Er:YSGG crystals

Er,Cr:YSGG crystals

Active elements from Erbium doped Yttrium Scandium Gallium Garnet crystals (Er:Y3Sc2Ga3O12 or Er:YSGG), single crystals, are desinged for diode pumped solid-state lasers radiating in the 3 μm range. Er:YSGG crystals show the perspectiveness of their application alongside with the widely used Er:YAG, Er:GGG and Er:YLF crystals.

Flash lamp pumped solid-state lasers based on Cr,Nd and Cr,Er doped Yttrium Scandium Gallium Garnet crystals (Cr,Nd:Y3Sc2Ga3O12 or Cr,Nd:YSGG and Cr,Er:Y3Sc2Ga3O12 or Cr,Er:YSGG) have a higher efficiency than those based on Nd:YAG and Er:YAG.

Active elements manufactured from YSGG crystals are optimum for medium power pulse lasers with the repetition rates of up to several tens of cycles. The advantages of YSGG crystals compared with YAG crystals are lost when large size elements are used because of the worse thermal characteristics of YSGG crystals.

Er:YSGG crystals/ Er,Cr:YSGG crystals

. scientific investigations
. medical applications, lithotripsy
. medical applications, scientific investigations

Technical Parameters:	
Rod Diameters	up to 15 mm
Diameter Tolerance:	+0.0000 / -0.0020 in
Length Tolerance	+0.040 / -0.000 in
Tilt / Wedge Angle	±5 min
Chamfer	0.005 ±0.003 in
Chamfer Angle	45 deg ±5 deg
Barrel Finish	55 micro-inch ±5 micro-inch
Parallelism	30 arc seconds
End Figure	λ / 10 wave at 633 nm
Perpendicularity	5 arc minutes
Surface Quality	10 - 5 scratch-dig
Wavefront Distortion	1/2 wave per inch of length

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Basic properties		
Crystal	Er3+:YSGG	Cr3+,Er3+:YSGG
Crystal structure	cubic	cubic
Dopant concentration	30 - 50 at.%	Cr: (1 ÷ 2) x 1020; Er: 4 x 1021
Spatial group	Oh10	Oh10
Lattice constant, Å	12.42	12.42
Density, g/cm3	5.2	5.2
Orientation	<001>, <111>	<001>, <111>
Mohs hardness	>7	> 7
Thermal expansion coefficient	8.1 x 10-6x° K-1	8.1 x 10-6 x° K-1
Thermal conductivity, W x cm-1 x ° K-1	0.079	0.06
Refractive index, at 1.064 μm	1.926	
Lifetime, μs	-	1400
Emission cross-section, cm2		5.2 x 10-21
Relative (to YAG) efficiency of transformation of energy of the flash lamp	-	1.5

Termooptical factor (dn/dT)	7 x 10-6 x° K-1	-
Generated wavelength, μm	2.797; 2.823	-
Lasing wavelength, μm	-	2.791
Refractive index	-	1.9263
Termooptical factor (dn/dT)	-	12.3 x 10-6 x ° K-1
Ultimate lasing regimes	-	overall efficiency 2.1%
Free running mode	-	slope efficiency 3.0%
Ultimate lasing regimes	-	overall efficiency 0.16%
Electro-optical Q-switch	-	slope efficiency 0.38%
Sizes, (dia x length), mm	-	from 3 x 30 to12.7 x 127.0
Fields of applications	-	material processing, medical applications, scientific investigations