Лазерное стекло LG-940/950/960

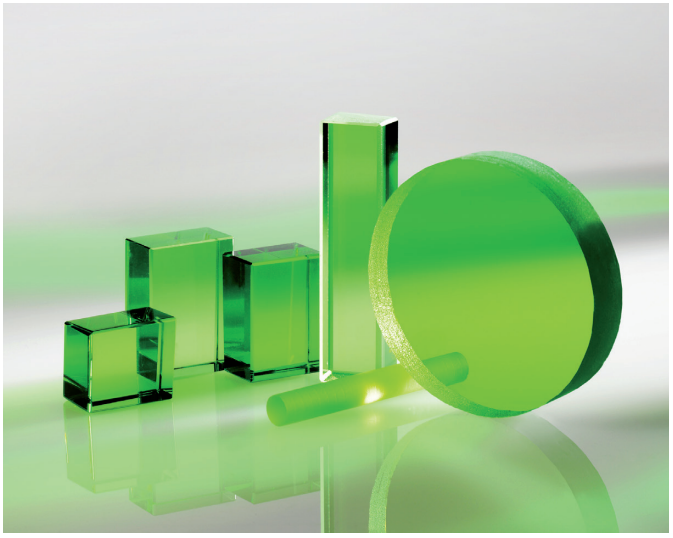
Технические характеристики

LG-940 'Eye-Safe' Laser Glass

Phosphate laser glass for rangefinding, medical and bio-photonic applications; operation at 1.5 µm

Product Information

The LG-940 is an Erbium – Ytterbium – Chromium – Cerium doped phosphate based laser glass used in flashlamp pumped and diode pumped solid-state laser systems. Phosphate glasses generally offer higher solubility of rare earth dopants, thus the amount of active ions can be significantly increased.



Applications

- Medical lasers for dermatological use
- Analytical instrumentation
- Rangefinders

Advantages

- Good athermal properties
- High transmission at the lasing wavelength
- Consistent quality and high homogeneity

Quality Assurance

Quality control is based on statistical process control, as well as on rigorous final inspection of the finished component. Glass properties are measured for every melt. Measurement instruments include a broad range of interferometers, spectrophotometers, physical property test systems, vision systems, and a laser test bed.

Forms of Supply

We supply fully finished laser components fabricated to customer specifications (e.g. rods, slabs and discs) with high laser damage threshold dielectric coatings.

Application Support

Please contact us with your requested laser glass specifications. Our experienced application team is trained to find the right solution for your application.

Erbium Laser Properties	
Emission Cross Section Maxima, λ [nm]	1532.5
Effective Linewidth [nm]	39.9
Linewidth, FWHM [nm]	25.3
Loss at Lasing Wavelength* [cm^{-1}]	
Radiative Lifetime τ_{Rad} [msec]	11.1
Emission Cross Section, σ_{em} [$10^{-21} cm^2$]	7.1
Fluorescence Lifetime [msec]	9.4

*Loss at the lasing wavelength is dominated by ground state absorption of erbium and is thus a function of erbium content in the glass. This glass is suitable for "eye-safe" laser devices. Actual safety depends on product configuration.

Erbium has significant absorption at the lasing wavelength.
For further information please contact a sales representative.

Optical Properties	
n_d	1.533
v_d	62.2
n_2 [10^{-13} esu]	1.3
dn/dT relative at 1.54 µm [10^{-6}/K]	–3.6
$n_{1540\ nm}$	1.522

Chemical Properties	
Weight Loss in 50 °C Water [mg/(cm²·day)]	0.025
Acid Resistance SR pH = 0.3 at 25 °C	4.3
Alkali Resistance AR pH = 12 at 50 °C	3.3
Staining Resistance FR pH = 4.6 100 h at 25 °C	0
Climatic Resistance CR Water Vapor at 40–50 °C for 30 h	1–2

Physical Properties	
Density, ρ [g/cm³]	3.04
Thermal Conductivity (25 °C), $\kappa_{25\,°C}$ [W/m·K]	0.51
Thermal Conductivity (90 °C), $\kappa_{90\,°C}$ [W/m·K]	0.61
Young's Modulus, E [GPa]	57.6
Poisson's Ratio, ν	0.26
Fracture Toughness, K_{1c} [MPa·m$^{1/2}$]	0.7
Knoop Hardness, $HK_{0.1/20}$	380
Heat Capacity (25 °C), $C_{p25\,°C}$ [J/g°C]	
Thermal Diffusivity (25 °C), $\delta_{25\,°C}$ [10^{-7}m²/sec]	
Thermal Expansion, $\alpha_{20-300\,°C}$ [10^{-7}/°C]	119.6
Thermal Expansion, $\alpha_{20-40\,°C}$ [10^{-7}/°C]	81.1
Transformation Temperature, T_g [°C]	456

LG-950 ‘Eye-Safe’ Laser Glass

Phosphate laser glass for range finding and medical applications at 1.5 µm

Product information

LG-950 is an Erbium and Ytterbium doped phosphate laser glass usable in diode pumped solid-state laser applications. Besides a good solubility of rare earth ions the phosphate glass offers also a good laser performance. The glass is produced in Europe and is designed for our European customers.

