KTP (KTiOPO4) Nonlinear Crystal for 1064 nm SHG and E-O Devices, 350–4500 nm

Model WQ-NLC-KTP · waveqvanta.com/products/ktp-potassium-titanyl-phosphate-crystal

Potassium titanyl phosphate (KTiOPO4, KTP) is a common choice for frequency doubling of Nd:YAG and other Nd-doped lasers at low to medium power density, in both extra- and intracavity setups. It is non-hygroscopic and transmits from 350 nm to 4500 nm. Its electro-optic and dielectric properties are comparable to those of LiNbO3, so it is also used in modulators, optical switches and waveguide devices.



Key features

- Transmission range 350–4500 nm
- Non-hygroscopic
- About 80% SHG conversion efficiency reported at 1064 nm
- Type II 1064 nm SHG at θ = 90°, φ = 23.2° with deff ≈ 8.3 × d36(KDP)
- Large nonlinear coefficient d33 = 16.9 pm/V
- Wide angular acceptance and small walk-off (1 mrad) for Type II 1064 nm SHG
- E-O and dielectric properties comparable to LiNbO3, with bandwidth above 15 GHz
- Sizes from 1 × 1 × 0.05 mm up to 30 × 30 × 40 mm

Specifications

Chemical Formula	KTiOPO4
Crystal Structure	Orthorhombic
Lattice Parameters	a = 6.404 Å, b = 10.615 Å, c = 12.814 Å, Z = 8
Melting Point / Curie Point	1172 °C / 936 °C
Mohs Hardness	≈ 5
Density	2.945 g/cm^3
Hygroscopic Susceptibility	None
Thermal Conductivity	k1 = 2.0 × 10^{-2} W/cm·°C; k2 = 3.0 × 10^{-2} W/cm·°C; k3 = 3.3 × 10^{-2} W/cm·°C
Thermal Expansion Coefficients	α1 = 11 × 10^{-6} /°C; α2 = 9 × 10^{-6} /°C; α3 = 0.6 × 10^{-6} /°C
Electrical Conductivity	3.5 × 10^{-8} S/cm (c-axis, 22 °C, 1 kHz)
Transmission Range	350–4500 nm
Absorption Coefficient	< 1%/cm at 1064 nm and 532 nm
Nonlinear Coefficients (1064 nm)	d31 = 2.54 pm/V, d32 = 4.35 pm/V, d33 = 16.9 pm/V, d24 = 3.64 pm/V, d15 = 1.91 pm/V
Phase-Matching Angle (Type II, 1064 nm SHG)	θ = 90°, φ = 23.2°
Effective Nonlinear Coefficient (Type II, 1064 nm SHG)	deff ≈ 8.3 × d36(KDP)
Angular Acceptance (Type II, 1064 nm SHG)	Δθ = 75 mrad, Δφ = 18 mrad
Temperature / Spectral Acceptance (Type II, 1064 nm SHG)	25 °C·cm / 5.6 Å·cm

Values are typical and subject to change. Custom sizes, cut angles and coatings are available on request.

Walk-off Angle (Type II, 1064 nm SHG)	1 mrad
Available Dimensions	1 × 1 × 0.05 mm to 30 × 30 × 40 mm
Dimension Tolerance	±0.02–0.1 mm; also quoted as (W ± 0.1 mm) × (H ± 0.1 mm) × (L +0.2/−0.1 mm)
Angle Tolerance	$\Delta\theta < \pm 0.5°$, $\Delta\varphi < \pm 0.5°$
Flatness / Transmitted Wavefront Distortion	< λ/8 @ 633 nm
Scratch/Dig	10/5 per MIL-O-13830A
Parallelism / Perpendicularity	Better than 10 arcsec / 5 arcmin
Clear Aperture	Central 90%
Optical Homogeneity	$\delta n \approx 10^{-6}$ /cm
Working Temperature	25–80 °C
Typical Coatings	a) S1 and S2: AR @ 1064 nm (R < 0.1%) and 532 nm (R < 0.25%); b) S1: HR @ 1064 nm (R > 99.8%) and HT @ 808 nm, S2: AR @ 1064 nm (R < 0.1%) and 532 nm (R < 0.25%); custom coatings on request

Standard sizes

Size	Cut / orientation	Surface / coating	Mount
5 × 5 × 1 mm	θ = 90°, φ = 0°	Polished, uncoated	Unmounted
6 × 6 × 5 mm	θ = 90°, φ = 23.5°, XY-cut	AR/AR @ 1064 + 532 nm	Unmounted
7 × 7 × 5 mm	θ = 90°, φ = 23.5°, XY-cut	AR/AR @ 1064 + 532 nm	Unmounted
10 × 10 × 6 mm	θ = 90°, φ = 23.5°, XY-cut	AR/AR @ 1064 + 532 nm	Unmounted
1 × 2 × 1 mm	X-cut	AR/AR @ 775 + 1550 nm (R < 0.5%)	Unmounted

Typical applications

- Frequency doubling of Nd-doped lasers for green output, and of 1.3 μm Nd:YAG or Nd:YAP lasers for red output
- Intracavity sum-frequency mixing of 0.81 μm diode and 1.064 μm Nd:YAG lasers for blue output
- OPG, OPA and OPO sources tunable over 0.6–4.5 μm
- Frequency-doubled Nd pump sources for dye lasers and Ti:sapphire lasers and amplifiers
- Electro-optic modulators, optical switches and directional couplers
- Optical waveguides for integrated nonlinear and E-O devices