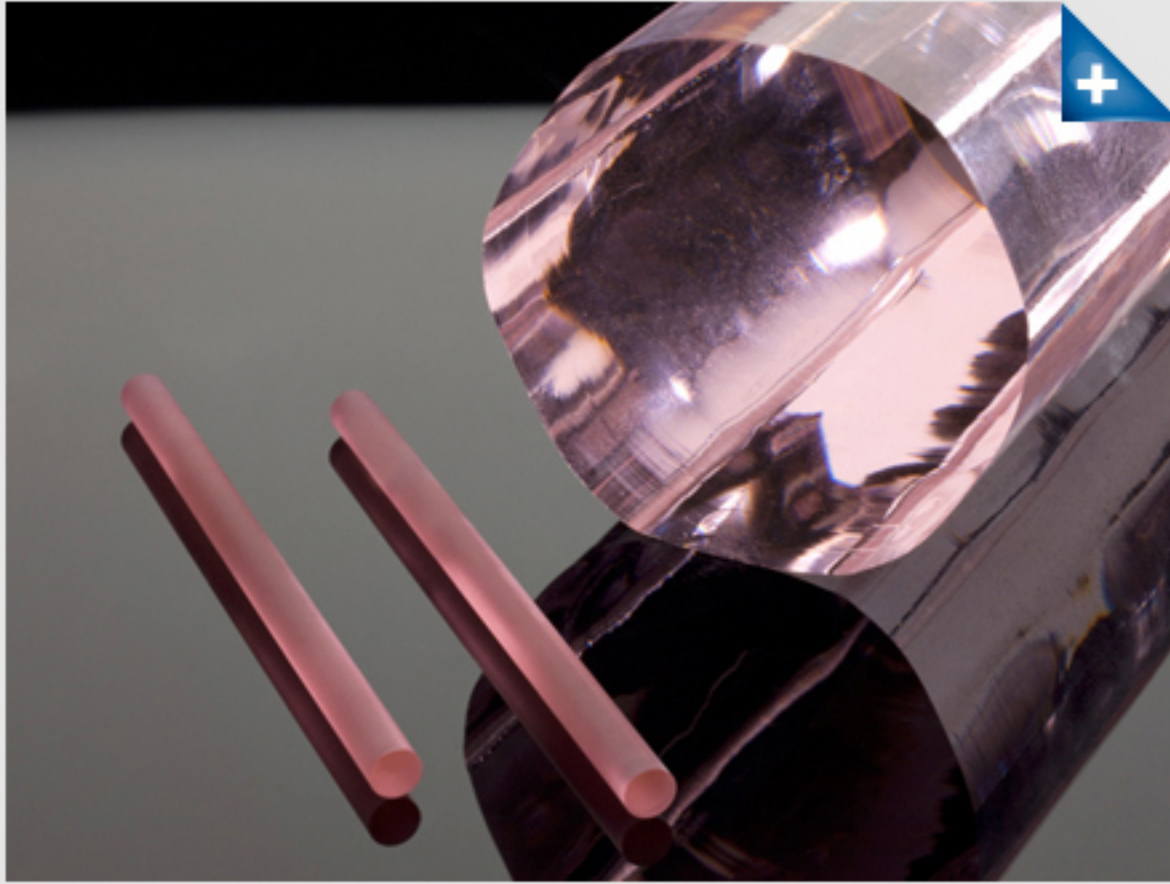


## Laser Materials Er:YAG



### General Information

**Highly doped (50%) Erbium YAG** is a well-known laser source for producing 2940nm emission, commonly used in medical [1] (e.g. cosmetic skin resurfacing), and dental [2] (e.g. oral surgery) applications due to the strong water and hydroxapatite absorption at this wavelength.

**Low doped (< 1%) Erbium YAG** have been studied as an efficient means to generate high power and high energy 1.6 micron 'eye-safe' laser emission thru 2 level resonant pumping schemes. In these systems, fiber or diode lasers pump the ~1.5 micron  $^4I_{15/2} \rightarrow ^4I_{13/2}$  4115/2 4113/2 absorption band, where non-radiative coupling between stark levels allows 1.6 micron laser emission with quantum efficiencies in excess of 90% [3].

[Contact us](#) with your specific requirements or for availability and pricing.

