

# APG-2 Phosphate Laser Glass

For High Power Applications

Neodymium Laser Properties	
Emission Peak, $\lambda$ [nm]	1054.6
Emission Width, $\Delta\lambda_{em}$ [nm]	31.5
Radiative Lifetime $\tau_{Rad}$ [ $\mu$ sec]	456
Emission Cross Section $\sigma_{em}$ [ $10^{-20}cm^2$ ]	2.4
*Quenching Constant-Zero Concentration Lifetime, $T_0$ [ $\mu$ sec]	428
*Quenching Constant-Q Factor, Q [ $10^{20}cm^{-3}$ ]	5.8

\*Lifetime as a function of neodymium content is approximated by:  $T=T_0/(1+(Nd/Q)^2)$ ,  
Nd=Nd concentration in  $10^{20}$  ions/cm<sup>3</sup>

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	$\leq 0.20$	3000nm	$\leq 0.80$
1054nm	$\leq 0.0015$	3333nm	$\leq 2.00$

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).

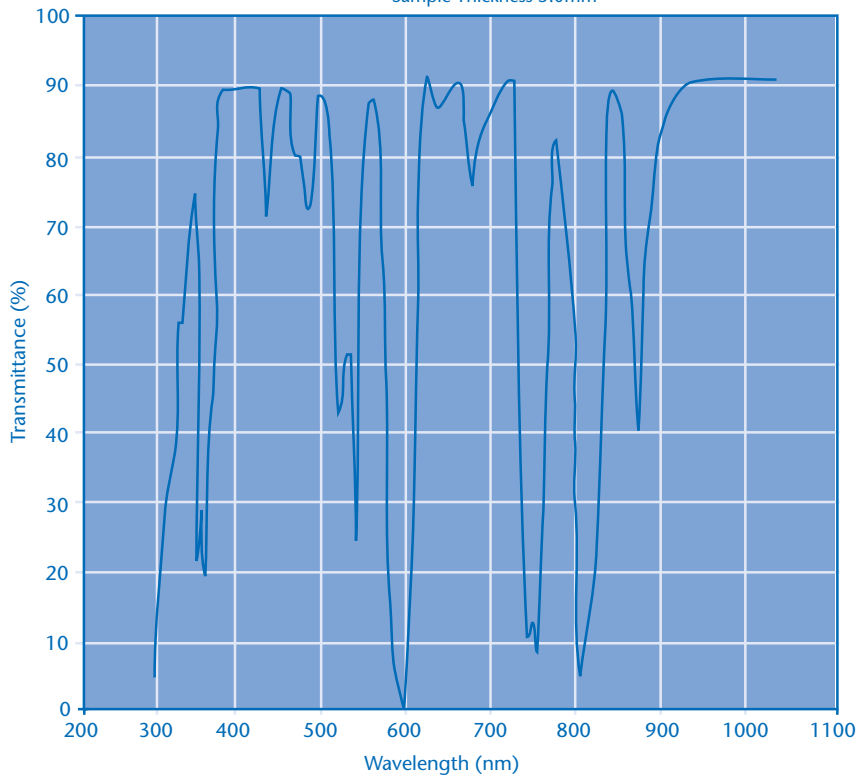
Physical Properties	
Density, $\rho$ [g/cm <sup>3</sup> ]	2.559
Thermal Conductivity (25°C), K [W/m•K]	0.80
Thermal Conductivity (90°C), K [W/m•K]	0.84
Young's Modulus, E [GPa]	63.81
Poisson's Ratio, $\nu$	0.225
Fracture Toughness, $K_{Ic}$ [MPa•m <sup>1/2</sup> ]	0.64
Knoop Hardness, $HK_{0.1/20}$	420
Heat Capacity (25°C), $C_p$ [J/g•°C]	0.77
Thermal Diffusivity (25°C), $\sigma$ [ $10^{-7}m^2/sec$ ]	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 <sup>2</sup> •day)]	0.007
Acid Resistance SR pH=0.3 at 25°C	3.0
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

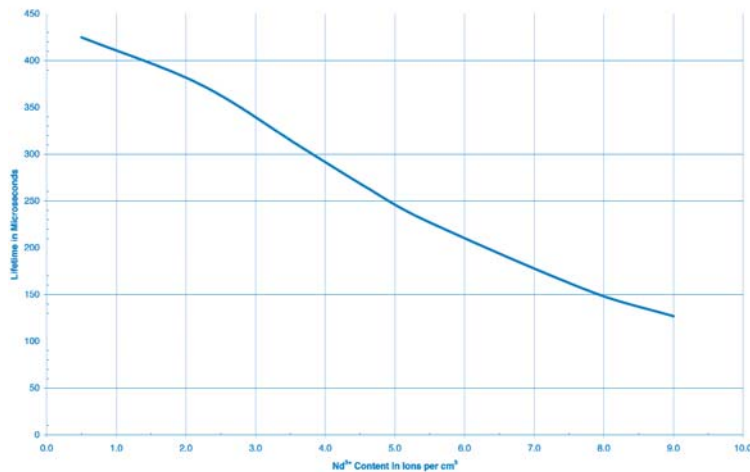
# APG-2 Phosphate Laser Glass

For High Power Applications

Transmission Curve for APG-2  
Neodymium Content 3.3wt% Nd<sub>2</sub>O<sub>3</sub>  
Sample Thickness 5.0mm



APG-2 Fluorescence Lifetime



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