



GAMDAN OPTICS

# Potassium Dihydrogen Phosphate and Potassium Dideuterium Phosphate ( $\text{KH}_2\text{PO}_4$ and $\text{KD}_2\text{PO}_4$ )



Potassium Dihydrogen Phosphate (KDP) and Dideuterium Phosphate (KD\*P) crystals are ones among the most widely-used commercial NLO materials, they feature good UV transmission, high damage threshold and high birefringence, though their NLO coefficients are relatively low. They are commonly used for doubling, tripling and quadrupling of Nd:YAG laser at the room temperature. In addition, they are also excellent electro-optic crystals with high electro-optic coefficients, widely used as electro-optical modulators, Q-switches, and Pockels Cells, etc.

## Features

- Strong UV transmission
- High optical damage threshold
- High birefringence
- High nonlinear coefficients

## Applications

- E-O modulator and Q switches
- SHG, THG and FHG for Nd:YAG lasers
- Shutter for high-speed imaging

## About GAMDAN

GAMDAN Optics synthesizes, custom designs and precision manufactures NLO crystals. Our exclusive **CrystalExpress<sup>SM</sup>** delivers California-grown crystals with exceptional quality in only 10 business days—the fastest in the industry.\*

Gamdans also supplies custom nonlinear, acousto-optic, electro-optic and laser crystals.

\*As of January 2008 per GAMDAN market survey. Precision cut and polish BBO and KTP crystals; coating times will vary.

# KDP and KD\*P

## Physical and Optical Properties

	KDP	KD*P(DKDP)
Chemical Formula	$\text{KH}_2\text{PO}_4$	$\text{KD}_2\text{PO}_4$
Crystal Structure	Tetragonal	Tetragonal
Transmission Range	200-1500nm	200-1600nm
Nonlinear Coefficients	$d_{36}=0.44\text{pm/V}$	$d_{36}=0.40\text{pm/V}$
Refractive Indices (at 1064nm)	$n_o=1.4938,$ $n_e=1.4599$	$n_o=1.4948,$ $n_e=1.4554$
Electro-Optical Coefficients	$r_{41}=8.8\text{pm/V}$ $r_{63}=10.3\text{pm/V}$	$r_{41}=8.8\text{pm/V}$ $r_{63}=25\text{pm/V}$
Longitudinal Half-Wave Voltage	$V_p=7.65\text{KV}(l=546\text{nm})$	$V_p=2.98\text{KV}(l=546\text{nm})$
Absorption	0.07/cm	0.006/cm
Temperature Synchronism Width	11.5 °C*cm	7.4 °C*cm
Spectral Synchronism Width	106 Å*cm	32 Å*cm
Angle Synchronism Width	0.84 mrad*cm	0.94 mrad*cm
Absorption Coefficient, cm <sup>-1</sup>	0.07	0.006
Mohs Hardness	2.5	2.5
Optical Damage Threshold	>5 GW/cm <sup>2</sup>	>3 GW/cm <sup>2</sup>
Extinction Ratio		30dB

## Sellmeier Equations

KDP	$n_o^2 = 2.259276 + 0.01008956/(\lambda^2 - 0.012942625) + 13.005522\lambda^2/(\lambda^2 - 400)$ $n_e^2 = 2.132668 + 0.008637494/(\lambda^2 - 0.012281043) + 3.2279924\lambda^2/(\lambda^2 - 400)$
DK*P	$n_o^2 = 1.9575544 + 0.2901391/(\lambda^2 - 0.0281399) - 0.02824391\lambda^2 + 0.004977826\lambda^4$ $n_e^2 = 1.5005779 + 0.6276034/(\lambda^2 - 0.0131558) - 0.01054063\lambda^2 + 0.002243821\lambda^4$

## KD\*P Single Crystals - Standard

Designation	Operation	Input	Output
53.7°	SHG (II)	1064nm	532nm
59.5°	THG (II)	1064nm + 532nm	355nm
63.7°	SFM (II)	1064nm + (421-1000nm)	302-515nm
86°	FHG (I) angle tune	532nm	266nm
90°	FHG (I) temp. tune	532nm	266nm
36.6°	SHG (I)	1064nm	532nm
46.8°	THG(I)	1064nm + 532nm	355nm

## DKDP Specifications

Wavefront Distortion	less than $\lambda/8$ @ 633nm
Dimension Tolerance	$(W \pm 0.1\text{mm}) \times (H \pm 0.1\text{mm}) \times (L + 0.2\text{mm}/-0.1\text{mm})$
Clear Aperture	> 90% central area
Flatness	$\lambda/8$ @ 633nm
Scratch/Dig Code	10/5 to MIL-O-13830A
Parallelism	better than 20 arc seconds
Perpendicularity	5 arc minutes
Angle Tolerance	$\theta \Delta < \pm 0.3^\circ$ , $\phi \Delta < \pm 0.3^\circ$
Quality Warranty Period	One year under proper use

### Note

KDP and KD\*P crystals are highly hygroscopic and crystal coating is not available. Keep the crystals in a dry environment (< 50%) for preservation. Crystals should be mounted in sealed housings.



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