IOG-10 Silicate Laser Glass

For Ion Exchange Applications

IOG-10 is an alkali-zinc-silicate glass developed for use in passive waveguide devices, which are fabricated by ion exchange in a molten KNO_3 or $AgNO_3$ salt bath. IOG-10 glass can be codoped with erbium and ytterbium for use in active devices. However, the laser properties of Er/Yb doped IOG-10 are inferior to those realized in a phosphate glass host, such as IOG-1 or IOG-2. IOG-10 devices are discussed in "Ionexchanged waveguide lasers in Er/Yb codoped silicate glass," Appl. Optics, 38 [33] 6879-6886 (1999).

Optical Properties	
n_d	1.530
v_d	56.6
$n_{1000\ nm}$ (calculated)	1.521
$n_{1540\ nm}$ (calculated)	1.518

Erbium Laser Properties	
Emission Maxima, λ (nm)	1536
Emission Cross Section at 1536 nm (10^{-21} cm²)	5.8
Excited State Lifetime for the 1536 nm Band (ms)	17.8
Max Absorption Cross Section for 980 nm Pump Band (10^{-21} cm²)	1.0

Ytterbium Laser Properties	
Emission Maxima, λ (nm)	1020
Emission Cross Section at 1002 nm (10^{-21} cm²)	4.5
Excited State Lifetime for the 1002 nm Band (ms)	1.4
Max Absorption Cross Section for 980 nm Pump Band (10^{-21} cm²)	12.0

• Properties will vary slightly with doping content

Chemical Properties	
Weight Loss in 50 °C Water [mg/(cm² x day)]	0.001
Acid Resistance SR pH = 0.3 at 25 °C	1.0
Alkali Resistance AR pH = 12 at 50 °C	1.0
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

Physical Properties	
Density, ρ [g/cm³]	2.71
Thermal Conductivity (25 °C), κ [W/m x K]	0.92
Young's Modulus, E [GPa]	71
Poisson's Ratio, ν	0.24
Fracture Toughness, K_{1c} [MPa x m$^{1/2}$]	0.71
Knoop Hardness, $HK_{0.1/20}$	520
Heat Capacity (25 °C), C_p [J/g x K]	0.77
Thermal Diffusivity (25°C), σ [10^{-7} m²/sec]	4.4
Thermal Expansion, $\alpha_{20-300\,°C}$ [10^{-7}/K]	93
Thermal Expansion, $\alpha_{20-40\,°C}$ [10^{-7}/K]	68
Glass Transformation Temperature, T_g (°C)	569

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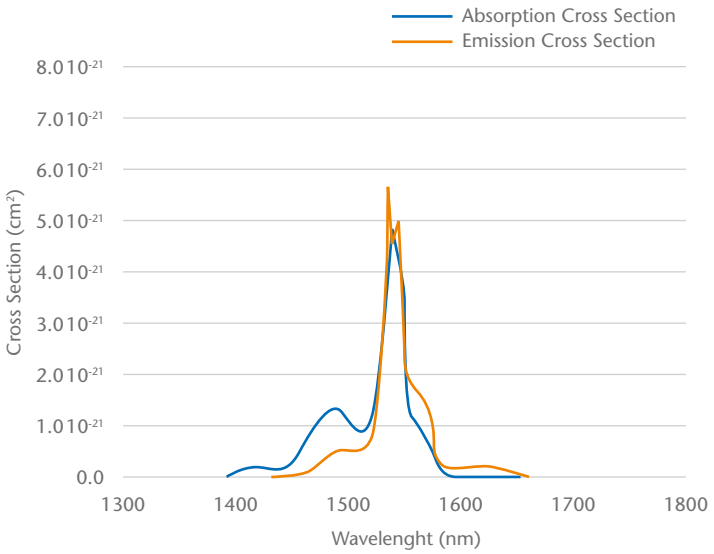
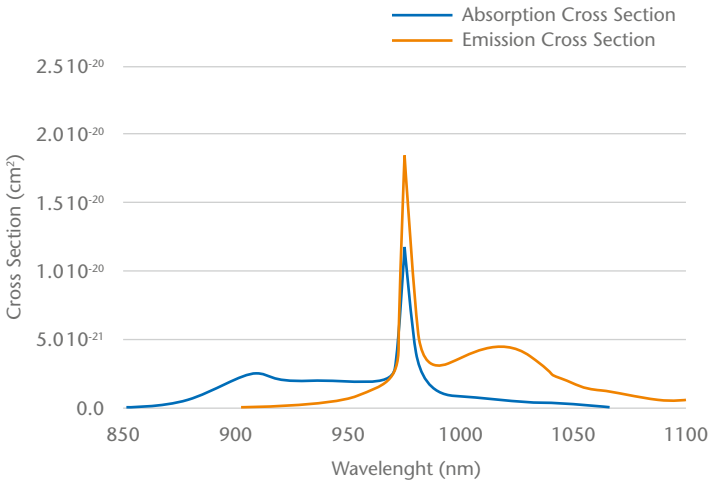
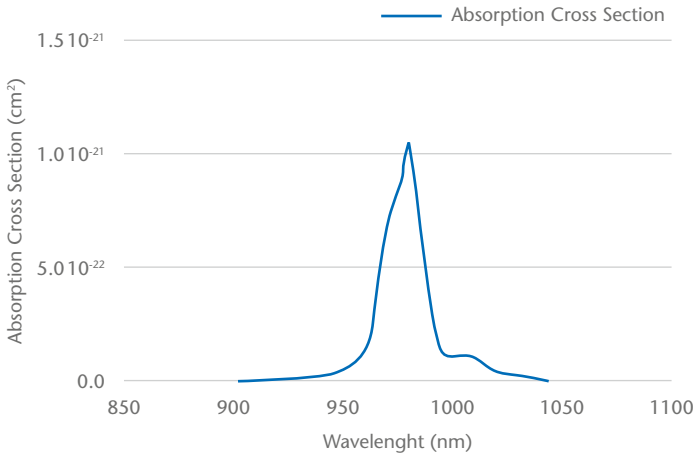
Erbium Absorption and Emission Cross Sections around 1540 nm



Ytterbium Absorption and Emission Cross Sections around 980 nm



Erbium Absorption Cross Section around 980 nm



Advanced Optics
SCHOTT North America, Inc.
400 York Avenue
Duryea, PA 18642
USA
Phone +1 570/457-7485
Fax +1 570/457-7330
info.optics@us.schott.com

www.us.schott.com/advanced_optics

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