HEM Ti:Sapphire Crystals for Ultrafast Lasers

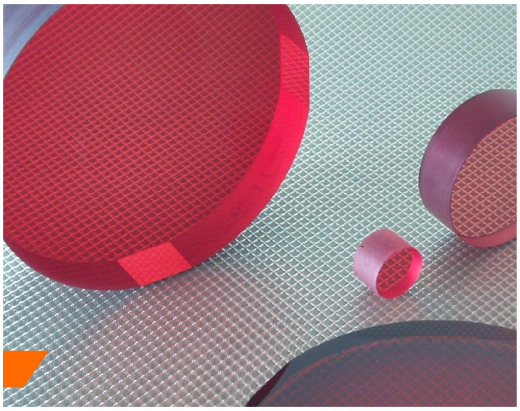
Product:Crystals for Ultrafast Lasers

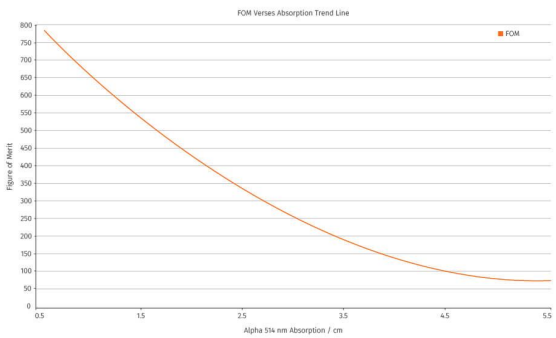
Product Overview：HEM　Ti:Sapphire laser optics are renowned for their high quality, demanded by the world's top ultrafast laser laboratories

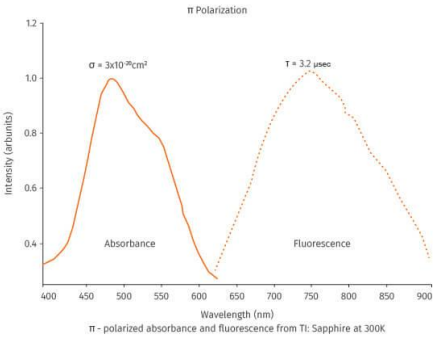
Crystal Systems' proprietary HEM® technology produces superior crystalline structures in crystal sizes up to 220 mm in diameter.　Ultrafast laser optics made from HEM® Ti:Sapphire crystals have transmitted wavefront values of 1/10th or better, and FOM values up to 1000.
Low damage HEM®　Ti:Sapphire laser materials are processed at Crystal Systems' optical fabrication facility with extremely tight geometries and crystal alignment.　All aspects of crystal quality and optical fabrication workmanship are verified with our specialized test and measurement equipment. We provide detailed quality reporting on the laser, optical and mechanical attributes of our HEM® Ti:Sapphire laser optics.
Crystal Systems has worked with the international community of high-intensity laser experts to develop the current range of HEM:ti sapphire ultrafast laser optics.　We are proud to deliver 200 mm and 220 mm HEM® Ti:Sapphire laser optics in support of today's leading-edge high-intensity laser facilities.

HEM® Ti:Sapphire

- 220 mm in diameter
- Excellent homogeneity
- Superior Thermal Properties
- High Figures of Merit (FOM)
- No Bulk Scatter
- High Laser Damage Threshold
- Large sizes and highly doped material available
- Alpha values @ 532 nm of 0.5-8.0/cm







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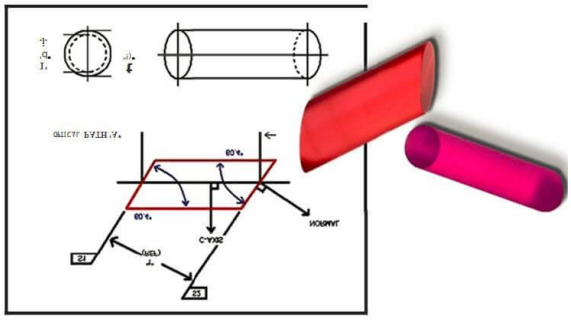
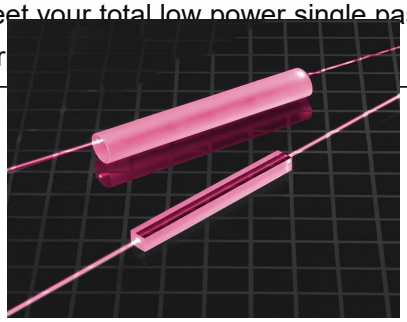
Tunability Range of HEMTi:Sapphire – HEM® Ti:sapphire has a wide tunable range from 650 nm to 1200 nm with peak intensity at ~800 nm. The wide bandwidth of the material allows for short pulses and high repetition rates. Our Ti:Sapphire laser optics are offered in a range of titanium doping concentrations, (0.5 to 8.0 @ alpha 532 nm) which allows adjustment of overall path length designs to meet your total low power single pass absor



