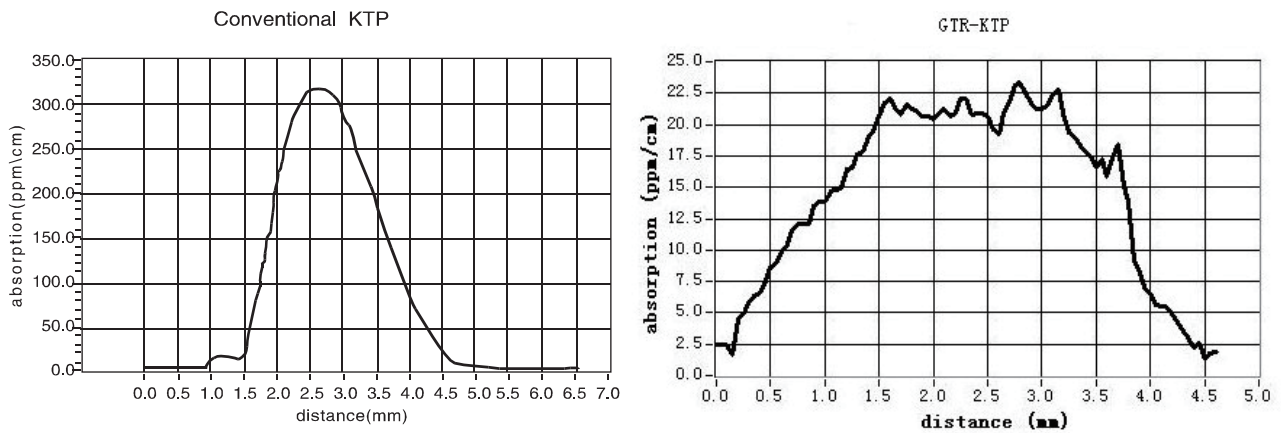


Gray-track Resistance KTP(KTiOPO₄, GTR-KTP)

Introduction

Potassium Titanyl Phosphate (KTiOPO₄ or KTP) is an excellent NLO crystal, widely used in both commercial and military lasers. However conventional KTP suffer a significant drawbacks. The gray track phenomena in conventional KTP limit its application in high repetition and high power laser system. The occurrence of gray-track can be measured by an increase of bulk absorption by a strong CW 532nm green laser within several minutes. This measurement can be performed with Photo-thermal Common-path interferometer.

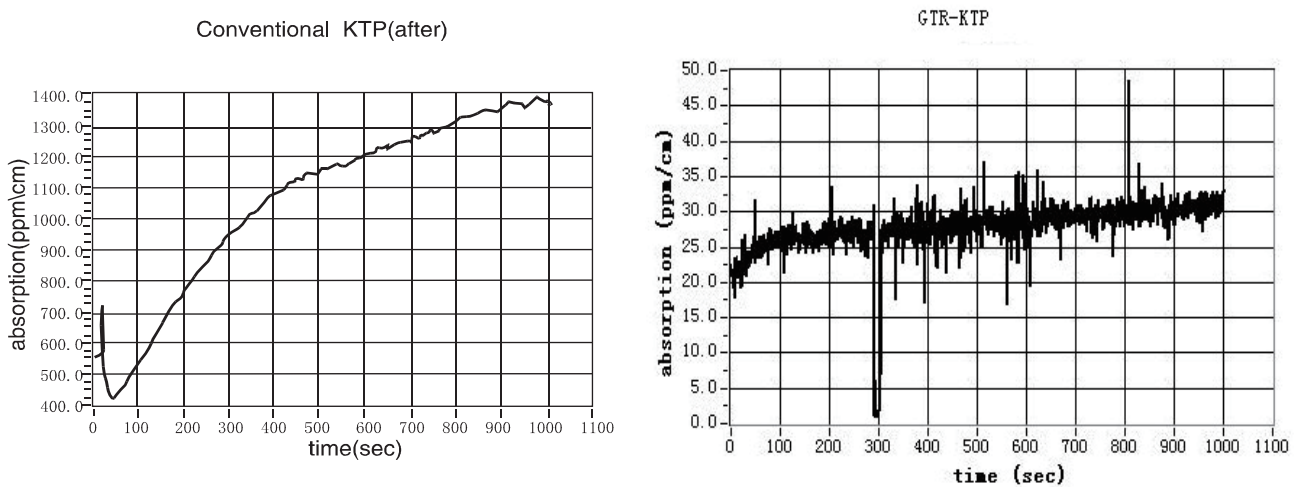
1. Longitudinal Test (Before Gray Tracking Test):



