



Iranian Journal of Physics Research, Vol. 25, No. 4, 2026  
DOI: 10.47176/ijpr.25.4.42097

## Growth and characterization of potassium dihydrogen phosphate (KDP) single crystal and feasibility of second harmonic generation of Nd:YAG laser

H Cheraghi\*, M Aghababagoli, M Yazdanmehr, and H Ahmadvand

Faculty of Applied Sciences, Malek Ashtar University of Technology, Iran

E-mail: hadischeraghi@mut-es.ac.ir

(Received 28 April 2025 ; in final form 2 September 2025)

### Abstract

Second harmonic generation (SHG) in solid-state lasers is always a significant aspect of nonlinear optics, achievable through certain single crystals such as potassium dihydrogen phosphate (KDP). In this study, the KDP single crystal was grown by the solution growth method using solvent evaporation at a constant temperature of 45°C, employing accurate temperature control and stabilization equipment. The grown single crystal was oriented using the X-ray Laue diffraction method, confirming its single-crystalline nature. The X-ray diffraction (XRD) analysis verified the crystalline phase formation and the absence of secondary phases in the crushed crystal sample. Fourier transform infrared (FTIR) spectroscopy confirmed the presence of bending, stretching, and other bonds. Diffuse reflectance spectroscopy (DRS) measurements yielded a bandgap of 4.12 eV for the grown crystal. The transmission spectrum demonstrated high transparency (>45%) in the 200–800 nm wavelength range. The optical axis and phase-matching angle of the grown crystal were determined based on Laue diffraction patterns, after which the crystal was rotated using a goniometer and sliced. Finally, second harmonic generation was tested using a 1064 nm Nd:YAG laser, successfully producing green light output at 532 nm.

**Keywords:** Potassium dihydrogen phosphate (KDP), Nonlinear single crystal, Second harmonic generation (SHG), Nd:YAG laser.

For full article, refer to the Persian section