai – 627002. TamilNadu, India.

Email: helinafredy@gmail.com

Abstract

Single crystals of Di Glycine Ammonium Sulphate (DGAS) a new semi organic non-linear optical material, has been grown from solution by slow evaporation method at room temperature. The title compound was synthesized and purified by repeated recrystallization process. The growth of crystals was confirmed at pH 5.3. The crystals were characterized by single crystal X-ray diffraction and Fourier transform Infrared Spectroscopic (FTIR) analysis. The formation of DGAS crystal was confirmed by powder XRD analysis. The range and percentage of optical transmission was ascertained by recording UV-vis-NIR spectrum. The second harmonic generation behaviour of DGAS crystal was tested by Kurtz-Perry powder technique and its mechanical hardness was estimated by Vickers microhardness method.

Keywords: Characterization, solution growth, X-ray diffraction, FTIR spectrum, Nonlinear optical crystals

1. Introduction

In our scientific world, the development of science in different areas have been achieved through the growth of good quality single crystals in order to satisfy the day-to-day technological requirements. But in the recent past the rapid development in the field of optoelectronics greatly increased the demand for newer nonlinear optical (NLO) materials. In this regard, materials scientists discovered new type of materials called semi-organic. Glycine family crystals have been subjected to extensive research by several researchers [1-4] for their efficient NLO properties. The glycine molecule can exist in zwitterionic form and hence it is capable of forming compounds with anionic, cationic and neutral chemical compounds. Thus a large variety of glycine coordinated compounds are formed. However, only those complexes of glycine, which crystallizes in noncentrosymmetric structure, are expected to exhibit nonlinear optical second harmonic generation. Glycine is one such amino acid that crystallizes in three different forms α, β and γ. It has been reported that glycine combines with H_2SO_4 [5], $CaCl_2$ [6], $BaCl_2$ [7], $CaNO_3$ [8] and $LiNO_3$ [9] to form single crystals. But none of the reports were available on the growth and characterization of Diglycine ammonium sulphate (DGAS) single crystals. The author report in this article on the estimation of solubility and growth of DGAS crystals from aqueous solution by slow evaporation method. These crystals were characterized by single crystal X-ray diffraction, FTIR, UV-vis-NIR transmittance analysis, Powder XRD, SHG efficiency and Vickers microhardness studies.

2. Experimental procedure

2.1 Synthesis, solubility and growth of DGAS single crystals

DGAS salt was synthesized by taking Analar grade glycine and ammonium sulphate in the ratio 2:1. The synthesized salt of DGAS was finely powdered and was used for solubility study. The solubility of DGAS was determined for six different temperatures, viz.,30,35,40,45,50 and 55^{o}C. Solubility at a particular temperature was determined by dissolving the synthesized salt in 100 ml of double distilled water taken in an