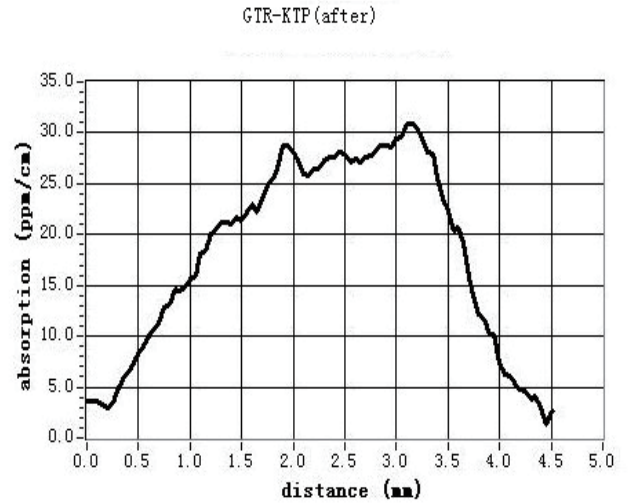
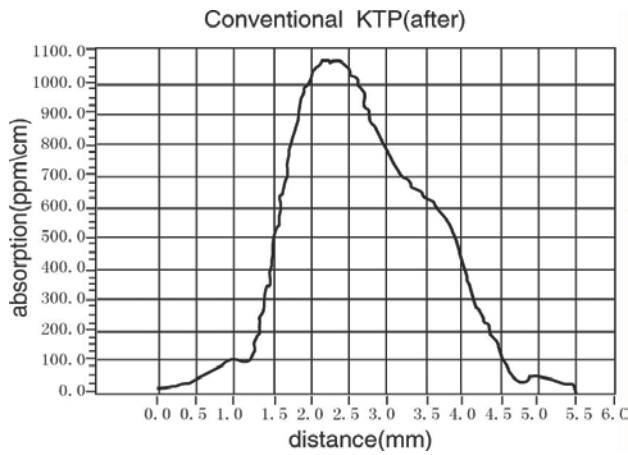
It appears that the absorption of GTR-KTP at 1064nm is only 1/10 of conventional KTP.

2. Gray Tracking Test:

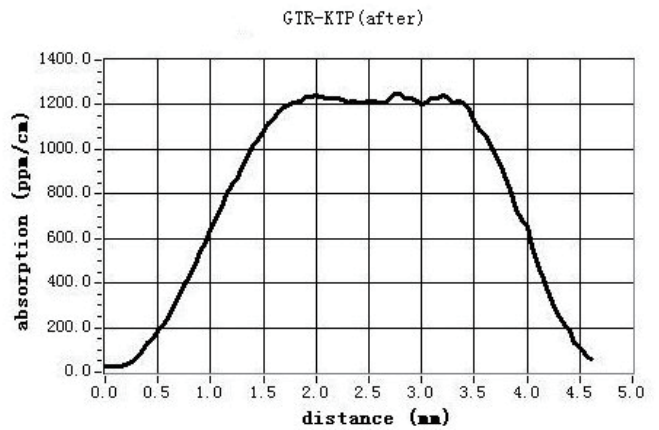
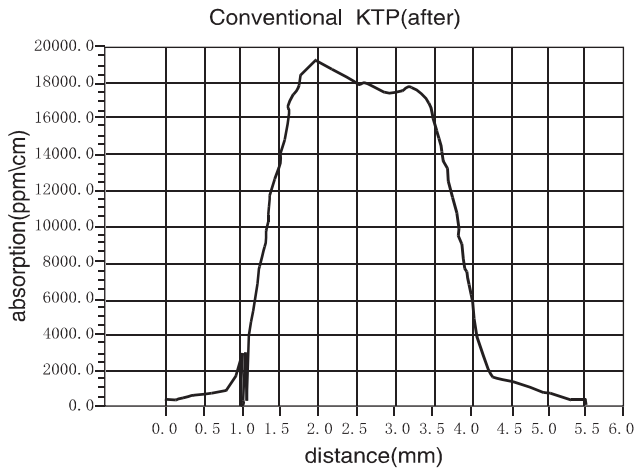
When a green laser beam(400mW, beam diameter 0.07mm, power density 10KW/cm²) goes through the crystal, it causes an increase in the IR absorption of the crystal. This phenomenon is correlated with “gray tracking effect”. The following graphs show the different absorption levels at 1064nm between CASTECH’s GTR KTP and the conventional KTP.



