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Praseodymium doped KDP Single Crystal Grown by Different Techniques and its Optical, SHG and Dielectric Studies : A New NLO Crystal

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Abstract : Praseodymium doped Potassium dihydrogen Orthophosphate (KDP) single crystals were grown using different techniques - SR method, Seed Rotation and Slow Evaporation. The single crystal grown by SR method on unidirectional {101} pyramidal face was around 150 mm in length and 16 mm in diameter. Kurtz powder technique is used to determine the SHG efficiency. It is observed that relative SHG conversion efficiency of crystal grown by SR method is greater compared to other techniques. Optical transmission spectra was recorded in the wavelength region 200 to 1100nm for the grown crystals using Perkin-Elmer Lambda 35 UV-Vis spectrophotometer. It is found that percentage transmission of crystal grown by SR method is more as compared to other techniques. The electronic band transitions was studied from the plot of photon energy (hν) versus $(\alpha h\nu)^2$ and the value of band gap energy (E_g) has been calculated.

The dielectric constant, dielectric loss and a conductivity of the grown crystals were studied as a function of frequency and the results are discussed. The addition of Praseodymium improves the quality and transparency of crystals, which shows the suitability of the grown NLO material for optical applications.

Keywords: Single Crystal growth; SR method; SHG; Optical properties; Dielectric properties.

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