Applications

- Rangefinders
- Medical lasers for dermatological use
- LIDAR

Quality assurance

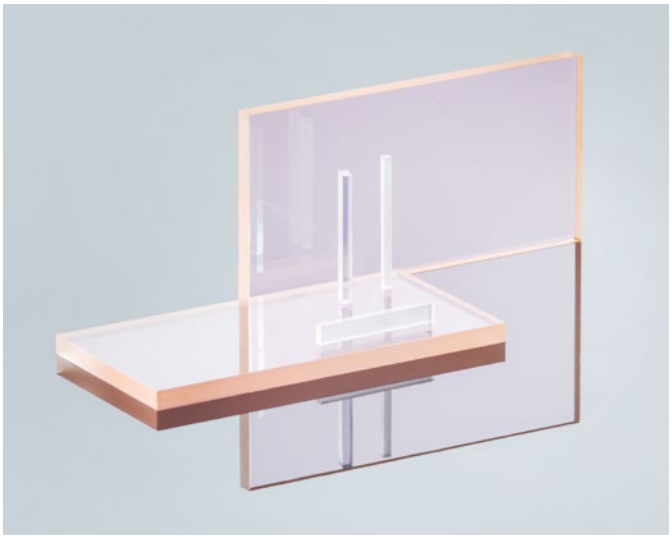
Quality control is carried out under rigorous final inspection of the finished component. Selected glass properties and doping levels are measured for every melt. Measurements include chemical composition control, a range of photometric measurements, physical property test and inspection of inner quality.

Forms of supply

The glass is available as fully finished components, such as rods, slabs and discs, manufactured according to customer specifications including dielectric coatings (AR, HR, etc.) with high laser threshold. Please contact us to find out which of the various doping levels are available from stock according to your needs.

Application support

Please contact us with your laser components specification. Our European expert application team will find the right solution for your application.



Erbium Laser Properties	
Emission Cross Section Maxima λ [nm]	1534.2
Effective Linewidth [nm]	53.4
Linewidth FWHM [nm]	20.4
Radiative Lifetime τ_{Rad} [ms] (calc.)	8.6
Emission Cross Section σ_{em} [10^{-21} cm^2]	7.0
Fluorescence Lifetime [ms]	6.4

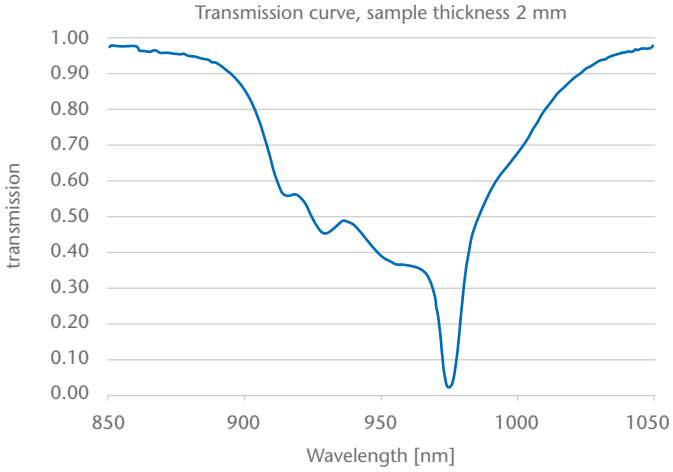
Erbium has significant absorption at the lasing wavelength.
For further information please contact a sales representative.

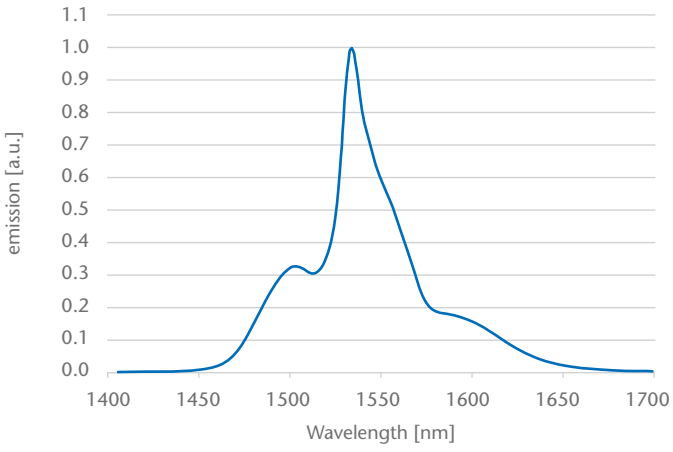
Optical Properties	
n_d	1.5291
ν_d	63.0
n_2 [10^{-20} m^2/W] (calc.)	3.4
dn/dT relative at 1.54 µm [10^{-6}/K]	
$n_{1534\ nm}$ (calc.)	1.5151
Stress Optical Coefficient K [10^{-6} mm^2/N]	2.35

