

Co:Spinel crystals

Passive Q-switches or saturable absorbers generate high power laser pulses without the use of electro-optic Q-switches, thereby reducing the package size and eliminating a high voltage power supply.

$\text{Co}^{2+}:\text{MgAl}_2\text{O}_4$ is a relatively new material for passive Q-switching in lasers emitting from 1.2 to 1.6 μm , in particular, for eye-safe 1.54 μm Er:glass laser, but also works at 1.44 μm and 1.34 μm laser wavelengths. Spinel is a hard, stable crystal that polishes well. Cobalt substitutes readily for magnesium in the Spinel host without the need for additional charge compensation ions. High absorption cross section ($3.5 \times 10^{-19} \text{ cm}^2$) permits Q-switching of Er:glass laser without intracavity focusing both with flash-lamp and diode laser pumping. Negligible excited-state absorption results in high contrast ratio of Q-switch, i.e. the ratio of initial (small signal) to saturated absorption is higher than 10.



Features:

- Suitable for 1540 nm eye-safe lasers
- High absorption section
- Negligible excited state absorption
- High optical quality
- Uniformly distributed Co

Applications:

- Eye-safe 1540 nm Er:glass laser
- 1440 nm laser
- 1340 nm laser
- Eye-safe laser range finder

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Chemical formula	Co ²⁺ :MgAl ₂ O ₄
Crystal structure	Cubic
Lattice parameters	8.07Å
Density	3.62 g/cm ³
Melting Point	2105°C
Refractive Index	n=1.6948 @1.54 μm
Thermal Conductivity / (W·cm ⁻¹ ·K ⁻¹ @25°C)	0.033W
Specific Heat/ (J·g ⁻¹ ·K ⁻¹)	1.046
Thermal Expansion / (10 ⁻⁶ /°C@25°C)	5.9
Hardness (Mohs)	8.2
Extinction Ratio	25dB
Orientation	[100] or [111] < ±0.5°
Optical density	0.1-0.9
Damage Threshold	>500 MW/cm ²
Doping concentration of Co ²⁺	0.01-0.3 atm%
Absorption coefficient	0 ~ 7 cm ⁻¹
Working wavelength	1200 – 1600 nm

Orientation Tolerance	< 0.5°
Thickness/Diameter Tolerance	±0.05 mm
Surface Flatness	<λ/8@632 nm
Wavefront Distortion	<λ/4@632 nm
Surface Quality	10/5
Parallel	10"
Perpendicular	5'
Clear Aperture	>90%
Chamfer	<0.1×45°
Coating	AR/AR@1540, R<0.2%; AR/AR@1340, R<0.2%
Maximum dimensions	Dia(3-15)×(3-50)mm