3. Transverse scan after gray tracking test (at 1064 nm)



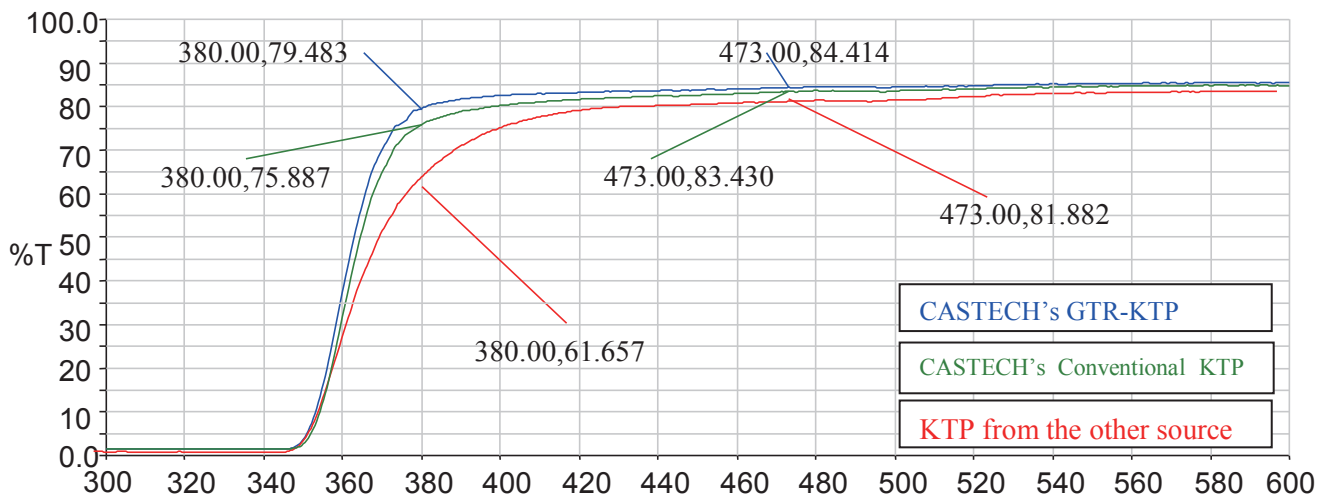
4. Transverse scan after gray tracking test (at 532 nm) :



5. Damage threshold testing:

After testing a group of GTR-KTP and the conventional KTP crystals (polished only) with laser condition of 10ns, 1 HZ, we found that CASTECH's GTR-KTP has laser damage threshold around 1.8GW/cm² at 1064nm, which is much higher than the conventional KTP(450MW/cm² in the same condition).

6. Transmission curve in the visible and UV region:



Apparently CASTECH's GTR-KTP has lower absorption than the conventional KTP in the range of 350-550nm.

We can conclude that CASTECH's GTR-KTP is expected to have a higher gray track resistance than the regular flux grown KTP crystals.

CASTECH provides the following AR-coatings

- IBS, IAD or E-beam coating methods are available upon request.
- Dual Band AR-coating (DBAR) of GTR-KTP for SHG of 1064nm.
low reflectance ($R < 0.2\%$ at 1064nm and $R < 0.5\%$ at 532nm);
high damage threshold ($> 1.2\text{GW}/\text{cm}^2$ at 1064nm, $> 300\text{MW}/\text{cm}^2$ at 532nm, at 10ns, 2.5HZ) long durability.
- Broad Band AR-coating (BBAR) of GTR-KTP for OPO applications.
- High reflectivity coating: HR1064nm&HT532nm, $R > 99.8\%$ @1064nm, $T > 95\%$ @532nm.
- Other coatings are available upon request.

CASTECH offers GTR-KTP with

- Strict quality control
- Large crystal size up to $7 \times 7 \times 20\text{mm}^3$
- Quick delivery(2 weeks for polished only, 3 weeks for coated)
- Unbeatable price and quantity discount
- Technical support
- AR, HR-coating, mounting and re-polishing service

CASTECH's Warranty on GTR-KTP Specifications

- Dimension tolerance: $(W \pm 0.1\text{mm}) \times (H \pm 0.1\text{mm}) \times (L + 0.5/-0.1\text{mm})$ ($L \geq 2.5\text{mm}$)
 $(W \pm 0.1\text{mm}) \times (H \pm 0.1\text{mm}) \times (L + 0.1/-0.1\text{mm})$ ($L < 2.5\text{mm}$)
- Clear aperture: central 90% of the diameter
- No visible scattering paths or centers when inspected by a 50mW green laser
- Flatness: less than $\lambda/8$ @ 633nm
- Transmitting wavefront distortion: less than $\lambda/8$ @ 633nm
- Chamfer: $\leq 0.2\text{mm} \times 45^\circ$
- Chip: $\leq 0.1\text{mm}$
- Scratch/Dig code: better than 10/5(polished only) to MIL-PRF-13830B
better than 20/10(AR-coated) to MIL-PRF-13830B
better than 40/20(HR-coated) to MIL-PRF-13830B
- Parallelism: better than 20 arc seconds
- Perpendicularity: ≤ 5 arc minutes
- Angle tolerance: $\leq 0.25^\circ$