SCIENTIFIC MATERIALS CORP.
A FLIR Systems Company

Passive Q-Switch Cr^{4+}:YAG

General Information

Cr^{4+}:YAG has become the solid-state passive Q-switch material of choice for 1 micron laser systems, offering several significant advantages over active acousto-optic and electro-optic devices, including:

- Eliminates the need for a high voltage power supply
- Reduce packaging size and weight
- Improved reliability and a longer lifetime in 1064 nm Nd:YAG lasers.
- Readily fabricated into high optical quality OEM components.

A small fraction of the chromium ions in YAG can be induced to change valence from the normal Cr^{3+} to Cr^{4+} with the addition of charge compensating impurities such as Mg^{2+} or Ca^{2+}. The best measure of the Cr^{4+} concentration is the low power absorption coefficient alpha at 1064 nm. The typical values of alpha vary from 1-7 cm-1 for passive Q-switch applications.

Contact us with your specific requirements or for availability and pricing.

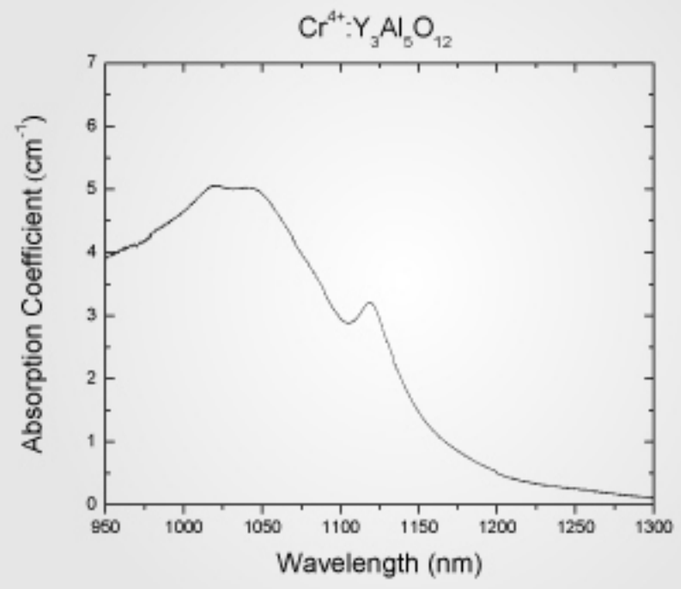
Standard Componet Specifications

Orientation	<100> standard, <110> optional
Surface Flatness	< λ/10
Surface Finish	10-5 Scratch-Dig (Per MIL-O-13830A)
Absorption Coefficient (λ specific)	1.0 cm^{-1} — 7 cm^{-1}
Coating	AR @ 1064 nm (<0.2%)

Customer Supplied Specifications (Typical)

Diameter / Cross section		<10 mm
Thickness		1-5 mm (+/- 1.0)mm
Specify Either:	Optical Density or Absorption Coeficient or % Transmission	0.1 to 0.8 1.0 cm^{-1} — 7 cm^{-1} 10% to 90%

Absorption Coefficient Chart



Material Properties

Charge compensating ion	Ca^{2+}
Crystal Structure	Cubic
Molecular Weight	593.7 g mol^{-1}
Melting Point	1965°C
Density	4.56 g cm^{-3}
Thermal Expansion Coefficient	6.14 x 10^{-6} K^{-1}
Thermal Conductivity	11.2 W m^{-1} K^{-1}
Specific Heat (Cp)	0.59 J g^{-1} K^{-1}
MOHS Hardness	8.2
Young's Modulus	335 GPa
Tensile Strength	2 GPa
Thermal Shock Resistant	800 W m^{-1}
Host Refractive Index @ 632.8 nm	1.83

References

1) Some fundamental theory is given by, A.E. Siegman, "Lasers", University Science Books, Mill Valley, CA (1986), Chapter 26

2) Practical devices are described by, W. Koechner, "Solid State Laser Engineering", Springer-Verlag, New York (1988). Chapter 8

3) A review article "Cr4+-doped crystals: their use as lasers and passive Q-switches" is given by, Y. Kalisky, Progress in Quantum Electronics 28 (2004) 249-303

4) A comprehensive reference for the optical properties of Cr4+ in YAG is given in A.G. Okhrimchuk and A.V. Shestakov, Optical Materials 3, 1-13 (1994)

Need Help? Please Call: **(406)585-3772** or Email: **sales@scientificmaterials.com**