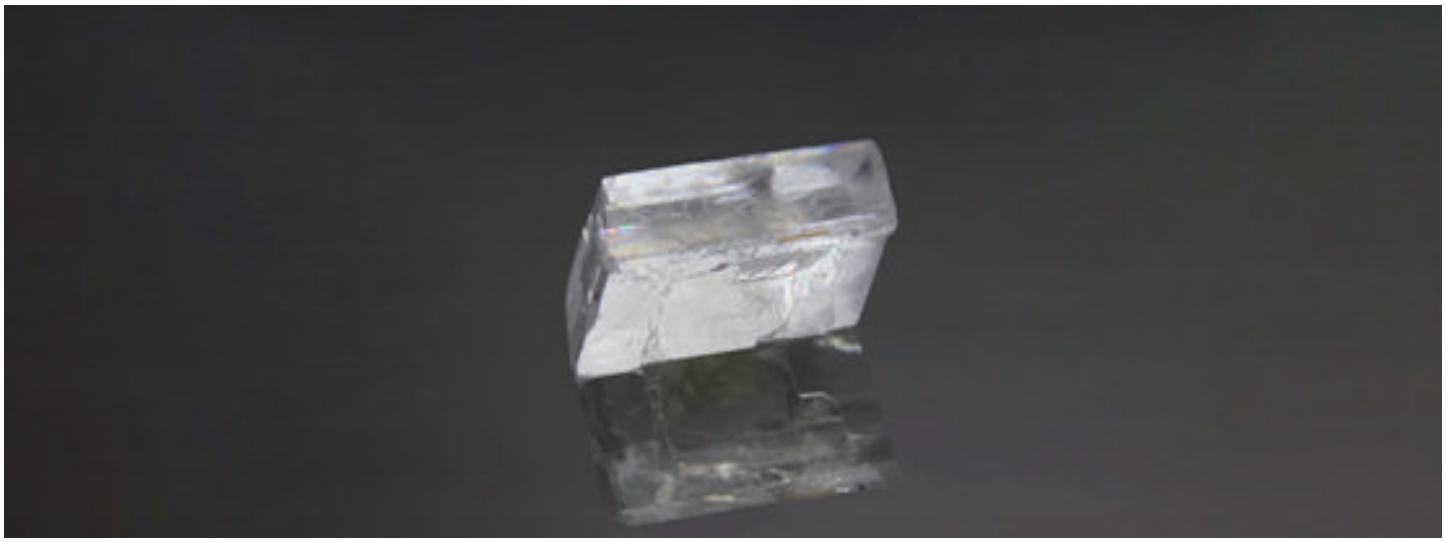
# KTP



## DESCRIPTION

KTP crystal, also known as potassium titanium phosphate oxychloride crystal with the chemical formula $KTiOPO_4$, is a crystal product with excellent nonlinear and electro-optical properties. KTP has a high electro-optical coefficient and low dielectric constant and can operate at high frequencies and can be used as an electro-optical Q-modulation crystal. KTP also has excellent frequency doubling properties: large nonlinear coefficient, no deflection angle, high optical damage threshold, and phase matching. KTP crystals are advantageous due to their high nonlinearity, high mechanical stability, high optical quality, and transparency range of 350nm - 4500nm, and these properties determine the wide application of KTP crystals that are widely used as nonlinear media. It is an excellent solution for Nd-doped laser frequency doubling applications, especially for low to medium power applications in both intra-cavity and extra-cavity designs. It also has a wide range of applications related to frequency doubling (SHG) of Nd-doped lasers with green/red output and frequency mixing (SFM) of Nd lasers and diode lasers with blue output.

