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www.elsevier.com/locate/jcrysgro

PII: S0022-0248(16)30006-9
DOI: <http://dx.doi.org/10.1016/j.jcrysgro.2016.01.025>
Reference: CRY23172

To appear in: *Journal of Crystal Growth*

Received date: 19 September 2015
Revised date: 20 January 2016
Accepted date: 24 January 2016

Cite this article as: N. Sudharsana, S. Hamad, S.Venugopal Rao, V. Krishnakumar and R. Nagalakshmi, A systematic study of Hydroxyethylammonium *p*-nitrophenolate Single Crystal exhibiting third order nonlinearity, *Journal of Crystal Growth* <http://dx.doi.org/10.1016/j.jcrysgro.2016.01.025>

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A systematic study of Hydroxyethylammonium *p*-nitrophenolate Single Crystal exhibiting third order nonlinearity

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Abstract: Hydroxyethylammonium *p*-nitrophenolate single crystal has been grown by slow evaporation solution growth method for the first time to the best of our knowledge. The crystal structure was determined by single crystal X-ray diffraction study. Optical property was characterized using ultraviolet-visible spectroscopy technique. ¹³C and ¹H Nuclear magnetic resonance spectroscopy was used to confirm the formation of title compound. Third order nonlinear susceptibility was evaluated using simple Z-scan technique. The thermal behaviour was investigated with the help of differential scanning calorimetric analyses.

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Keywords: A1.Crystal structure; A1.X-ray diffraction; A2.Growth from solutions; A2.Single crystal growth; B2.Nonlinear optic materials.

1.Introduction:

p-nitrophenolate (NP) is a classic dipolar nonlinear optical (NLO) chromophore and a typical one-dimensional (1D) donor–acceptor π system, and the presence of proton transfer of the phenolic OH of *p*-nitrophenolate with various organic and inorganic bases results in an enhancement of the hyperpolarizability of both species [1,2]. Organic crystals of nitrophenol family play a prominent role in NLO applications due to their superior qualities such as high laser damage threshold, wide transparency windows, and extended thermal stability. The prospect of utilization of third order NLO effects which permit all-optical switching, an essential element for the future development of optical information processing and applications in broad-band communications, is enticing. Especially, NLO materials exhibiting strong two-photon absorption (TPA) are in great demand, due to their applications in three-dimensional fluorescence imaging and multi-photon microscopy, eye and sensor protection, frequency up conversion lasing, optical signal reshaping and stabilizing fast fluctuations of laser power [3–7]. In the present study, we have grown a new organic optical crystal and characterized it to study its structural, optical, thermal and third-order nonlinear optical properties.

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