Sellmeier Coefficients			
B1	1.24000	C1	0.00745
B2	0.07010	C2	0.03330
B3	0.81400	C3	100.000

Physical Properties	
Density ρ [g/cm^3]	2.919
Thermal Conductivity $\lambda_{90°C}$ [W/(m·K)]	0.63
Young's Modulus E [10^3 N/mm^2]	56.3
Poisson's Ratio µ	0.249
Knoop Hardness $HK_{0.1/20}$	371
Heat Capacity c_p [J/(g·K)]	0.72
Thermal Expansion $\alpha_{(+20/+300°C)}$ [10^{-6}/K]	12.9
Thermal Expansion $\alpha_{(+20/+40°C)}$ [10^{-6}/K]	10.84
Transformation Temperature T_g [°C]	422

Chemical Properties	
SR	4.0
AR	4.3
FR	0
CR	4





(All properties displayed exemplary for a doping level of $14.7 \cdot 10^{20}$ Yb^{3+} ions/cm^3 and $0.55 \cdot 10^{20}$ Er^{3+} ions/cm^3)

The following doping levels are available:

Yb^{3+} [10^{20} ions/cm^3]	Er^{3+} [10^{20} ions/cm^3]
13.2	0.55
20.0	0.15
all	
±0.3	±0.05

Other doping levels are available for
$12 - 20 \cdot 10^{20}$ Yb^{3+} Ions/cm^3 and $0.13 - 0.70 \cdot 10^{20}$ Er^{3+} Ions/cm^3

LG-960 ‘Eye-Safe’ Laser Glass

Phosphate laser glass for range finding and medical applications at 1.5 µm

Product information

LG-960 is an Erbium – Ytterbium doped phosphate laser glass with improved thermo-mechanical figure of merit usable in flash lamp and diode pumped solid state laser applications. It offers possibilities for increased load and/or repetition rates.

Applications

- Rangefinders
- LIDAR
- Medical lasers for dermatological use

Quality assurance

Quality control is carried out under rigorous final inspection of the finished component. Selected glass properties and doping levels are measured for every melt. Measurements include chemical composition control, a range of photometric measurements, physical property test and inspection of inner quality.

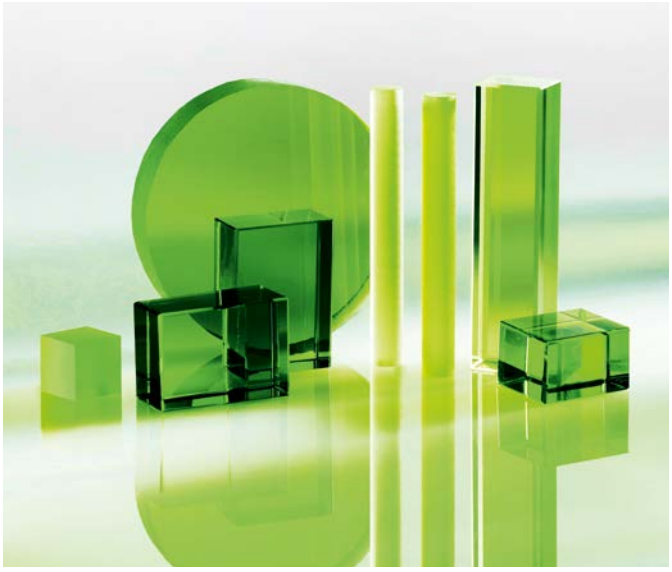
Forms of supply

The glass is available as fully finished components, such as rods, slabs and discs, manufactured according to customer specifications including dielectric coatings (AR, HR, etc.) with high laser damage threshold.

Application support

Please contact us with your laser components specification. Our experienced expert application team will find the right solution for your application.

Erbium has significant absorption at the lasing wavelength.
For further information please contact a sales representative.



