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# Alexandrite Rods (710 nm – 800 nm)

- A broad wavelength tuning range of 710 nm – 800 nm
- Robust solid-state laser material with a thermal shock resistance five time that of Nd:YAG
- Rod Lengths: 3 mm – 152.4 mm
- Rod Diameters: 2 mm – 12.7 mm

| 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<br>b = 9.404 Å<br>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$^{-1}$<br>\|\|b 6.1 x 10$^{-6}$ K$^{1}$<br>\|\|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 |

| 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 |
| **Wave Front Distortion:** | less than 1/2 wave per inch of length (measured at 1 micron) |
| **Rod End Coatings:** | Single-layer $MgF_2$<br>Single wavelength and broad band anti-reflection coatings available |
| **Cr Concentrations:** | standard range: 0.10 - 0.17 at %<br>special order: < 0.10 or 0.17 - 0.20 at %<br>optimum chrome concentration: 0.83 / d at %<br>(d is laser rod diameter in mm) |

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| 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<br>E ||b = 1.7421<br>E ||c = 1.7346 |
| **Refractive Index Temperature Variation:** | 8 x $10^{-6}$ $K^{-1}$ |
| **Dopant Site Symmetry:** | 78% mirror (laser active)<br>22% inversion |
| **Non-linear Refractive Index, $n_2$:** | ~ $10^{-13}$ esu |
| **Findlay-Clay Insertion Loss:** | < 0.3% $cm^{-1}$ |

# Alexandrite Absorption Coefficient