

Titanium Doped Sapphire Crystal (Ti:Sapphire)

Introduction

Titanium doped Sapphire (Ti:Sapphire) is the most widely used laser crystal for widely tunable and ultrashort pulsed lasers with high gain and power outputs. CASTECH possesses the advanced growth method of Temperature Gradient Technique (TGT), and it supplies large-sized (Dia.30x30mm) 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 characterized by the (0001) oriented growth, high doping level ($\alpha_{490} = 4.0\text{cm}^{-1}$), high gain and laser damage threshold.

Main Applications

- The tunable wavelengths that cover a broad range from 700 to 1000 nm make Ti:Sapphire an excellent substitute for dye lasers in many applications.
- Doubling by NLO crystals such as BBO in an ultra-thin, Ti:Sapphire can be used to generate UV and DUV (up to 193 nm) laser with ultrafast pulses below 10fs.
- Ti:Sapphire is also widely used as the pump source of OPOs to expand the tunable range.

Basic Properties

Chemical formula:	$\text{Ti}^{3+}:\text{Al}_2\text{O}_3$
Crystal structure:	Hexagonal
Lattice constants:	$a=4.758\text{\AA}$, $c=12.991\text{\AA}$
Density:	3.98 g/cm^3
Melting point:	2040°C
Mohs hardness:	9
Thermal conductivity:	52 W/m/k
Specific heat:	0.42 J/g/K
Laser action:	4-Level Vibronic
Fluorescence lifetime:	$3.2\ \mu\text{s}$ (T=300K)
Tuning range:	660 - 1050 nm
Absorption range:	400 - 600 nm
Emission peak:	795 nm
Absorption peak:	488 nm
Refractive index:	1.76 @ 800 nm
Peak Cross-section:	$3\sim 4 \times 10^{-19}\text{cm}^2$
Thermal Expansion:	$8.40 \times 10^{-6}/^\circ\text{C}$

Standard product specifications

- Orientation: Optical axis C normal to rod axis
- Ti_2O_3 concentration: 0.06 - 0.26atm %
- Figure Of Merit (FOM): 100~250 (>250 available upon special requests)
- α_{490} : 1.0~4.0 cm^{-1}
- Diameter: 2~30mm or specified
- Path Length: 2~30mm or specified
- End configurations: Flat/Flat or Brewster/Brewster ends
- Flatness: $<\lambda/10$ @ 633 nm
- Parallelism: <10 arc sec
- Surface finishing: $<40/20$ scratch/dig to MIL-PRF-13830B
- Wavefront distortion: $<\lambda/4$ per inch

Note: AR Coating is available upon request.