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OPTICAL CHARACTERIZATION OF TRIS THIOUREA POTASSIUM CHLORIDE SINGLE CRYSTALS

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ABSTRACT

Tris thiourea potassium chloride single crystals were synthesized by slow evaporation method. The optical characterization of the synthesized crystals was done by XRD (X-ray diffraction analysis), SEM (Scanning electron microscopy) analysis, and UV- Visible Spectroscopy. XRD analysis revealed the orthorhombic structure of crystal. SEM analysis showed that, tris thiourea potassium chloride crystals are agglomerated. UV- Visible spectra proves the suitability of tris thiourea potassium chloride crystals for frequency doubling.

Keywords: SEM, Tris thiourea potassium chloride, XRD

I. INTRODUCTION

The optical properties of NLO materials are widely studied because of the increasing recognition of their role in in the field of telecommunications, optical information and second harmonic generation [1-3]. Tristhiourea potassium chloride is a semi organic nonlinear optical material. In the present study pure single crystals of Tristhiourea potassium chloride were grown at room temperature by slow evaporation technique. The synthesized crystals were subjected to optical characterization. The result indicates the orthorhombic structure of crystal and its suitability for frequency doubling.

II.EXPERIMENTAL

Analar grade reagents were used. To prepare tris thiourea potassium chloride, completely dissolve calculated amount of thiourea in 20 ml double distilled water in a beaker. Then dissolve required amount of potassium chloride in this solution with constant stirring. Thiourea and potassium chloride were in the stoichiometric ratio 3:1. Cover the solution containing beaker using perforated filter paper. Kept it in a vibration free platform. After slow evaporation of solution at room temperature, crystals of tris thiourea potassium chloride will grow.

XRD study was carried out on a Philips X pert pro. The powdered samples were scanned over the range of 2θ (10 – 70) with an angular step of 0.02°/min.

The UV –visible study was carried out by varian, cary 5000 model, UV visible spectrometer.

The surface morphological features of the samples have been observed using a SEM in back scattered mode. It isoperated at 20Kv and the magnifications used is 1500Xand 10,000X.

III. RESULT AND DISCUSSION

3.1 XRD (X-ray diffraction analysis)

The X-ray diffraction pattern (Fig.1) shows the high crystallinity of tris thiourea potassium chloride crystals. The lattice parameter calculations are a = 7.565 A^0, b = 7.254 A^0, c = 6.69 A^0, $\alpha = \beta = \gamma = 90°$. It indicates the orthorhombic structure of crystal.

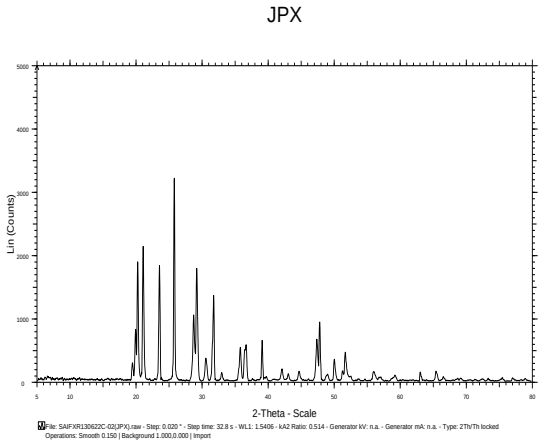

Fig.1 XRD spectrum of crystal

3.2 SEM Analysis

The morphology and size distribution of tris thiourea potassium chloride samples were studied through SEM. It reveals the irregularity in shape of crystals. Detailed examination shows that samples are very fine and agglomerated. (Fig.2 and Fig.3)

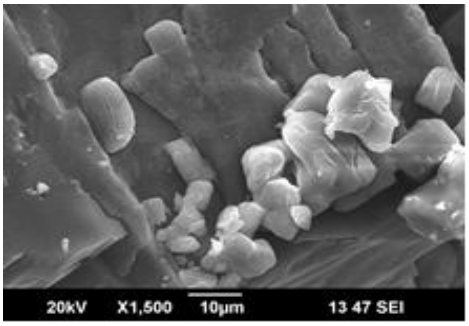

Fig.2 SEM image of crystal

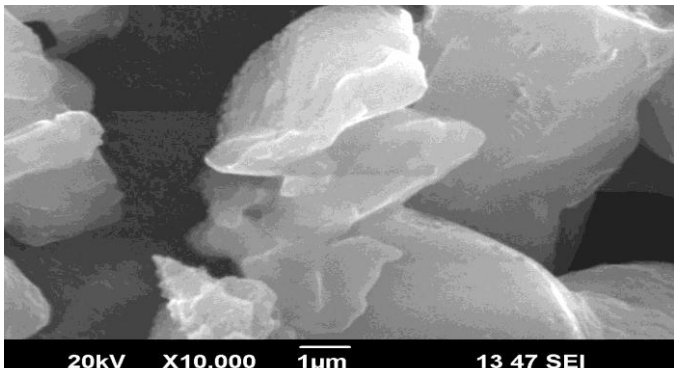

Fig.3 SEM image of crystal

3.3 UV- VISIBLE SPECTRA

For non– linear optic applications, the spectral range is chosen in between 200 nm -1100 nm. The UV cut off at 280 nm for the synthesized tris thiourea potassium chloride crystal proves its suitability for frequency doubling.

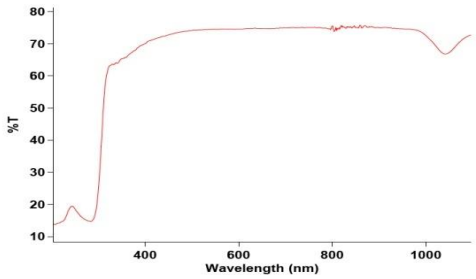

Fig.4 UV- Visible spectra of crystal

IV. CONCLUSION

Tris thiourea potassium chloride single crystal synthesized by slow evaporation method was clearly described and optical characterization was done on the basis of XRD, SEM and UV- Visible spectra. SEM clearly indicates that the tris thiourea potassium chloride particles are not single particles and XRD shows its crystal structure. NLO property of crystal was confirmed as orthorhombic by UV- Visible spectra.

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