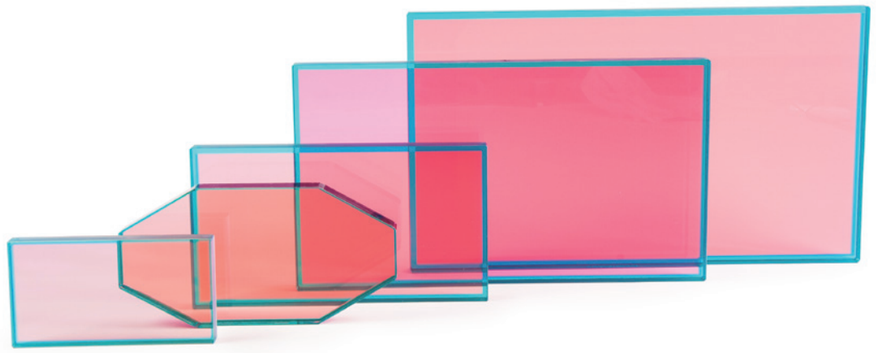
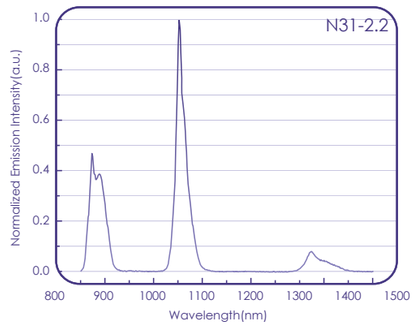
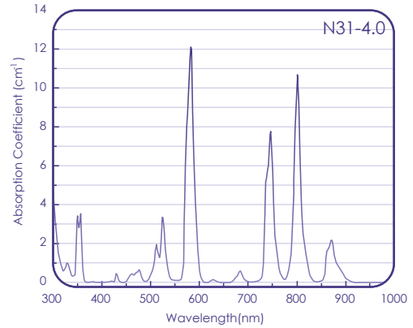
N31 Nd^{3+}-doped phosphate glass for high energy applications



N31 phosphate glass is specially developed for high power laser facility. At present, it has been successfully applied in *Shen Guang Ⅱ* and *Shen Guang Ⅲ* system. Glass slab up to 900mm×500mm×70mm can be produced at SIOM, and is the most popular laser glass in China. More than 1500 pieces of edge Cladding N31 glass with size up to 810mm×460mm×40mm have been used in high power laser facilities in China, and has been applied in several laser facilities in US and Europe.





Laser Specifications	
Nd_2O_3 (wt%)	3.5
Nd^{3+} conc. (10^{20}ions/cm^3)	3.4±0.1
Cross section for stimulated emission ($10^{-20}cm^2$)	3.8±0.1
Lifetime at 1053nm (μsec)	≥370 (Nd_2O_3 : 0.5wt%) ≥360 (Nd_2O_3 : 1.2wt%) ≥315 (Nd_2O_3 : 3.5wt%) ≥310 (Nd_2O_3 : 4.2wt%)
Effective bandwidth(nm)	25.4
Fluorescence peak wavelength(nm)	1053
Absorption coefficient (cm^{-1})	≤0.0015 (1053nm) ≤0.25 (400nm) ≤1.5 (3333nm)
Optical Specifications	
Non-linear refractive index coeff.n_2($\times10^{-13}$e.s.u)	≤1.2
Refractive index (1053nm)	1.535±0.003
Abbe value	65.6
dn/dT (10^{-6}/ºC) (20~100ºC)	-4.3
Thermal Specifications	
Transformation temp.(ºC)	445
Softening temp.(ºC)	485
Coeff.of linear thermal expansion (10^{-7}/K) (30~100ºC)	116
Coeff.of linear thermal expansion (10^{-7}/K) (30~300ºC)	127
Thermal coeff. of optical path length (10^{-6}/K) (50~100ºC)	1.4
Thermal conductivity (25ºC) (W/m K)	0.59
Specific heat (25ºC) (J/g K)	0.75
Chemical Specifications	
D_w (H_2O 98ºC)(mg/(cm^2/day))	0.12
Other Specifications	
Density(g/cm^3)	2.87
Young's modulus (G Pa)	58.3
Posson's ratio	0.26
Knoop hardness (kg/cm^2)	404
Fracture toughness (MPa·$m^{1/2}$)	0.58

*The homogeneity is about 2×10^{-6}