

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

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|--|--|
| 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

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|------------------------|---|
| 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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