

Ti:Sapphire

Titanium-doped sapphire crystals combine supreme physical and optical properties with broadest lasing range.

Ti:Sapphire crystal is indefinitely long stability and useful lifetime added to the lasing over entire band of 660–1050 nm challenge “dirty” dyes in variety of applications. It is the most widely used laser crystal for widely tunable and ultrashort pulsed lasers with high gain and high power outputs. Medical laser systems, lidars, laser spectroscopy, direct femtosecond pulse generation by Kerr-type mode-locking – there are few of existing and potential applications.

The absorption band of Ti:Sapphire centered at 490 nm makes it suitable for variety of laser pump sources – Argon Ion, Frequency

Doubled Nd:YAG and YLF, Copper Vapour lasers. Because of 3.2 μ s fluorescence lifetime Ti:Sapphire crystals can be effectively pumped by short pulse flashlamps in powerful laser systems.

Using advanced growth method of Temperature Gradient Technique (TGT), AOTK supplies large-sized (Dia.125x 80mm) Ti:Sapphire crystal in high quality free of light scatter, with the dislocation density less than 10^2cm^{-2} . The TGT grown sapphire crystal is advantages by the (0001) oriented growth, high doping level ($\alpha_{490} = 7.5\text{cm}^{-1}$), high gain and laser damage threshold. Ti:Sapphire crystals of highest optical quality, figure of merit and different doping levels are routinely available from AOTK.



Physical and Laser Properties

Chemical Formula	Ti ³⁺ :Al ₂ O ₃
Crystal Structure	Hexagonal
Lattice Constants	a = 4.758Å, c = 12.991Å
Density	3.98 g/cm ³
Mohs Hardness	9
Thermal Conductivity	0.11 cal/(cm x sec x °C)
Thermal Expansion	8.40 x 10 ⁻⁶ /°C
Specific Heat	0.10 cal/g
Heat Capacity	18.6 cal/°C-mole
Melting Point	2050°C
Laser Action	4-Level Vibronic
Fluorescence Lifetime	3.2 μ s (T = 300K)
Peak Cross-section	3~4 x 10 ⁻¹⁹
Tuning Range	660-1050 nm
Absorption Range	400-600 nm
Emission Peak	795 nm
Absorption Peak	488 nm
Absorption Coefficient (α)	1.0-7.5 cm ⁻¹
Refractive Index	1.76 @ 800 nm

Standard Specifications

Ti ₂ O ₃ Concentrations	0.06-0.5 wt%
Orientation	Optical axis C normal to rod axis
Figure of Merit (FOM)	> 150 (> 300 available on special requests)
Wavefront Distortion	< $\lambda/4$ inch
Typical End Configurations	Brewster/Brewster or Flat/Flat

Surface Finish	10/5 scratch/dig as per MIL-O-13830A
Flatness	$\lambda/10$ @632.8 nm
Parallelism	< 10 arc seconds

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AOTK, Inc. 1502, No. 694 Xianyue Rd. Xiamen 361009, P.R. China
Phone: +86-592-550 2081 Fax: +86-592-550 2082 E-mail: sales@aotk.com www.AOTK.com