

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:	Be (Al _{1-x} Cr _x) ₂ O ₄
Crystal Structure:	Orthorhombic
Unit Cell Dimensions: (contains four formula units)	a = 5.476 Å per ASTM 10-32 b = 9.404 Å c = 4.427 Å
X-Ray Density:	3.7 g cm ³
Melting Point:	1870°C
Thermal Expansion:	a 5.9 x 10 ⁻⁶ K ⁻¹ b 6.1 x 10 ⁻⁶ K ⁻¹ c 6.7 x 10 ⁻⁶ 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 GPa
Thermal Shock Resistance:	35 - 74 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 λ / 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 x 10 ¹⁹ cm ⁻³
Refractive Indices (750 nm): (Biaxial, Positive)	E a = 1.7367 E b = 1.7421 E c = 1.7346
Refractive Index Variation:	8 x 10 ⁻⁶ K ⁻¹
Dopant Site Symmetry:	78% mirror (laser active) 22% inversion
Non-Linear Refractive Index, n ₂ :	~ 10 ⁻¹³ esu
Findlay-Clay Insertion Loss:	< 0.3% cm ⁻¹



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