### Dopant Ion

Er3+ concentration range	0.1 - 100 atomic %
Dopant Ion Density @ 1 atomic %	
Y3+ Site	$1.38 \times 10^{20} \text{ cm}^{-3}$
Al3+ Site (IV)	$1.38 \times 10^{20} \text{ cm}^{-3}$
Al3+ Site (VI)	$0.92 \times 10^{20} \text{ cm}^{-3}$

### Common Operating Specs

	50% Er:YAG	Low Doped (0.1% - 1.0%) Er:YAG
Emission Wavelength	2.94 $\mu\text{m}$	1.6 $\mu\text{m}$
Laser Transition	$^4I_{11/2} \rightarrow ^4I_{13/2}$	$^4I_{13/2} \rightarrow ^4I_{15/2}$
Flourescence Lifetime	230 $\mu\text{s}$	2+-5 ms
Pump Wavelength	600-800 nm	1.5 $\mu\text{m}$

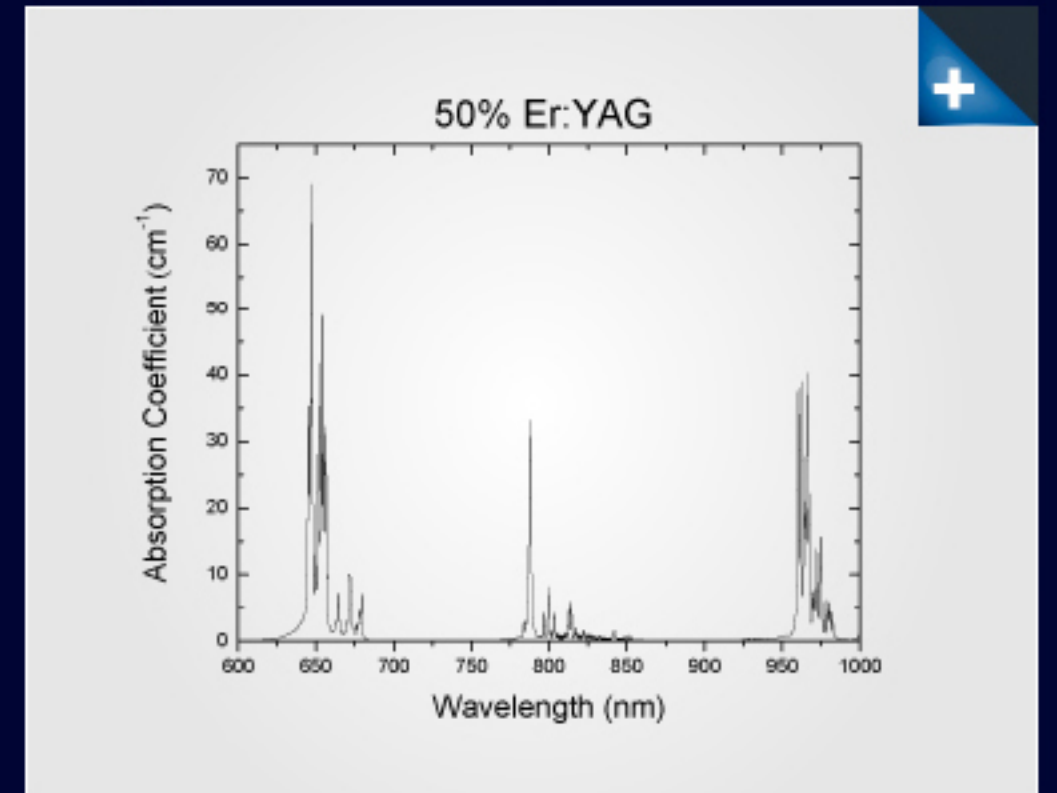
### Physical Properties

Coefficient of Thermal Expansion	$6.14 \times 10^{-6} \text{ K}^{-1}$
Thermal Diffusivity	$0.041 \text{ cm}^2 \text{ s}^{-2}$
Thermal Conductivity	$11.2 \text{ W m}^{-1} \text{ K}^{-1}$
Specific Heat (Cp)	$0.59 \text{ J g}^{-1} \text{ K}^{-1}$
Thermal Shock Resistant	$800 \text{ W m}^{-1}$
Thermal Shock Resistant	1.83
dn/dT (Thermal Coefficient of Refractive Index) @ 1064nm	$7.8 \times 10^{-6} \text{ K}^{-1}$
Molecular Weight	$593.7 \text{ g mol}^{-1}$
Melting Point	1965°C
Density	$4.56 \text{ g cm}^{-3}$
MOHS Hardness	8.25
Young's Modulus	335 Gpa
Tensile Strength	2 Gpa
Crystal Structure	Cubic
Standard Orientation	<111>
Y3+ Site Symmetry	$8D_2$
Lattice Constant	$a=12.013 \text{ \AA}$

### References

- 1) Teikemeier G, Goldberg DJ. "Skin resurfacing with the erbium:YAG laser". *Dermatol. Surg.* 23, 685-687 (1997).
- 2) Bornstein E. "Proper use of Er:YAG lasers and contact sapphire tips when cutting teeth and bone: scientific principles and clinical application". *Dent. Today* 23, 84, 86-89; quiz 89
- 3) S.S. D. Setzler, et. al., "Resonantly Pumped Eyesafe Erbium Lasers". *IEEE Journal of Selected topics in Quantum Electronics* 11, 645 (2005).

### Absorption Coefficient Chart 50% Er:YAG



### Absorption Coefficient Chart Low Doped (0.1% - 1.0%) Er:YAG