## FEATURES

- High damage threshold
- High temperature stability
- Low half-wave voltage
- Easy to grow into large crystals
- Large reception angle
- High photoelectric coefficien
- low dielectric constant
- Wide temperature range and spectral range

## APPLICATIONS

- Electro-optical modulator
- Electro-optical Q-switch
- Directional coupler
- Gamma-rays detection
- Optical waveguides for integrated NLO and EO devices
- KTP OPO and ZGP OPO in series for mid-infrared power generation

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## CRYSTAL SPECIFICATION

| | | |
|---|---|---|
| Materials | $KTiOPO_4$ | |
| Tangential positioning accuracy | <30 arc min | |
| Phase Matching | II型, θ=90°; φ=Phase Matching Angle | |
| Phase Matching Range | 497-3300nm | |
| Angular Tolerance | Δθ≤0.25°, ΔΦ≤0.25° | |
| Dimensional Tolerance | (W± 0.1mm)×(H±0.1mm)×(L+0.5/-0.1mm) | Length≥2.5mm |
| | (W±0.1mm)×(H±0.1mm)×(L+0.1/-0.1mm) | Length<2.5mm |
| Flatness | < λ/8 @633nm | |
| Surface quality | 10/5 S/D | |
| Parallelism | <10 arc sec | |
| Perpendicularity | ≤5 arc min | |
| Coating | a) S1&S2:AR@1064nm R<0.1% | |
| | AR@532nm, R<0.25% | |
| | b) S1:HR@1064nm, R>99.8% | |
| | High temperature@808nm, T>5% | |
| | S2: HR@1064nm, R<0.1% | |
| | AR@532nm, R<0.25% | |
| | Custom coatings are available upon request | |

## CRYSTAL PHYSICAL PROPERTIES

| | |
|---|---|
| Crystal Structure | Orthogonal point set:$mm^2$ |
| Lattice parameters | a=6.404Å,b=10.615Å,c=12.814Å,z=8 |
| Melting point | ~1172℃ |
| Transformation temperature | 936℃ |
| Decomposition temperature | ~1150℃ |
| Optical uniformity | dn~$10^{-6}$/cm |
| Hardness | ~5 |
| Density | 3.01g/$cm^3$ |
| Specific heat | 0.1737cal/g.℃ |
| Absorption coefficient | a<1%/cm@1064nm and 532nm |
| Moisture absorption | no |
| Dielectric constant | 13 |
| Coefficient of thermal expansion (in the range of 25℃-900℃) | $a_1=11\times10^{-6}$ ℃$^{-1}$ |
| | $a_2=9\times10^{-6}$ ℃$^{-1}$ |
| | $a_3=0.6\times10^{-6}$ ℃$^{-1}$ |
| Thermal conductivity | $k_1=2.0\times10^{-2}$ W/cm℃ |
| | $k_2=3.0\times10^{-2}$ W/cm ℃ |
| | $k_3=3.3\times10^{-2}$ W/cm ℃ |
| Electrical conductivity | $3.5\times10^{-8}$ s/cm(c-axis, 22℃, 1kHz) |

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## CRYSTAL OPTICAL PROPERTIES

| | |
|---|---|
| Transparency range | 497-1800nm |
| Thermal light coefficient | $dn_x/dT=1.1\times10\text{-}5/℃$ |
| | $dn_y/dT=1.3\times10\text{-}5/℃$ |
| | $dn_z/dT=1.6\times10\text{-}5/℃$ |
| Sellmeier equation | $n_x^2=3.0065+0.03901/(I^2-0.04251)-0.01327I^2$ |
| | $n_y^2=3.0333+0.04154/(I^2-0.04527)-0.01408I^2$ |
| | $n_z^2=3.3134+0.05694/(I^2-0.05658)-0.01682I^2$ |
| Effective nonlinear optical coefficient | $deff(II)\approx(d_{24}-d_{15})\sin^2\theta\sin^2\varphi-(d_{15}\sin^2\varphi+d_{24}\cos^2\varphi)\sin\theta$ |
| Damage Threshold | >0.5GW/cm$^3$ for 10ns pulse@1064nm |

## SPECTRA