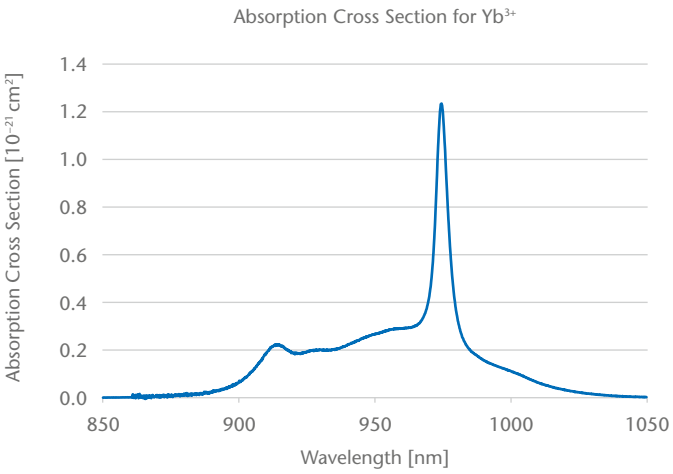
Erbium Laser Properties (Calculated, McCumber)	
Emission Cross Section Maxima λ [nm]	1534
Effective Linewidth [nm]	45.6
Linewidth FWHM [nm]	23.9
Radiative Lifetime τ_{Rad} [ms]	10.4
Emission Cross Section σ_{em} [10^{-21} cm^2]	6.8
Fluorescence Lifetime [ms] (measured)	10.2

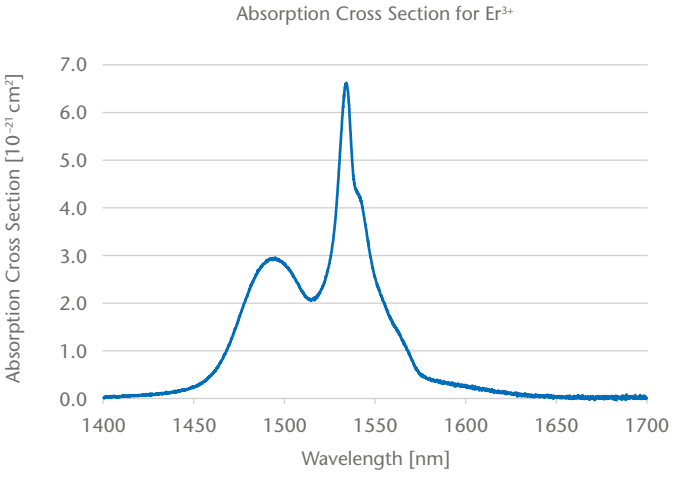
Optical Properties	
n_d	1.5443
ν_d	62.27
n_2 [10^{-20} m^2/W] (calc.)	3.6
$dn/dT_{rel.}$ (1060 nm, 20 °C – 40 °C) [10^{-6}/K]	0.4
$n_{1540\ nm}$	1.533
Stress Optical Coefficient K [10^{-6} mm^2/N] (588 nm)	2.60

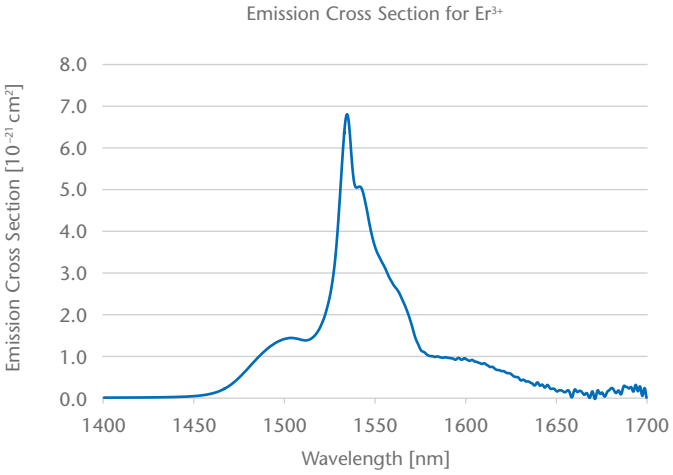
Sellmeier Coefficients			
B1	1.27635140	C1	0.00755618
B2	0.07497787	C2	0.03314959
B3	0.85823953	C3	99.796425

Physical Properties	
Density ρ [g/cm³]	3.13
Thermal Conductivity $\lambda_{25\,°C}$ [W/(m·K)]	0.59
Thermal Conductivity $\lambda_{90\,°C}$ [W/(m·K)]	0.64
Young's Modulus E [10^3 N/mm²]	66.7
Poisson's Ratio μ	0.25
Fracture Toughness, K_{1C} [MPa·$m^{1/2}$]	0.7
Knoop Hardness $HK_{0.1/20}$	393
Heat Capacity $c_{p,\,+25\,°C/+100\,°C}$ [J/(g·K)]	0.67
Thermal Expansion $\alpha_{(+20/+300\,°C)}$ [10^{-6}/K]	9.8
Thermal Expansion $\alpha_{(+20/+40\,°C)}$ [10^{-6}/K]	7.2
Transformation Temperature T_g [°C]	504

Chemical Properties	
Water Loss in 50 °C Water [mg/cm² d)]	0.0001
SR	4.3
AR	2.0
FR	0
CR	1







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