NLO, FLUORESCENCE, XRD & MORPHOLOGICAL STUDIES OF A NEW SEMI ORGANIC SINGLE CRYSTAL: LITHIUM PARA NITROPHENOLATE TRI HYDRATE

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ABSTRACT

NLO materials are leading and prime factors for last few years. Lithium para nitrophenolate tri hydrate is a NLO material is obtained by solution growth method.

The characterization such as NLO, fluorescence, xrd, morphological & dielectric loss has been studied and reported.

Key words: NLO, fluorescence, Xrd, morphological & dielectric loss, Lithium Para Nitrophenolate Tri Hydrate.

INTRODUCTION

Lithium Para Nitrophenolate Tri Hydrate crystals are semi organic NLO crystal having monoclinic system and space group Pa and synthesized in 2 months and grown crystal size is 16x10x7 mm^3 by solution growth method [1, 2].

NLO, fluorescence, Xrd, morphological & dielectric loss studies are carried out in this paper for Lithium Para Nitrophenolate Tri Hydrate crystals.

POWDER XRD STUDY

The grown crystal of Lithium Para Nitro Phenolate Tri hydrate has been subjected to powder X- ray diffraction pattern and is in shown in Fig1. In general, Powder XRD authenticates the crystallinity of the sample, here the range of 2Ɵ values are 10°- 80° in steps of 10° is reported.

Powder form of the above mentioned crystal was taken for the analysis with a scan speed of 1°/60s is also given. The well defined and sharp peaks signify the good crystalline nature of the sample [3].

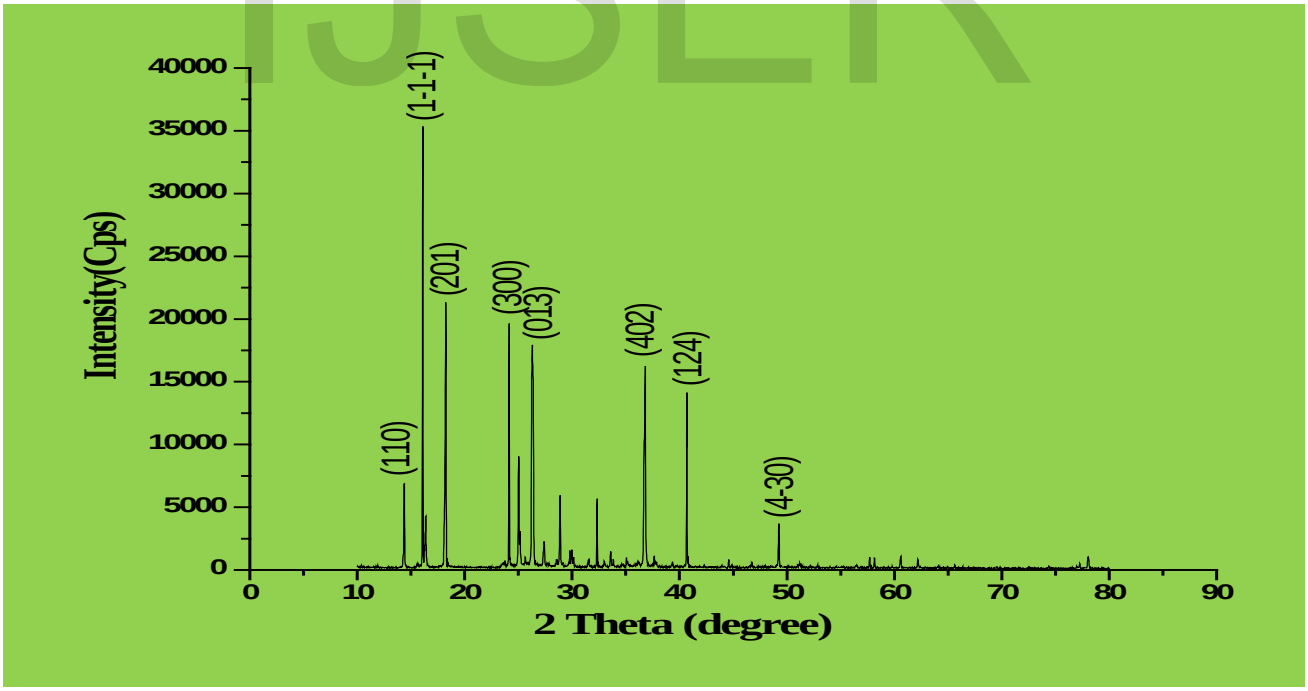

Fig.1. Powder Xrd Study for Lithium Para Nitrophenolate Tri Hydrate Crystal

NLO STUDIES

By using Kurtz test the second harmonic generation (SHG) efficiency of the crystal is measured. The incident fundamental beam of 35 ps pulse width, 1.5 milli Joules pulse^{-1} energy at a wavelength of 1.064 μm from an Nd: YAG laser is directed on to the sample of Lithium para nitro phenolate tri hydrate [4].

