LG-770 Phosphate Laser Glass

For High Energy Applications

Neodymium Laser Properties	
Emission Peak, λ [nm]	1052.7
Emission Width, $\Delta\lambda_{em}$ [nm]	25.4
Radiative Lifetime, τ_{Rad} [µsec]	350
Emission Cross Section, σ_{em} [10^{-20} cm^2]	3.9
*Quenching Constant-Zero Concentration Lifetime, τ_o [µsec]	372
*Quenching Constant-Q Factor, Q [10^{20} cm^{-3}]	8.8

*Lifetime as a function of neodymium content is approximated by: $T=T_o/(1+(Nd/Q)^2)$, Nd=Nd concentration in 10^{20} ions/cm^3

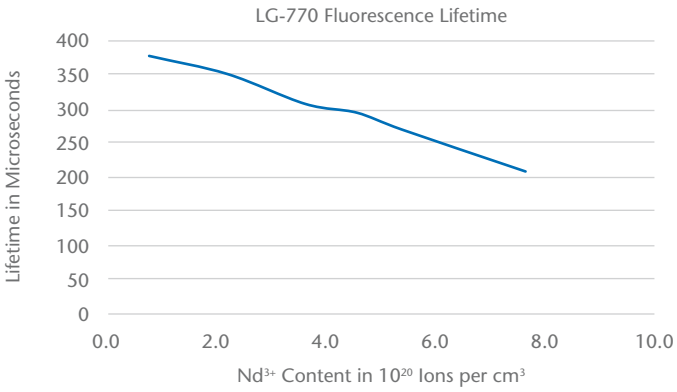
Optical Properties	
n_d	1.5086
v_d	68.40
$n_{633\ nm}$	1.5070
$n_{1054\ nm}$	1.4996
Nonlinear Refractive Index at 1054 nm, n_2 [10^{-13} esu]	1.02
Stress-Optic Coefficient, K (588 nm, 22°C) [10^{-6} mm^2/N]	2.10
Stress-Optic Coefficient, $-K_{par}$ (632.8 nm, 25°C) [10^{-6} mm^2/N]	2.20
Stress-Optic Coefficient, $-K_{per}$ (632.8 nm, 25°C) [10^{-6} mm^2/N]	3.90
Temperature Coefficient of Refractive Index, dn/dT_{rel} (1060 nm, 20-40° C) [10^{-6}/° C]	–4.7
Temperature Coefficient of Optical Pathlength, $W = \alpha_{20-40°C}$ (n-1) + dn/dT [10^{-6}/°C]	1.1

Sellmeier Coefficients			
B1	1.03692728	C1	0.00577291
B2	0.21105327	C2	0.01976189
B3	0.77362466	C3	101.422203

Attenuation Coefficient [cm^{-1}]			
400 nm	≤ 0.20	3000 nm	≤ 0.80
1054 nm	≤ 0.0015	3333 nm	≤ 2.00

Chemical Properties	
Weight Loss in 50°C Water [mg/(cm^2•day)]	0.040
Acid Resistance SR pH = 0.3 at 25°C	3.0
Alkali Resistance AR pH = 12 at 50°C	4.0
Staining Resistance FR pH = 4.6 100h at 25°C	0
Climatic Resistance CR Water Vapor at 40–50°C for 30 h	3

LG-770 is an aluminum-phosphate based glass with a high cross section for stimulated emission, extremely low non-linear refractive index, and good athermal characteristics. This glass was initially developed for the US DOE National Ignition Facility and French CEA Project Laser Megajoule. The development and the advantages of this glass are discussed in "Laser and thermo-physical properties of Nd-doped phosphate glasses" Proc SPIE, Vol 1761, 162-173 (1992).



