

APG-1 Phosphate Laser Glass

For High Power Applications

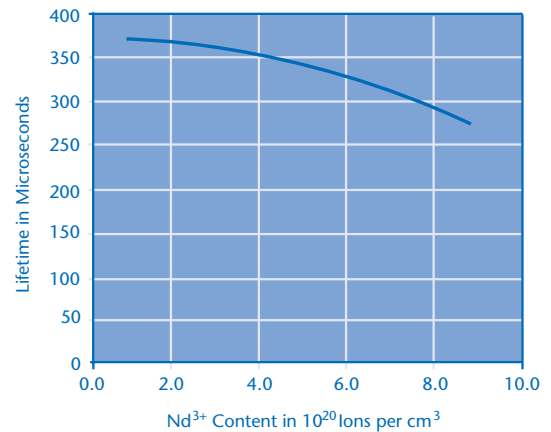
Neodymium Laser Properties	
Emission Peak, λ [nm]	1053.9
Emission Width, $\Delta\lambda_{em}$ [nm]	27.8
Radiative Lifetime τ_{Rad} [μ sec]	361
Emission Cross Section σ_{em} [$10^{-20}cm^2$]	3.4
*Quenching Constant-Zero Concentration Lifetime, τ_0 [μ sec]	370
*Quenching Constant-Q Factor, Q [$10^{20}cm^{-3}$]	16.7

*Lifetime as a function of neodymium content is approximated by: $T = \tau_0 / (1 + (Nd/Q)^2)$,
Nd = Nd concentration in 10^{20} ions/cm³

Optical Properties			
n_d			1.5370
v_d			67.70
n_{633nm}			1.5350
n_{1054nm}			1.5260
Nonlinear Refractive Index at 1054nm, n_2 [10^{-13} esu]			1.13
Stress-Optic Coefficient, K (588nm, 22°C)[$10^{-6}mm^2/N$]			2.20
Stress-Optic Coefficient, $-K_{par}$ (632.8nm, 25°C)[$10^{-6}mm^2/N$]			1.00
Stress-Optic Coefficient, $-K_{per}$ (632.8nm, 25°C)[$10^{-6}mm^2/N$]			3.10
Temperature Coefficient of Refractive Index, dn/dT_{rel} (1060nm, 20-40°C) [$10^{-6}/^\circ C$]			1.2
Temperature Coefficient of Optical Pathlength, $W = \alpha_{20-40^\circ C}(n-1) + dn/dT$ [$10^{-6}/^\circ C$]			5.2
Sellmeier Coefficients			
B1	1.01260752	C1	0.01079807
B2	0.32028946	C2	0.00000000
B3	1.02870062	C3	107.148538
Attenuation Coefficient [cm^{-1}]			
400nm	≤ 0.20	3000nm	≤ 0.80
1054nm	≤ 0.0015	3333nm	≤ 2.00

APG-1 is an advanced phosphate laser glass developed to offer thermo-mechanical properties desirable in the active material of high repetition rate laser systems. APG-1 is an aluminum-phosphate based glass initially developed for the US DOE High Average Power laser program. The development and the advantages of this glass are discussed in "Advances in glasses for high average power laser systems" Proc SPIE, Vol 1021, 36-41 (1988).

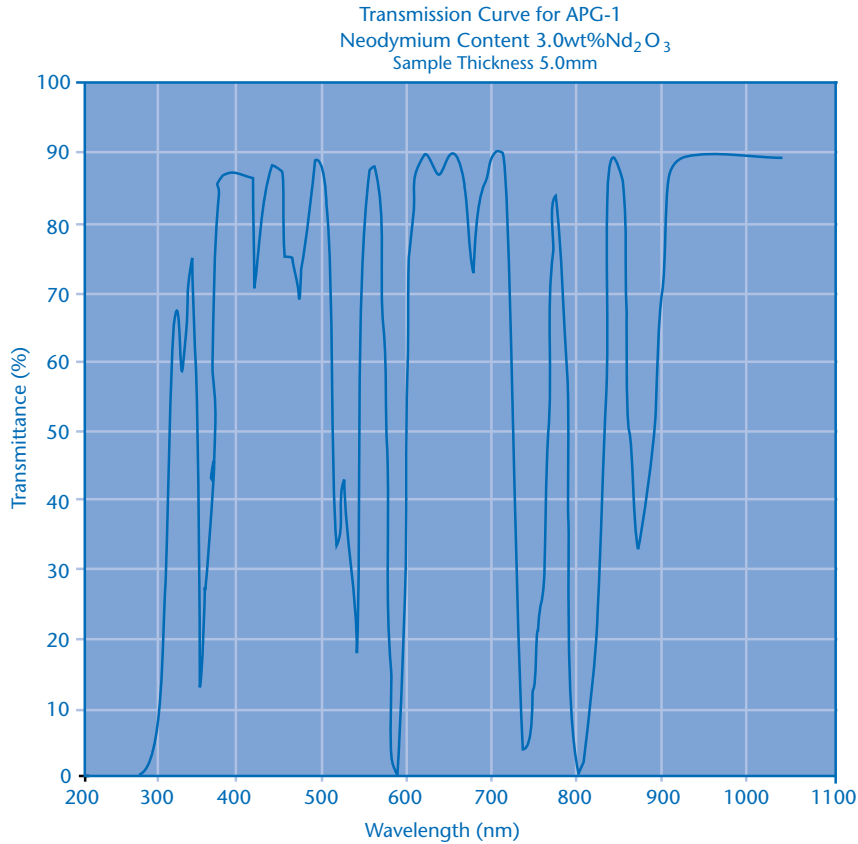
APG-1 Fluorescence Lifetime



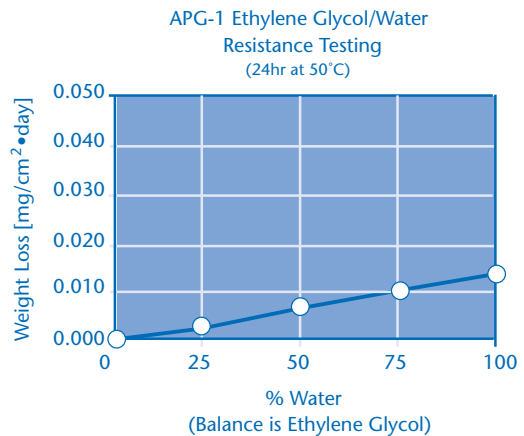
Physical Properties	
Density, ρ [g/cm ³]	2.633
Thermal Conductivity (25°C), K [W/m•K]	0.78
Thermal Conductivity (90°C), K [W/m•K]	0.83
Young's Modulus, E [GPa]	70.00
Poisson's Ratio, ν	0.238
Fracture Toughness, K_{Ic} [MPa•m ^{1/2}]	0.61
Knoop Hardness, $HK_{0.1/20}$	450
Heat Capacity (25°C), C_p [J/g°C]	0.84
Thermal Diffusivity (25°C), σ [$10^{-7}m^2/sec$]	3.54
Thermal Expansion, $\alpha_{20-300^\circ C}$ [$10^{-7}/^\circ C$]	99.6
Thermal Expansion, $\alpha_{20-40^\circ C}$ [$10^{-7}/^\circ C$]	76.0
Transformation Temperature, T_g [°C]	450

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Chemical Properties	
Weight Loss in 50°C Water [mg/(cm ² •day)]	0.006
Acid Resistance SR pH=0.3 at 25°C	3.3
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	1



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