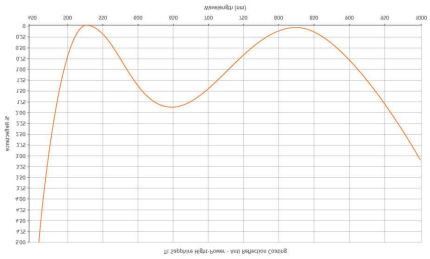


Absorption / Fluorescence – Ti:Sapphire lasers are typically operated using π-polarization. This chart shows the absorption and fluorescence bands of HEM® Ti:Sapphire in π-polarization.

Brewster's Angle Laser Crystals – Most of our smaller crystals are polished with Brewster's angle ends to minimize reflection losses. Brewster's angle is based on the index of refraction of the material. The index of refraction for Ti:Sapphire is ~1.76, resulting in ~60.4° Brewster's angle. The accuracy of our C-axis rotation is tightly controlled to avoid laser modulation.

Advanced laser polishing and high damage coatings – Crystal Systems applies the most advanced polishing technologies to its high-power laser optics in order to create angstrom-level roughness with low sub-surface damage. We perform testing to ensure high and repeatable laser damage threshold values.

Anti-Reflection Coating – Crystal Systems offers advanced anti-reflection coatings for multipass amplifier crystals. Our coatings are engineered to provide maximum efficiency at the pump and lasing wavelengths. The AR coatings are successfully operating in the field with consistently high laser damage threshold results, allowing laser operators to calculate pump powers accurately, thereby maximizing power output with low risk of damage.

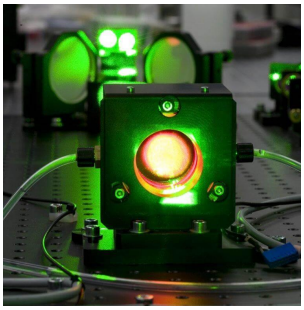


Features

High quality HEM® Ti:Sapphire laser crystals begin with perfect crystalline structure and the correct 3+ valance electron state. We ensure these requirements through our multiple-stage, rigorous inspection process, using state-of-the-art test and measurement equipment. We test our rods for absorption values, homogeneity, light scatter, FOM, flatness, and transmitted wave fronts. Each HEM® Ti:Sapphire laser rod is examined and verified utilizing advanced equipment and expert laser technicians. Total focus on quality and accuracy guarantees that our laser crystals dimensions, surfaces and crystalline structure provide the foundation for your laser platform's high power levels and excellent beam profiles.

Applications

HEM® Ti:sapphire's wide emission range, (650 nm to 1200 nm), high-power density pumping capability along with excellent thermal properties enable today's high-intensity laser platforms. These facilities are creating the next generation of laser-based applications such as proton therapy, accelerator physics, nuclear physics, far-field physics, infrared spectroscopy and materials characterization. Crystal Systems works closely with its customers to develop new crystal designs so that the ultrafast laser community can continue to advance the reliability and performance of their products.



Laser Damage Threshold Testing of Ti:Sapphire AR Coating

The test results below come from one of the periodic tests that Crystal Systems performs on the AR coating used on HEM® Ti:Sapphire Amplifier Crystals. These results are representative of the damage threshold that can be expected with our coatings.

Test Sample

- Test Type: laser damage threshold
- Substrate Material: HEM Ti:Sapphire
- Sample Size: 1″ diameter
- Coating Type: AR

Test Conditions

- Test Wavelength: 532 nm
- Angle of Incidence: 0º
- Pulse Repetition Frequencies: 10 Hz
- Polarization: linear
- Test Beam Profile: TEM Pulsewidth, (FWHM): 10 ns Axial Modes: multiple S
- Pit Diameter: 570 µm
- Number of Sites: 80
- Test Method: laser damage frequency
- Exposure duration: 200 shots/site

Test Results

- Damage Definition: plasma, increased He-Ne scattering, visible damage as observed using a
  100X Nomarski Brightfield Microscope.
- Description of Results: part irradiated at 13.00 Jcm-2 with no damage in 10 sites
- Laser Damage Threshold: calculated at 14.16 Jcm-2 peak fluence
- Testing provided by Spica Technologies Inc.