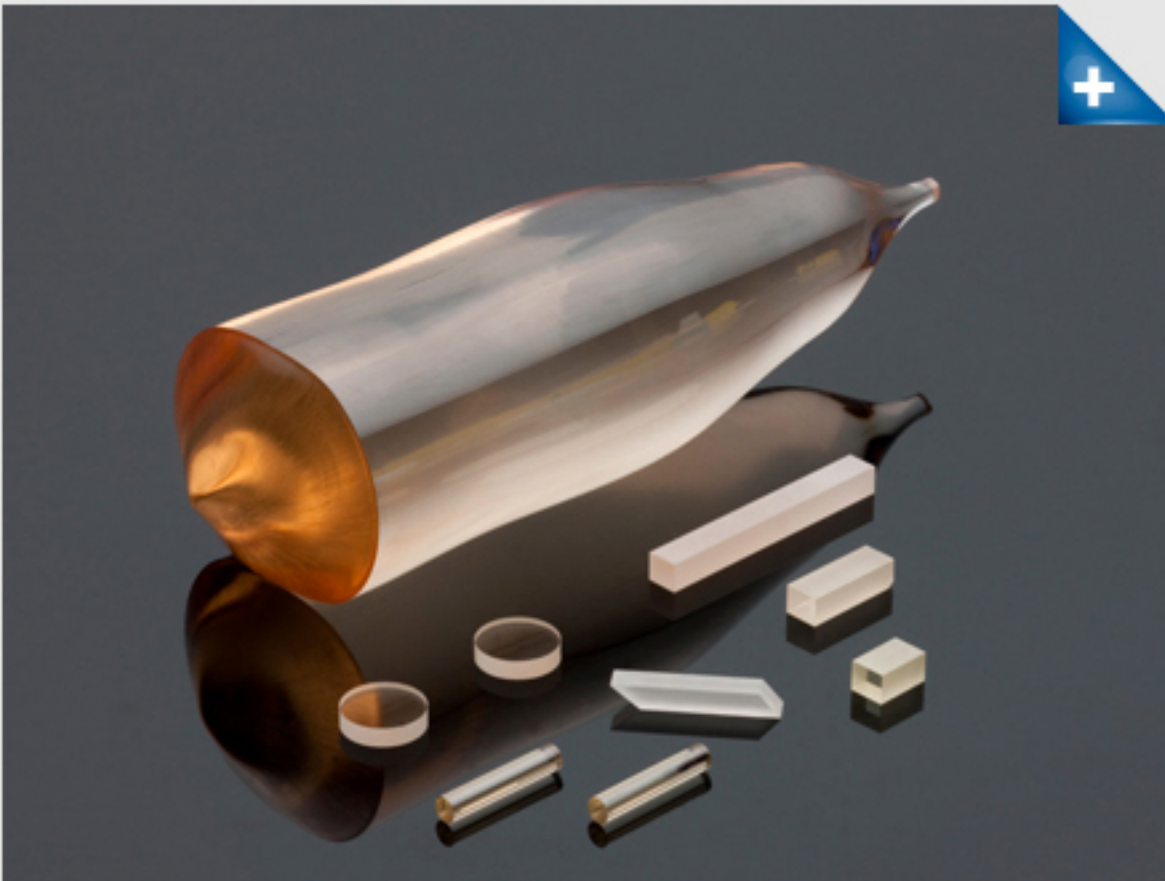


Laser Materials YALO₃



General Information

SMC offers high quality Yttrium Orthoaluminate, also referred to as yttrium aluminum perovskite (YAP), doped with Tm, Nd, Pr, Er and Cr.

YAP's hardness and thermal conductivity are similar to YAG, but exhibits a highly anisotropic thermal expansion coefficient and is birefringent. YAP is an orthorhombic negative biaxial crystal belonging to the D162h (Pnma) space group. Emission wavelengths are polarized, and emission and absorption cross sections are dependant upon the crystallographic orientation. SMC (along with references [1] and [3] below), use the Pnma space group convention for defining the crystallographic a, b, and c-axis lattice constants. Others (including reference [2]) use the Pbnm convention. In the table below, we related the two conventions thru their common lattice constants.

[Contact us](#) with your specific requirements or for availability and pricing of currently stocked compositions and concentrations.

Dopant Ion

	Tm:YALO	Nd:YALO
Emission Wavelength	1.99 μm (E a) 1.94 μm (E c)	1.073 μm
Laser Transition	³ F ₄ → ³ H ₆	⁴ F _{3/2} → ⁴ I _{11/2}
Pump Wavelength	795 nm	lamp
Y3+ Site	1.96 x 10 ²⁰ cm ⁻³	
Al3+Site (IV)	1.96 x 10 ²⁰ cm ⁻³	
Al3+Site (VI)	NA	

Physical Properties

Coefficient of Thermal Expansion [3]	2.32 x 10 ⁻⁶ K ⁻¹ (a) 8.08 x 10 ⁻⁶ K ⁻¹ (b) 8.7 x 10 ⁻⁶ K ⁻¹ (c)
Thermal Diffusivity [3]	0.039 cm ² s ⁻² (a) 0.045 cm ² s ⁻² (c)
Thermal Conductivity [3]	11.7 W m ⁻¹ K ⁻¹ (a) 10.0 W m ⁻¹ K ⁻¹ (b) 13.3 W m ⁻¹ K ⁻¹ (c)
Specific Heat (Cp) ¹	0.557 J g ⁻¹ K ⁻¹
Refractive Index @ 632.8 nm	1.96(a) 1.94(b) 1.97(c)
dn/dT (Thermal Coefficient of Refractive Index) @ 1064nm [3]	7.7 10 ⁻⁶ K ⁻¹ (E a) 11.7 10 ⁻⁶ K ⁻¹ (E b) 8.3 10 ⁻⁶ K ⁻¹ (E c)
Molecular Weight	163.89 g mol ⁻¹
Melting Point	1870°C
Density	5.35 g cm ⁻³
MOHS Hardness	8.5
Crystal Structure	Orthorhombic
Standard Orientation	a-axis or c-axis
Y3+ Site Symmetry	C _{1h}

Lattice Constant

	(Pnma space group)	(Pbnm space group)
5.330 Å	a-axis	b-axis
7.375 Å	b-axis	c-axis
5.180 Å	c-axis	a-axis

References

- 1) 1.94 micron and 1.99 micron emission of Tm:YAP is studied in Stoneman et. al.,
- 2) Emission and absorption properties of Nd:YAP are summarized in A. A. Kaminskii, "Laser Crystals: Their physics and properties", Second Edition, Springer-Verlag New York, 1990 Chapter 6.3; ISBN 0-387-09576-4
- 3) Thermo-optic properties of YAP and other laser host materials are studied in: R. L. Aggarwal, et. al., JOURNAL OF APPLIED PHYSICS 98, 103514 (2005)

Absorption Coefficient Chart

