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**Selective enhancement of second and third-order nonlinear optical properties of newly synthesised Trisglycine epsomite single crystal**

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**HIGHLIGHTS**

- Trisglycine Epsomite crystal (TGE) was grown lucratively by slow evaporation method.
- TGE crystal structure altered from orthorhombic to triclinic.
- TGE reveals excellent transparency with large band gap value 5.45eV.
- TGE exhibits SHG and THG nonlinear optical properties.

**ABSTRACT**

An exceedingly high-quality second and third-order nonlinear optical (TONLO) single crystal trisglycine epsomite (TGE) has been grown productively using aqueous solution by conventional solution growth method. Single crystal XRD confirms the distortion of crystal structure from orthorhombic to triclinic with space group. CHN analysis authenticates the occurrence of carbon, hydrogen and nitrogen in the grown crystal. FTIR studies substantiate the existence of functional groups. The optical transmission studies proves the transparency of the sample in the entire visible region and band gap was determined using Tauc's plot. The output intensity of SHG was verified by Kurtz and Perry powder technique and it was found to be 0.792 times greater than that of KDP. TONLO properties such as nonlinear refraction (NLR), nonlinear absorption (NLA), third-order susceptibility ( $\chi^3$ ) and hyperpolarizability ( $\gamma$ ) were determined with high accuracy using

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