

APG-2 Phosphate Laser Glass

For High Power Applications

Neodymium Laser Properties	
Emission Peak, λ [nm]	1054.6
Emission Width, $\Delta\lambda_{em}$ [nm]	31.5
Radiative Lifetime τ_{Rad} [μ sec]	456
Emission Cross Section σ_{em} [$10^{-20}cm^2$]	2.4
*Quenching Constant-Zero Concentration Lifetime, T_0 [μ sec]	464
*Quenching Constant-Q Factor, Q [$10^{20}cm^{-3}$]	10.6

*Lifetime as a function of neodymium content is approximated by: $T=T_0/(1+(Nd/Q)^2)$,
Nd=Nd concentration in 10^{20} ions/cm³

Optical Properties			
n_d			1.5127
v_d			66.90
n_{633nm}			1.5111
n_{1054nm}			1.5032
Nonlinear Refractive Index at 1054nm, n_2 [10^{-13} esu]			1.06
Stress-Optic Coefficient, K (588nm, 22°C)[$10^{-6}mm^2/N$]			2.82
Stress-Optic Coefficient, $-K_{par}$ (632.8nm, 25°C)[$10^{-6}mm^2/N$]			0.90
Stress-Optic Coefficient, $-K_{per}$ (632.8nm, 25°C)[$10^{-6}mm^2/N$]			3.50
Temperature Coefficient of Refractive Index, dn/dT_{rel} (1060nm, 20-40°C) [$10^{-6}/^\circ C$]			3.4
Temperature Coefficient of Optical Pathlength, $W=\alpha_{20-40^\circ C}(n-1)+dn/dT$ [$10^{-6}/^\circ C$]			6.0
Sellmeier Coefficients			
B1	0.48185842	C1	0.00118494
B2	0.77833079	C2	0.01258472
B3	0.92495196	C3	103.238954
Attenuation Coefficient [cm^{-1}]			
400nm	≤ 0.20	3000nm	≤ 0.80
1054nm	≤ 0.0015	3333nm	≤ 2.00