The SHG signal at 532 nm is detected in transmission using a photomultiplier tube (PMT). The SHG in the crystal is validated with the emission of green radiation from the specimen Crystal.

FLUORESCENCE STUDY

Fluorescence is the emission of light by a substance that has absorbed light or other electromagnetic radiations. The most striking examples of fluorescence occur when the absorbed radiation is in the UV region of the spectrum, and thus invisible to the human eye and the emitted light is in the visible region [5, 6].

Fluorescence has many practical applications. Here the spectrum given in Fig. 2 shows a peak at ~ 376 nm and indicates that a Lithium Para Nitrophenolate Tri Hydrate Crystal has a violet fluorescence emission spectrum.

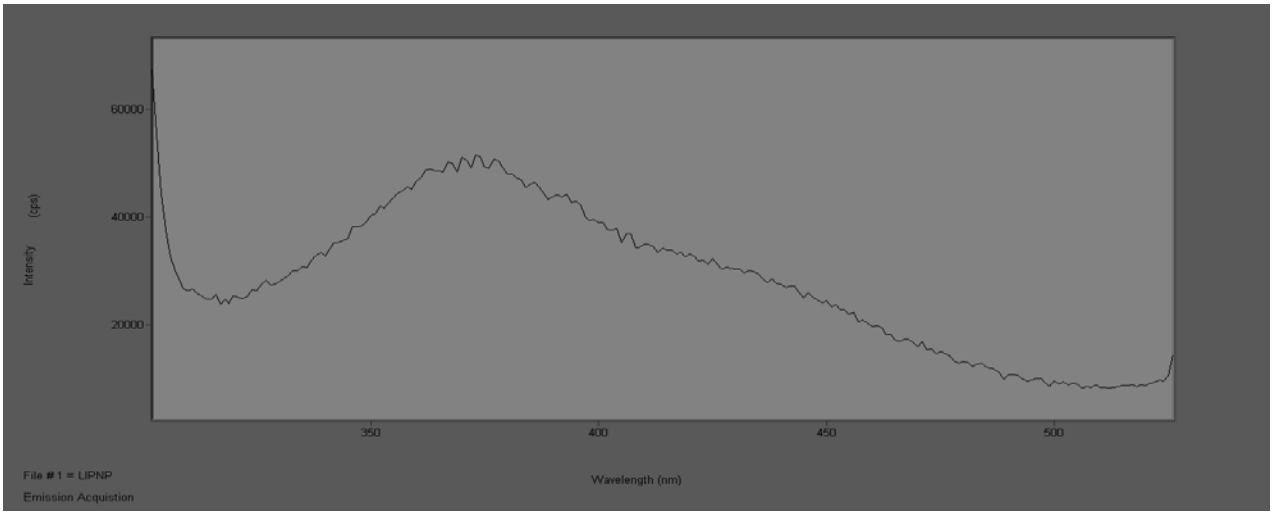

Fig.2. Fluorescence study of Lithium Para Nitrophenolate Tri Hydrate Crystal

MORPHOLOGICAL STUDIES

The morphology of Lithium Para Nitrophenolate Tri Hydrate Crystal is shown in Fig.3.

The crystal has eight faces within which four are distinctive and others are parallels.

The faces are (0 0 1), (1 1 0), (-3 0 -1), (2 -2 1). The largest unit cell dimension is along c axis.

Here, c and c* are almost coincident.

