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PII: S0022-0248(16)30050-1
DOI: http://dx.doi.org/10.1016/j.jcrysgro.2016.02.023
Reference: CRYS23210

To appear in: *Journal of Crystal Growth*

Received date: 28 September 2015
Revised date: 4 February 2016
Accepted date: 17 February 2016

Cite this article as: D Rajan Babu, H. Arul and R. Ezhil Vizhi, Growth and Characterization of Morpholinium dihydrogenphosphate single crystal, *Journal of Crystal Growth,* http://dx.doi.org/10.1016/j.jcrysgro.2016.02.023

Growth and Characterization of Morpholinium dihydrogenphosphate single crystal

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Abstract

Morpholinium dihydrogenphosphate (MDP) single crystals were synthesized, and were subsequently grown by controlled evaporation technique at room temperature for nonlinear optical applications. The grown crystal, which belongs to the monoclinic system with the space group $P2_1$, was subjected to single crystal X-ray diffraction to confirm the structure. UV-Vis-NIR spectroscopy was done on the grown crystal and it showed good optical transparency in the entire visible region with a minimum cut-off wavelength of 289 nm. The optical band gap was computed as a function of photon energy using Tauc's plot. The refractive index of the grown crystal was determined using a Metricon Prism Coupler. The thermogravimetric (TG) and differential thermal analysis (DTA) traces disclosed the thermal stability of the compound. The mechanical strength of the crystal was investigated by a Vickers microhardness tester. Dielectric constant and dielectric loss were calculated and plotted as a function of frequency at different temperatures. The second harmonic conversion efficiency was determined using the Kurtz-Perry powder technique, and the efficiency was found to be 1.2 times greater than that of standard KDP.

Keywords: A1. Crystal growth, B1. Refractive index, B2. Dielectrics, B2. Nonlinear optical materials