ABSTRACT

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ZTS [zinc tris(thiourea) sulphate] is an efficient semiorganic nonlinear optical material for second harmonic generation. It has a high damage resistance and low UV cutoff of about 260 nm which makes it suitable for frequency conversion of high power lasers. It belongs to the orthorhombic crystal system with a tetramolecular unit cell of dimensions a = 11.130, b = 7.773 and c = 15.491Å. Several investigators have shown considerable interest on this material.

In the present study, pure, urea added and divalent metal impurity (Ni^{2+} and Mg^{2+}) added ZTS single crystals were grown by the slow evaporation solution growth technique. The grown crystals were characterized by density, X-ray diffraction, atomic absorption spectroscopic, high resolution X-ray diffraction, FT-IR spectral, second harmonic generation, UV-Vis spectral, photoluminescence spectral, microhardness and dielectric measurements.

The results obtained indicate that the impurity added crystals grown are basically ZTS but incorporated with a small amount of impurity molecules in the crystal matrix. HRXRD analysis carried out shows that the incorporation of impurities changes the crystalline perfection. Urea added ZTS and Ni^{2+} added ZTS single crystals were found to have good crystalline perfection when compared to the Mg^{2+} added single crystals.

All the crystals grown are found to be hard, stable and transparent. The dielectric parameters, viz. dielectric constant, dielectric loss and AC conductivity increase with the increase in temperature for all the grown crystals. The low ε_r values observed for several samples (around 4 at 40°C) indicate that ZTS is a promising low ε_r value dielectric material.

A report of the present research work is provided in this thesis.