Physical Properties	
Density, ρ [g/cm^3]	2.585
Thermal Conductivity (25°C), κ [W/m•K]	0.57
Thermal Conductivity (90°C), κ [W/m•K]	0.63
Young's Modulus, E [GPa]	47.29
Poisson's Ratio, ν	0.253
Fracture Toughness, K_{1c} [$MPa•m^{1/2}$]	0.48
Knoop Hardness, $HK_{0.1/20}$	330
Heat Capacity (25°C), C_p [J/g°C]	0.77
Thermal Diffusivity (25°C), σ [10^{-7} m^2/sec]	2.86
Thermal Expansion, $\alpha_{20-300°C}$ [10^{-7}/°C]	133.6
Thermal Expansion, $\alpha_{20-40°C}$ [10^{-7}/°C]	116.1
Transformation Temperature, T_g [°C]	461

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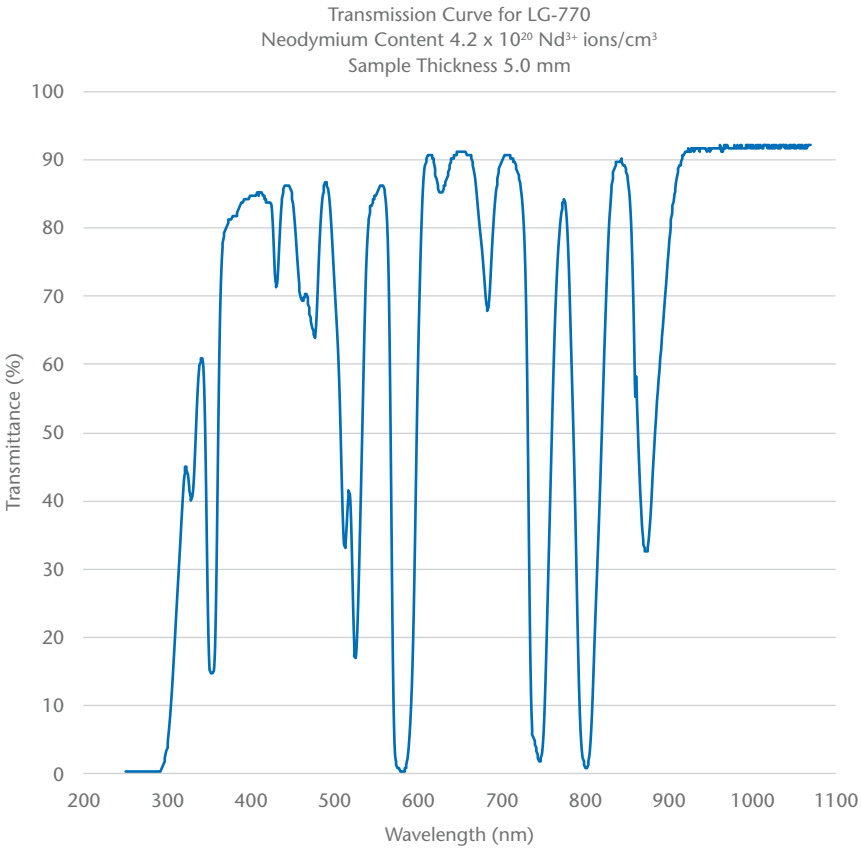

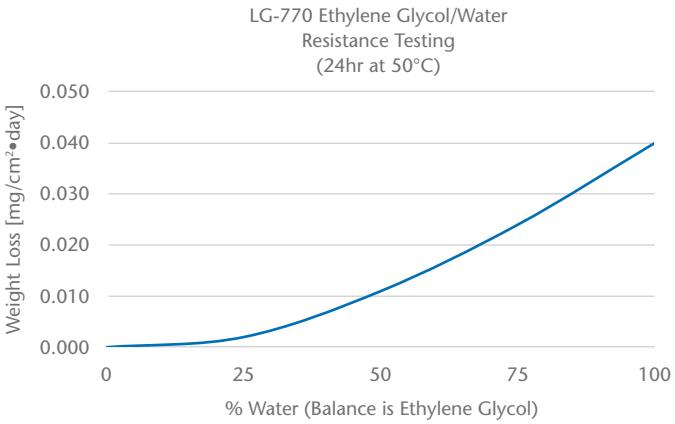

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