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## Structural and optical studies on rare earth doped L-histidine hydrochloride mono hydrate single crystals

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Julk growth nonlinear optical single crystals of Eu3<sup>+</sup> ion doped L-histidine hydrochloride monohydrate (LHHC) have been Bard grown using slow evaporation method (SEST) and also Sankaranarayanan-Ramasamy (SR) uniaxial crystal growth method from aqueous solution. The lattice dimensions have been measured from the single crystal X-ray diffraction analysis and belong to orthorhombic system having non-centro symmetry with P2,2,2, space group. The crystalline perfection has been evaluated by high resolution X-ray diffraction (HRXRD) technique and found that the crystalline quality is good. The presence of various functional groups has been identified through Fourier transform infra-red spectroscopy (FTIR). Its optical character has been assessed by UV-Vis analysis and found to be transparent with its lower cut off wavelength 242 nm. Eu3+:LHHC crystal has 9% higher transmittance than that of pure sample. The optical band gaps of Eu3<sup>+</sup> doped samples grown by SEST and SR methods were observed 4.3 eV and 4.4 eV respectively. The thermal analysis (TG/DTA) of the grown crystal indicated the better thermal stability and was thermally stable up to 1560C. Surface morphology of the growth plane was observed by using scanning electron microscopy (SEM). The elemental analysis and the incorporation of Eu3<sup>+</sup> ion in the crystal lattice was confirmed using energy dispersive X-ray analysis (EDAX). The dielectric constant was higher and the dielectric loss was less in the grown crystals. Frequency dependent dielectric constant and dielectric loss of the grown crystals were carried out along the growth axis for different temperatures. The mechanical strength of the grown crystals was tested by Vickers micro hardness study along the growth plane (100) and the crystals grown by SR method have higher hardness value than SEST grown crystal. SHG efficiency of the grown crystal was observed 3.6 times higher than that of potassium dihydrogen phosphate (KDP) single crystal. The photoluminescence (PL) study of the crystal was investigated using spectro photometer at room temperature. The grown crystal was excited by 615 nm wavelength. The emission spectra of the crystal excited with ultraviolet radiation shows that the intensity of  ${}^{5}D_{0} \rightarrow 7F_{2}$  emission is stronger than  ${}^{5}D_{0} \rightarrow 7F_{2}$  emission of Eu3<sup>+</sup>. The decay of Eu3<sup>+</sup>:LHHC grown crystals is bi-exponential in nature with a long life time of  $\tau 2$  is 7.2410 µs. The photoconductivity study confirms the positive photo conducting nature of the grown crystal.

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