

Alexandrite

Alexandrite is the leader of a class of tunable solid-state laser materials. Enhanced by several years of research and development, it features a broad wavelength tuning range of 710 - 800 nm with the capability to store and efficiently extract multijoule pulses of energy. It is one of the most robust solid-state laser materials available with a thermal shock resistance five times that of Nd:YAG.

Alexandrite's unique combination of properties offer application in such areas as dermatology, lithotripsy, spectroscopy, atmospheric lidar, testing of fiber optics and photodetectors, materials processing, pumping of dye lasers, non-linear optics studies and annealing of semiconductors.

Structural & Mechanical Properties

Formula:	$\text{Be}(\text{Al}_{1-x}\text{Cr}_x)_2\text{O}_4$
Crystal Structure:	Orthorhombic
Unit Cell Dimensions: (contains four formula units)	$a = 5.476 \text{ \AA}$ per ASTM 10-32 $b = 9.404 \text{ \AA}$ $c = 4.427 \text{ \AA}$
X-Ray Density:	3.7 g cm^3
Melting Point:	1870°C
Thermal Expansion:	$\parallel a 5.9 \times 10^{-6} \text{ K}^{-1}$ $\parallel b 6.1 \times 10^{-6} \text{ K}^{-1}$ $\parallel c 6.7 \times 10^{-6} \text{ K}^{-1}$
Thermal Conductivity:	0.23 W / cmK
Hardness (Vickers):	2000 kg mm^{-2}
Young's Modulus:	469 GPa
Fracture Stress:	$0.457 - 0.948 \text{ GPa}$
Thermal Shock Resistance:	$35 - 74 \text{ W / cm}$

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General Specifications

Diameter Tolerance:	+0.000" / -0.002"
Chamfer:	0.005" ± 0.003" @ 45°
Barrel Finish:	55 ± 5 μinches
Perpendicularity:	within 5 arc minutes
Parallelism:	30 arc-seconds or less
Rod End Face Flatness:	within $\lambda / 10$ wave at 632 nm wavelength
Surface Quality:	10 - 5 scratch-dig per MIL-O-13830 A
Wavefront Distortion:	less than 1/2 wave per inch of length (measured at 1 micron)
Rod End Coatings:	Single-layer MgF ₂ Single wavelength and broad band anti-reflection coatings available
Cr Concentration:	standard range: 0.10 - 0.17 at % special order: < 0.10 or 0.17 - 0.20 at % optimum chrome concentration: 0.83 / d at % (d is laser rod diameter in mm)

Optical Properties

Chrome Concentration Range:	0.01 - 0.2 at %
Chrome - ion Density (0.1 at %):	$3.51 \times 10^{19} \text{ cm}^{-3}$
Refractive Indices (750 nm): (Biaxial, Positive)	E a = 1.7367 E b = 1.7421 E c = 1.7346
Refractive Index Variation:	$8 \times 10^{-6} \text{ K}^{-1}$
Dopant Site Symmetry:	78% mirror (laser active) 22% inversion
Non-Linear Refractive Index, n_2 :	$\sim 10^{-13} \text{ esu}$
Findlay-Clay Insertion Loss:	< 0.3% cm^{-1}

Specifications and information are subject to change without prior notice.
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