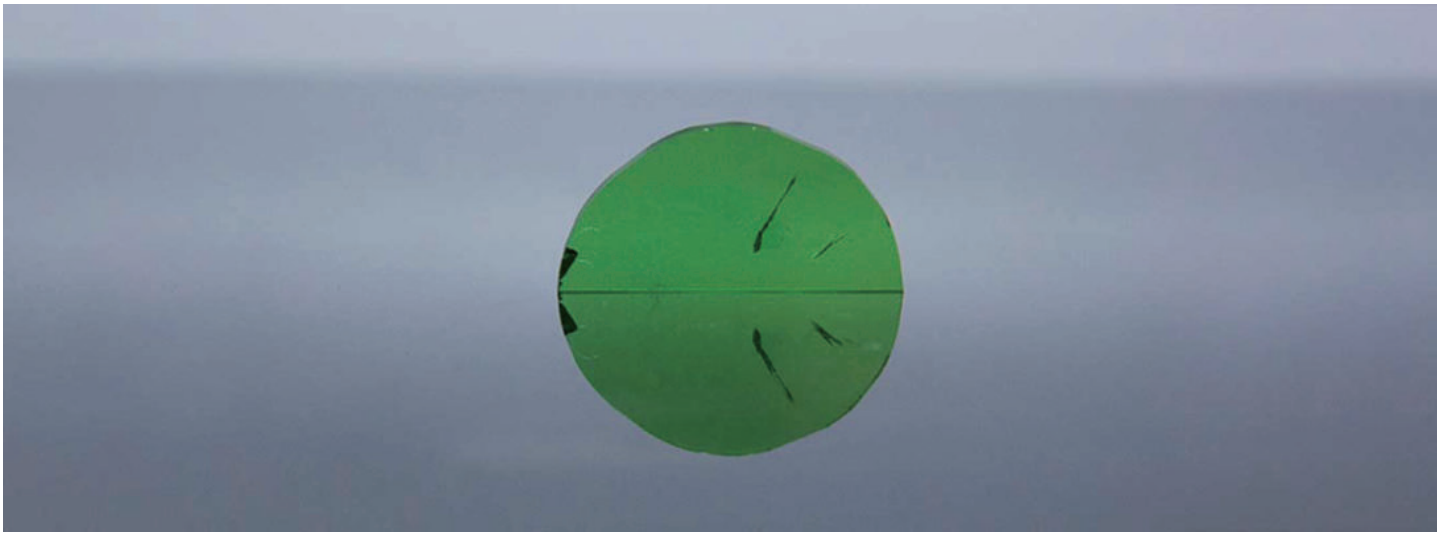
Cr:GSGG



DESCRIPTION

Cr:GSGG crystal (Cr doped Gadolinium scandium gallium garnet) is a laser material with high efficiency. An electro-optic shutter element was first utilized to provide Q-switched operation of the ruby laser. Passive Q-switched ruby lasers were achieved with saturable dye absorbers and colored glass (compounds of selenium and cadmium sulfide. Recently the operational characteristics of a dye Q-switch for a pulsed ruby laser was still studied for application in underwater holography. However, the dye Q-switch was limited in durability because of degradation (decomposition) of the dyes and the glass Q-switch was readily damaged. Thus, the tetravalent chromium doped gadolinium scandium gallium garnet $Gd_3Sc_2Ga_3O_{12}$ (Cr^{4+}:GSGG) passive Q-switch ruby laser-offers for the first time high reliability, durability and high efficiency.

Cr:GSGG crystal – a crystal which shows high efficiency and high reliability.

Cr^{4+}: GSGG has been utilized for the first time to provide a saturable absorber Q-switch for the ruby laser. Single output pulse operation (100 mJ and 27 ns duration) with efficiencies relative to the free-running ruby laser operation of 25-30% was routinely obtained.

The crystalline material Cr^{3+}:GSGG is currently of interest as a broad-band, room temperature laser material. The small separation between the $^4T2$ and ^2E electronic levels of Cr^{3+} in the system can result in interesting spectroscopic behaviour. People have investigated the temperature dependence of the CW and transient luminescence, and have found it to be consistent with a model for the dominant Cr^{3+} site in which the lowest energy ^2E and $^4T2$ levels are approximately coincident in energy at low temperature.

APPLICATIONS

- *Cr^{4+}: GSGG used in saturable absorber Q-switch for the ruby laser.*

The tetravalent chromium doped gadolinium scandium gallium garnet $Gd_3Sc_2Ga_3O_{12}$ (Cr^{4+}:GSGG) passive Q-switch ruby laser-offers for the first time high reliability, durability and high efficiency. Single output pulse operation (100 mJ and 27 ns duration) with efficiencies relative to the free-running ruby laser operation of 25-30% was routinely obtained.

FEATURES

- High reliability
- High efficiency
- High durability
- Strong and saturable absorption
- Good thermal conductivity

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Cr:GSGG

PARAMETERS

SPECTRAL PROPERTIES

Emission wavelength (nm)	1061.2
Emission Cross Section (pm^2)[a]	13
R_2 -> Y_3 Transition Linewidth (cm^{-1})	11.5
Nd^{3+} Fluorescence Lifetime (ps) at Low Concentrations (<$10^{17}cm^{-3}$)	273-283
Nd^{3+} concentration for which lifetime is reduced by 50% (10^{20} Nd ions cm^{-3})	5

OPTICAL PROPERTIES

Refractive index at 1064 nm	1.9424
Index change with temperature dn / dt, (10^{-6} k^{-1})	10.9
Index change with temperature	
P11	-0.012 ± 0.003
P12	0.019 ± 0.003
P44	-0.0665 ± 0.0013

OPTICAL PROPERTIES

Density ($g*cm^{-3}$)	6.495
Calorific Capacity ($J*g^{-1}*K^{-1}$)	0.4029
Thermal Conductivity ($W*m^{-1}*K^{-1}$)	6
Thermal Expansivity (10^{-6} K^{-1})	7.5
Poisson Ratio	0.28
Young's Modulus (GPa)	210
Breaking Tenacity (MPa)	1.2
Thermal Stress Resistance ($W*m^{-1}$)[b]	660

SPECTRA