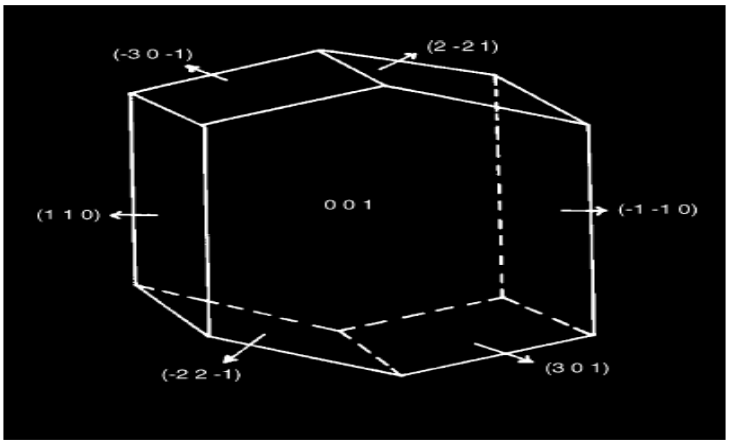

Fig.3. Morphological study of lithium para nitrophenolate tri hydrate crystal

DIELECTRIC LOSS

A study of dielectrics in crystal discloses information about the electric field allocation and charge transport mechanism. The dielectric loss was calculated using the relation $\varepsilon'' = \varepsilon_r D$, where D is the dissipation factor. Fig. 4 shows the variation of the dielectric loss at different frequencies measured at different temperatures [7,8].

From the curve, it is observed that the dielectric loss decreases with increasing frequency and attain saturation at higher frequencies [9,10].

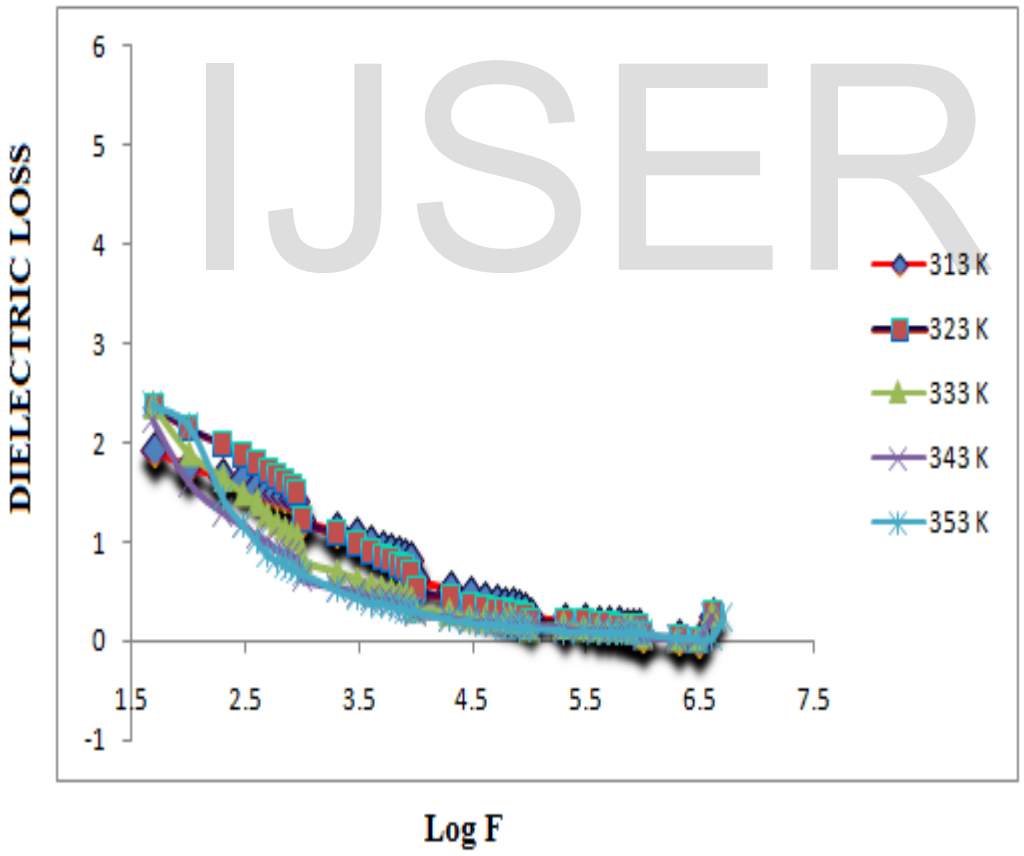

Fig.4. Dielectric loss study of lithium para nitrophenolate tri hydrate crystal

CONCLUSIONS

Lithium Para Nitrophenolate Tri Hydrate crystals are semi organic NLO crystal having monoclinic system and space group Pa and synthesized in 2 months and grown by solution growth method and NLO, fluorescence, Xrd, morphological & dielectric loss studies are carried out for the crystals and reported.

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PROFILE

This is K.Senthil Kannan M.Sc (Gold medalist), M.Phil, B.Ed, P.G.D.C.A., M.B.A., M.A., D.C.H., C.I., (Ph.D) and passed SLET (UGC) in the first attempt and having More than 7 years of research experience and more than one decade of academic output.

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