

# Ti:sapphire



## DESCRIPTION

Ti:sapphire crystal product, also known as titanium doped sapphire crystal, with the chemical formula of  $\text{Ti}^{3+}:\text{Al}_2\text{O}_3$ , is a transition metal doped laser crystal with good comprehensive performance.

As an optically pumped solid-state laser crystal, Ti doped sapphire is widely used in wavelength tunable lasers. The tunable range is 650-1100nm and the peak value is 800nm. It is the widest wavelength tunable laser crystal.

$\text{Ti}^{3+}$  ions have very large gain bandwidth, which opens the possibility of obtaining very wide wavelength tunability in short pulse lasers. The upper state lifetime of Ti:sapphire is as short as 3.2 ms. because of its high saturated power, it is generally used as a lamp, an argon ion laser or a frequency double pumped Nd:YAG laser. Using self mode locking technology, Ti:sapphire laser can directly output laser pulses with a pulse width of less than 6.5 fs, which is the narrowest laser pulse of all lasers directly output from the resonator. Through the dual frequency technology, the wavelength of the laser beam can cover the wide band from blue to deep UV. The 193nm laser produced has been used in the lithography machine.

The product has the characteristics of short service life and high saturation power. It can be used in lamps, argon ion lasers or frequency double pumped Nd:YAG lasers.

## FEATURES

- High damage threshold
- With wide absorption pump
- The narrow width of lock mode
- Wide wavelength tunability
- The output efficiency of excellence
- On the state of life is short (3.2 mm)

## APPLICATIONS

- Ti:sapphire amplifier
- Ti:sapphire tunable laser
- Femtosecond titanium sapphire laser
- Sapphire oscillator pump parameters



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## MATERIAL SPECIFICATIONS

Material	Ti <sup>3+</sup> :Al <sub>2</sub> O <sub>3</sub>
The concentration	(0.05~0.35) wt%
Orientation	A shaft within 5°, E vector parallel to the axis C
Parallelism	30"
Vertical	5
Figure of merit (FOM)	100~300
Wavefront distortion	<λ /4@632 nm
The surface roughness	<λ/8@632 nm
Clear aperture	>90%
The surface quality	10-5(MIL-PRF-13830B)
Coating	Standard coating is AR with R < 5.0% each face @532 nm and R < 0.5% each face from 650 nm to 850 nm. Custom coatings
Chamfering	<0.2×45°

## PHYSICAL AND CHEMICAL PROPERTIES

The crystal structure	Hexagonal system
The density	3.98 g/cm <sup>3</sup>
Melting point	2040°C
Coefficient of thermal conductivity	33 W / (mK)
The refractive index temperature coefficient	13×10 <sup>-6</sup> K <sup>-1</sup>
Thermal shock parameters	790 W/m
Thermal expansion	≈ 5 × 10 <sup>-6</sup> K <sup>-1</sup>
Hardness (mo)	9
Young's modulus/GPa	335
Specific heat capacity	0.1 cal/g
Tensile strength/Mpa	400
The diameter	4-12mm
The density of 0.1% with titanium	4.56×10 <sup>19</sup> cm <sup>-3</sup>

## OPTICAL PROPERYIES

Laser transition	F <sub>3/2</sub> →F <sub>1/2</sub>
The laser wavelength	660-1200 nm
The center	800 nm
Tunable absorption band	400-600 nm
Absorption peak	488 nm
The emission cross section @ 790 nm	41 × 10 <sup>-20</sup> cm <sup>2</sup>
The fluorescence lifetime	3.2 ms
Emission line width	650-1100 nm
The refractive index @ 633 nm	1.77@ 532 nm; 1.76@800 nm; 1.75@1100 nm
Absorption coefficient	0.5~6.0 cm <sup>-1</sup>



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## SPECTRA

