

Ti:Sapphire crystals

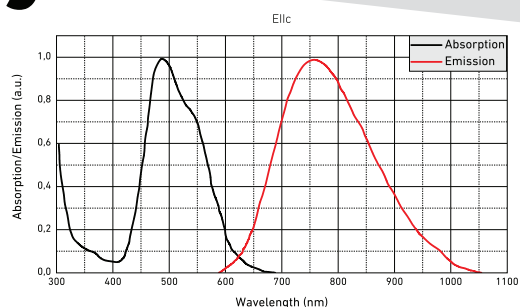
Main features

- Excellent thermal conductivity
- Broad gain bandwidth
- Wide range of possible pump wavelengths (typically 532 nm)
- Custom crystals available upon request

Application examples

- Mode-locked lasers with ultrashort pulses
- Multi-pass amplifiers and regenerative amplifiers

Titanium-doped sapphire ($\text{Ti}^{3+}:\text{Al}_2\text{O}_3$) is a widely used transition-metal-doped laser crystal. Ti^{3+} ion has a very large gain bandwidth, that opens possibility to obtain very wide wavelength tunability realized in short pulse lasers.



To obtain crystals with good optical quality Ti^{3+} doping concentration should not exceed 0.25 at.%. Ti:Sapphire crystal is characterized by a short upper-state lifetime and a high saturation power. All these properties lead to the necessity of using a strongly focused pump beam.

Standard specifications

Ti:SAPPHIRE CRYSTALS	
Orientation	a-cut
Absorption	90-95% of 532 nm pump radiation
Figure of merit	>150
Clear aperture	>90%
Face dimensions tolerance	+0.0/-0.1 mm
Length tolerance	±0.1 mm
Parallelism error	<30 arcsec
Perpendicularity error	<10 arcmin
Protective chamfers	<0.15 mm at 45°
Surface quality	10-5 S-D
Surface flatness	<λ/10@632.8 nm (for 6x6 mm and smaller crystals)
Wavefront distortion	λ/4@632.8 nm
Coatings	AR(R<1%)@532 nm + AR(R<0.3%)@750-850 nm on both faces
LIDT	>2 J/cm²@800 nm, 300 ps
Mount	Unmounted

Standard products

FACE DIMENSIONS	LENGTH	END FACES	COATINGS	SKU
3 x 3 mm	5 mm	Brewster-angle cut	Uncoated	6633
3 x 3 mm	5 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6632
6 x 6 mm	7 mm	Brewster-angle cut	Uncoated	6635
6 x 6 mm	7 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6634
6 x 6 mm	10 mm	Brewster-angle cut	Uncoated	6637
6 x 6 mm	10 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6636
6 x 6 mm	15 mm	Brewster-angle cut	Uncoated	6639
6 x 6 mm	15 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6638
ø6 mm	20 mm	Brewster-angle cut	Uncoated	6641
ø6 mm	20 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6648
ø12 mm	15 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6640
ø16 mm	20 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6642
ø20 mm	25 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6643
ø30 mm	25 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6644
ø40 mm	25 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6645
ø50 mm	25 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6646
50 x 50 mm	30 mm	Right-angle cut	AR/AR@532 nm + 750-850 nm	6647

Properties

SPECTROSCOPIC AND THERMO-MECHANICAL PROPERTIES	
Absorption peak wavelength	~500 nm
Absorption cross-section at peak wavelength	$38 \times 10^{-20} \text{ cm}^2$
Laser wavelength	790 (670-1070) nm
Lifetime of energy level	3.2 μs
Emission cross-section @790 nm	$41 \times 10^{-20} \text{ cm}^2$
Refractive index @800 nm	1.76
Crystal structure	hexagonal
Density	3.98 g/cm³
Mohs hardness	9
Thermal conductivity	$33 \text{ Wm}^{-1} \text{ K}^{-1}$
dn/dT	$13 \times 10^{-6} \text{ K}^{-1}$
Thermal expansion coefficient	$5 \times 10^{-6} \text{ K}^{-1}$
Typical doping level	0.1-0.25 at. %