

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 co-doped 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 "Ion-exchanged 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
$n_{1000\text{nm}}$ (calculated)	1.521
$n_{1540\text{m}}$ (calculated)	1.518

Erbium Laser Properties

Emission Maxima, λ (nm)	1536
Emission Cross Section at 1536 nm (10^{-21} cm^2)	5.8
Excited State Lifetime for the 1536 nm Band (ms)	17.8
Max Absorption Cross Section for 980nm Pump Band (10^{-21} cm^2)	1.0

Ytterbium Laser Properties

Emission Maxima, λ (nm)	1020
Emission Cross Section at 1020 nm (10^{-21} cm^2)	4.5
Excited State Lifetime for the 1020 nm Band (ms)	1.4
Max Absorption Cross Section for 980nm Pump Band (10^{-21} cm^2)	12.0

Chemical Properties

Weight Loss in 50°C Water (mg/($\text{cm}^2 \cdot \text{day}$))	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 100h at 25°C	0
Climactic Resistance CR Water Vapor at 40-50°C for 30 h	1

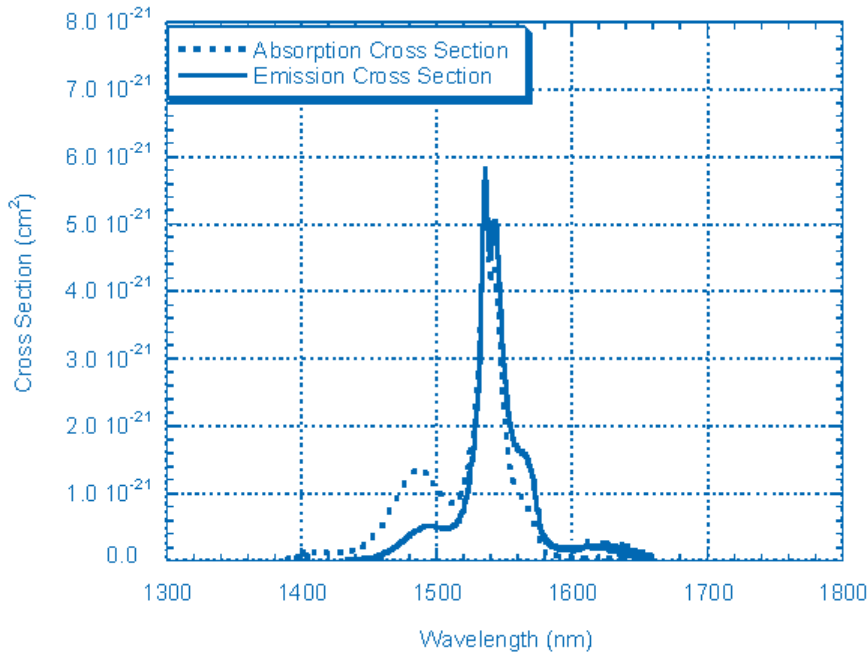
Physical Properties

Density, ρ (g/cm^3)	2.71
Thermal Conductivity (25°C), K ($\text{W/m} \cdot \text{K}$)	0.92
Young's Modulus, E (GPa)	71
Poisson's Ratio, ν	0.24
Fracture Toughness, K_{1c} ($\text{MPa} \cdot \text{m}^{1/2}$)	0.71
Knoop Hardness, $\text{HK}_{0.1/20}$	520
Heat Capacity (25°C), C_p ($\text{J/g} \cdot \text{K}$)	0.77
Thermal Diffusivity (25°C), σ ($10^{-7} \text{ m}^2/\text{sec}$)	4.4
Thermal Expansion, $\alpha_{20-300^\circ\text{C}}$ ($10^{-7}/\text{K}$)	93
Thermal Expansion, $\alpha_{20-40^\circ\text{C}}$ ($10^{-7}/\text{K}$)	68
Glass Transformation Temperature, T_g (°C)	569

- Properties will vary slightly with doping content

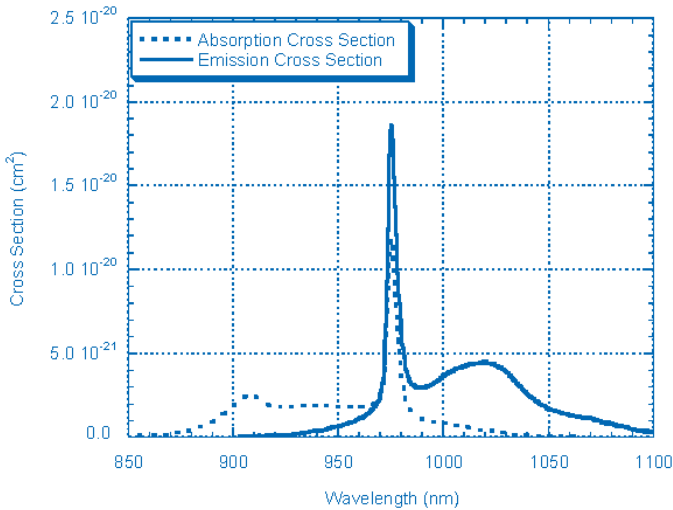
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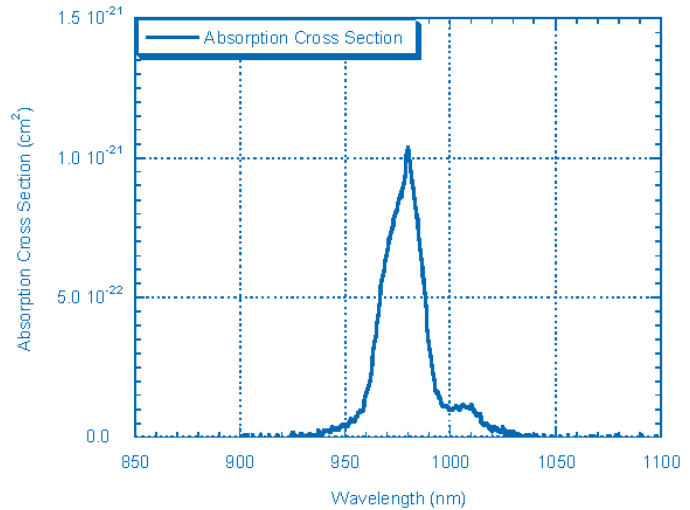


Erbium Absorption and Emission Cross Sections around 1540nm

Ytterbium Absorption and Emission Cross Sections around 980nm



Erbium Absorption Cross Section around 980nm



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