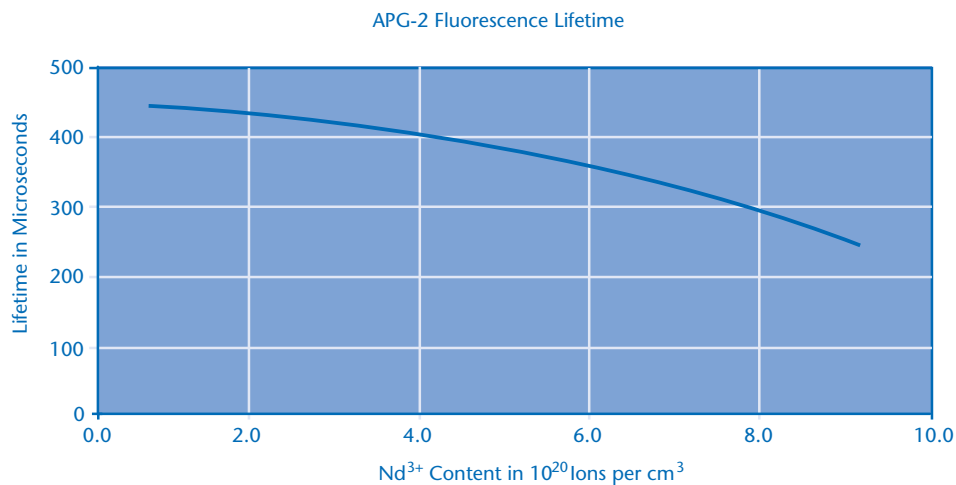
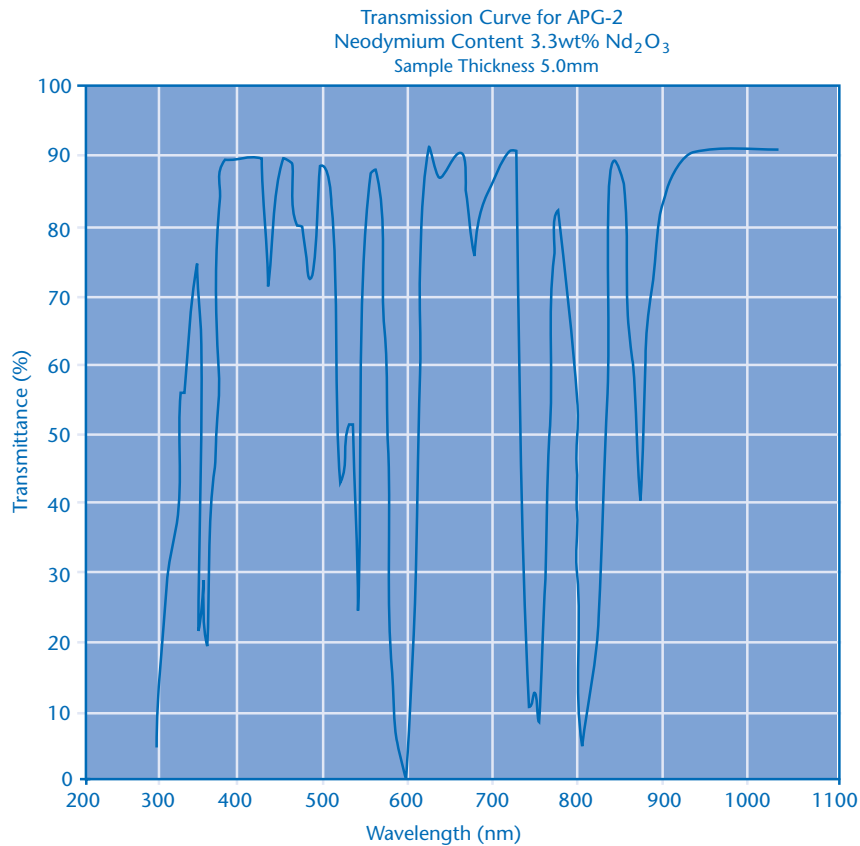
APG-2 is an advanced phosphate glass developed to offer thermo-mechanical properties superior to any commercially available phosphate laser glass. APG-2 offers a long low-concentration emission lifetime and a large gain bandwidth, properties attractive for laser designs limited by amplified stimulated emission and/or intended for utilization as broadband oscillators and ultrashort pulse laser sources. This glass is discussed in "Laser properties of a new average-power Nd-doped phosphate glass" Appl. Phys. B 61, 257-266 (1997).

Physical Properties	
Density, ρ [g/cm ³]	2.559
Thermal Conductivity (25°C), K [W/m•K]	0.80
Thermal Conductivity (90°C), K [W/m•K]	0.84
Young's Modulus, E [GPa]	63.81
Poisson's Ratio, ν	0.225
Fracture Toughness, K_{Ic} [MPa•m ^{1/2}]	0.64
Knoop Hardness, $HK_{0.1/20}$	420
Heat Capacity (25°C), C_p [J/g•°C]	0.77
Thermal Diffusivity (25°C), σ [$10^{-7}m^2/sec$]	4.06
Thermal Expansion, $\alpha_{20-300^\circ C}$ [$10^{-7}/^\circ C$]	62.6
Thermal Expansion, $\alpha_{20-40^\circ C}$ [$10^{-7}/^\circ C$]	50.7
Transformation Temperature, T_g [°C]	540

Chemical Properties	
Weight Loss in 50°C Water [mg/(cm ² •day)]	0.007
Acid Resistance SR pH=0.3 at 25°C	0.0
Alkali Resistance AR pH=12 at 50°C	3.3
Staining Resistance FR pH=4.6 100h at 25°C	3
Climatic Resistance CR Water Vapor at 40-50°C for 30 h	1

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