Glass for Laser Applications

SCHOTT offers active and passive laser glasses for high power, ultra-short pulse, laser range finding and medical applications. These materials run the gamut from neodymium-doped laser and special filter glasses for use as active laser medium and diagnostic filters to ultra-stable glass ceramic for laser applications requiring the utmost in precision.

SCHOTT melts these materials at our factory in Duryea, PA in continuous melting tanks and single batch crucibles. SCHOTT also offers custom glass melting services so that you can tailor a glass to a specific application.

Active Glasses

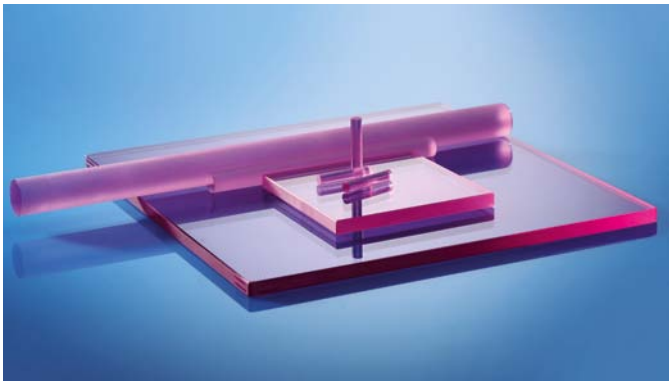
Glass is a uniquely suitable host material for rare earth ions to provide the laser action in optically pumped lasers. SCHOTT has combined wide ranging compositional possibilities of glass with a deep understanding of property control in developing our active laser glass products. The result is a glass tailored to your application, possessing the characteristics needed to excel in high energy, high average power or integrated optics uses.

The innovation doesn't stop there. SCHOTT has long been at the forefront of optical glass manufacturing technology and has met a wide variety of challenges especially for the glass laser industry. Platinum-particle-free melting developed at SCHOTT permits high fluence operation of phosphate laser glass components without laser-induced damage; large volume laser slabs in apertures to 40 cm and in mass quantities enable high energy storage for the inertial confinement fusion program; and zig-zag slabs and large diameter laser rods produced in the highest optical quality and homogeneity help to realize high output powers of materials processing laser systems.

SCHOTT Laser Glass Types

Phosphate Based Laser Glass for High Energy Applications

LG-750, LG-760, LG-770 have been developed to meet the needs of the high energy solid state laser community. All three glasses exhibit high laser cross section, low nonlinear refractive index, and athermal characteristics. All are available in a form free of all metallic platinum particles or other inclusions that can exhibit laser damage.



SCHOTT supplies finished components with high-end polish and coating.

Phosphate Based Laser Glass for High Power and Ultra-Short Pulse Applications

APG-1 is a phosphate glass with enhanced thermal mechanical properties desirable in high average power applications. The broad emission bandwidth of this material has been utilized in femtosecond regime laser systems. The lower gain cross section and long low concentration emission lifetime have made this glass of interest in applications limited by amplified stimulated emission and/or intended for excitation by diode lasers.

´Eye-Safe´ Laser Glasses

The **LG-940** is an Erbium – Ytterbium – Chromium – Cerium doped phosphate based laser glass used in flashlamp pumped and diode pumped solid-state laser systems. Phosphate glasses generally offer higher solubility of rare earth dopants, thus the amount of active ions can be significantly increased.

SCHOTT
glass made of ideas

Silicate Based Laser Glass

LG-680 is the classic laser glass that features a high cross section, high ultraviolet transmission, and high resistance to solarization. This glass is commonly employed in high repetition rate solid state laser systems.

Active Glass for Integrated Optic Applications

IOG-1 and IOG-10 were developed specifically for compatibility with known sodium ion exchange technologies for fabrication of active guided wave structures. These glasses have particularly found applications with such rare earth ions as erbium, ytterbium, praseodymium, and their combinations.

Laser Glass Codes

SCHOTT production laser glass codes indicate the type of host glass and, in the case of neodymium, the active rare earth ion concentration. For example, LG-770-4.2 refers to a phosphate glass doped with 4.2×10^{20} Nd^{3+}ions/cm^3, and LG-770-2 % denotes the same glass doped with 2 wt % Nd_2O_3. The number of ions per cm^3 can easily be converted to the Nd_2O_3 weight percentage (and vice versa) by using the following formulas:

Nd_2O_3 [wt %] = 1/F x Nd^{3+} ion concentration [10^{20} ions/cm^3]

Nd^{3+} ion concentration [10^{20} ions/cm^3] = F x Nd_2O_3 [wt %]

Where the value of F is as follows for the common laser glasses:

Glass Type	Value of F	Glass Type	Value of F
LG-680	0.91	APG-1	0.94
LG-750	1.01	IOG-1	0.98
LG-760	0.93	IOG-10	0.97
LG-770	0.92		

Passive Glasses

Laser Cavity Materials

SCHOTT offers different materials for use as laser pumping cavity filters. They absorb undesired pumping light in the UV and IR, preventing solarization of the laser glass. By absorbing the Nd laser light these filters reduce amplified spontaneous emission and eliminate parasitic oscillation, thereby increasing lasing efficiencies and powers. They are used in many configurations: flat plates, close fitting cylindrical sleeves, cylindrical water jackets, etc. These materials can be chemically strengthened to increase their mechanical strength and thermal shock resistance fourfold.

S7010N and S7005 samarium-doped glasses block the 1.06 (um wavelength and UV pump light from neodymium lasing elements, such as Nd: YAG or Nd:glass rods and slabs. Two samarium-doped silicate glasses are offered. S7010N (10 % doping) is recommended for most applications, while S7005 (5 % doping) is usually reserved for elements thicker than 6 mm.

S7000, a clear, cerium-doped silicate glass, is also available to serve as a UV cut-off material.

ZERODUR®

ZERODUR® is a glass ceramic that was developed by the SCHOTT research laboratories for applications calling for a near-zero coefficient of thermal expansion over a fairly wide temperature range. It is a homogeneous material that exhibits practically no measurable variations in its thermal and mechanical properties. It possesses exceptional long-term dimensional stability. Because ZERODUR® is transparent, its internal quality can be measured to meet your specifications.

Contract Melting

SCHOTT North America recognizes that the needs of laser customers are not limited to available glasses. For this reason we maintain a program of custom test melting on a contract basis. In this way we can provide you with glass samples suitable for characterization of optical, physical, and laser properties, as well as for fabrication of small optics and devices. This allows you to take advantage of our vast glass knowledge, or, if you prefer, to have us melt your glass composition.

High-End Component Manufacture

All components are manufactured per customers' specifications and can be polished up to λ/10 flatness. SCHOTT also provides an anti-reflection or high-reflection coating with a laser induced damage threshold > 1.5 GW/cm^2.

Quality Assurance

Quality control is based on statistical process control, as well as on rigorous final inspection of the finished component. Glass properties are measured for every melt. Measurement instruments include a broad range of interferometers, spectrophotometers, physical property test systems, vision systems, and a laser test bed.

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