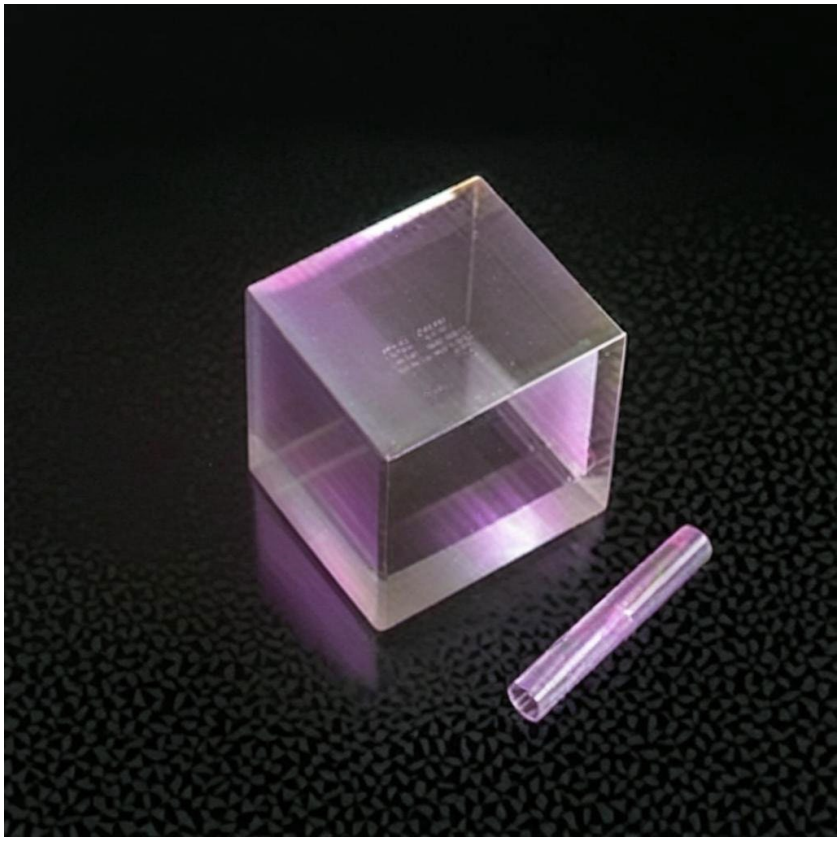
Photonics On Crystals

POC-OC-122422-PPKTP Crystal Datasheet

1 Main Features

- **Wide Transparency Range:** Effective transmission from 350 nm to 4000 nm for versatile applications.
- **Efficient Nonlinear Conversion:** Optimized for Quasi-Phase Matching (QPM) with minimal phase mismatching.
- **High Conversion Efficiency:** Ideal for second-harmonic generation (SHG), sum-frequency generation (SFG), and spontaneous parametric down-conversion (SPDC).
- **Robust and Stable:** Resistant to temperature variations, ensuring long-term performance and reliability.
- **Customizable Specifications:** Suitable for specific wavelengths and applications as per user requirements.



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2. Material General Description

Periodically Poled Potassium Titanyl Phosphate (PPKTP) is a nonlinear crystal widely used in photonic applications for its exceptional ability to achieve high-efficiency frequency conversion through Quasi-

Phase Matching (QPM). This crystal is engineered with a unique structure featuring alternating self-polarized domains that facilitate QPM processes. The key advantage of PPKTP is its capacity to correct non-collinear phase mismatches, enabling robust nonlinear optical interactions across its broad transparency range (350–4000 nm).

Due to its high nonlinear coefficient and broad transparency range, PPKTP is an ideal choice for demanding photonics applications such as second-harmonic generation (SHG), sum-frequency generation (SFG), and spontaneous parametric down-conversion (SPDC). These properties, combined with its robust structural stability, make PPKTP crystals versatile for laser technology, quantum optics, spectroscopy, and biomedical imaging applications.

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3. General Applications and Examples

PPKTP crystals have a wide range of applications in photonics, particularly in areas requiring efficient nonlinear optical processes. Some notable applications include:

1. **Spontaneous Parametric Down-Conversion (SPDC):**
    - PPKTP is a key material for SPDC processes in quantum optics. It enables the generation of entangled photon pairs, a critical resource for quantum key distribution, quantum computing, and quantum imaging.
    - Example: A single PPKTP crystal can be used in a quantum entanglement setup to create pairs of photons with high efficiency and purity.
2. **Second-Harmonic Generation (SHG):**
    - Widely used for generating visible green laser light from infrared lasers, SHG applications in PPKTP often operate near the 1 μm wavelength range.
    - Example: PPKTP crystals are employed in green laser pointers and compact solid-state lasers used in spectroscopy.
3. **Sum-Frequency Generation (SFG):**
    - SFG in PPKTP is utilized in various spectroscopic and imaging techniques, including biomedical imaging and chemical sensing.
    - Example: SFG microscopy combines infrared and visible light to provide highly sensitive, label-free imaging of biological samples.
4. **Frequency Conversion Applications:**
    - PPKTP crystals facilitate frequency doubling and tripling in laser systems, enabling the creation of tunable laser outputs for industrial and scientific uses.
5. **Broadband Applications:**
    - PPKTP crystals support a wide transparency range, making them suitable for multi-wavelength optical communication and high-precision laser-based instrumentation.

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4. Chemical and Structural Properties of PPKTP Crystals

Property	Value
Chemical Formula	KTiOPO4
Crystal Structure	Orthorhombic
Transparency Range	350–4000 nm
Nonlinear Coefficients	d33 = 16.9 pm/V, d31 = 4.1 pm/V
Damage Threshold	> 5 GW/cm² (at 1064 nm, 10 ns pulse)
Thermal Conductivity	~2 W/m·K
Refractive Index (1064 nm)	n_o = 1.824, n_e = 1.742

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5. Optical and Nonlinear Optical Properties

Property	Value
Nonlinear Process	Quasi-Phase Matching (QPM)
Conversion Efficiency	Up to 50%
Phase Matching Type	Type I and Type II
Coherence Length	~30 µm
Effective Nonlinear Coefficient (deff)	9.5 pm/V (typical for QPM)

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6. Spectrum Transmission Curves

(Spectrum transmission curve data is unavailable in the image. Please provide details or request additional information for this section.)

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7. Coating Specifications

Coating Type	Specifications
Anti-Reflective (AR) Coating	R < 0.2% for specific wavelengths
Broadband Coating	Suitable for 700–2000 nm
Custom Coatings	Available upon request

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8. Standard Fabrication Specifications

Specification	Value
Dimensions	2 × 2 × 10 mm (standard)

Poling Periods	4.2 µm, 6.8 µm, custom sizes available
Surface Flatness	λ/10
Parallelism	< 10 arc seconds
Perpendicularity	< 15 arc minutes
Surface Quality	10-5 Scratch-Dig

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9. POC Strength and Capabilities

Photonics On Crystals (POC) is a leading provider of advanced nonlinear optical crystals, including PPKTP, with a focus on precision fabrication, customization, and robust quality control. With extensive expertise in photonics and quantum technologies, POC offers tailored solutions to meet the needs of researchers and industry professionals. Our state-of-the-art facilities and commitment to innovation ensure that every PPKTP crystal meets the highest standards of performance and reliability.

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10. Standard Products

Product Code	Dimensions (mm)	Poling Period (µm)	Price (USD)
PPKTP-01	2 × 2 × 10	4.2	600
PPKTP-02	2 × 2 × 15	6.8	750
Custom-PPTKP	Customizable	Customizable	Request Quote