

Newsletter

Advanced Solutions for Optics, Lithography & Science !

SCHOTT
glass made of ideas

Vol. VI, No. 2, June 2010

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New "design-to-application" glass products from SCHOTT

We have added the following low transformation temperature (T_g) optical glasses to our portfolio: P-SF68, P-SK58A, P-SK60, P-LAK35, P-LASF50 und P-LASF51.

These products were developed on request of our customers and partners that manufacture miniaturized-optics solutions in collaboration with us. This was part of our concept "design-to-application" meaning that SCHOTT develops raw materials specifically tailored to its customer' requests.

In addition, the above mentioned low T_g glasses were added to our glass portfolio with the preferred supply form as glass rods. According to SCHOTT optical glass rod sales manager Marko Ludwig,

"This provides an ideal combination of glass properties and customer-specific products – which is particularly important for the consumer market," and represents a positive addition to the product portfolio which was very well received by the market.

If you are looking for a development partner or would like to find out more about our new glass products, please contact us at info.optics@schott.com.

Rods made of optical glass now also available in squared format

SQUARE RODS FROM SCHOTT!

	nd	vd	ne	ve	PgF
P-LASF51	1.81000	40.93	1.81470	40.68	0.5670
P-LASF50	1.80860	40.46	1.81335	40.22	0.5680
P-SK58A	1.58913	61.15	1.59143	60.93	0.5386
P-SK60	1.61035	57.90	1.61286	57.66	0.5427
P-LAK35	1.69350	53.20	1.69661	52.95	0.5482
P-SF68	2.00520	21.00	2.01643	20.82	0.6392

Values of new glass types added to the portfolio

VISIT US AT:

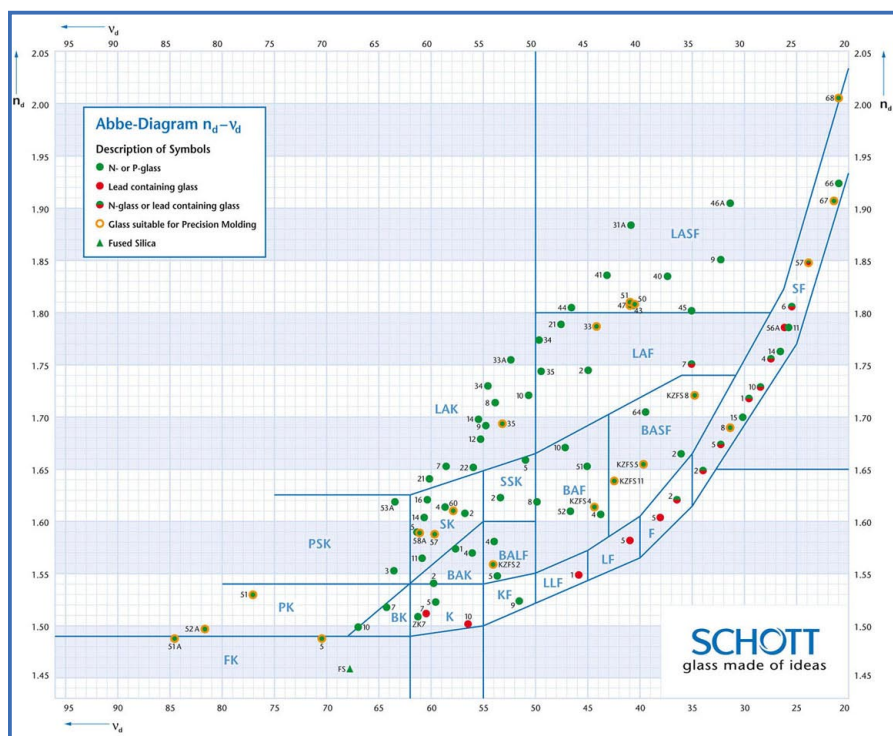
OPTATEC 2010

June 15th - 18th 2010

Frankfurt

Hall 3, Booth D12

"SCHOTT - your partner for excellence in optics"



Abbe Diagram with an overview of all Low Tg glasses from SCHOTT

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N-BK7 with optimized transmission supports the trend of 3D movies

Advanced Optics has developed a variant of our N-BK7 featuring extremely high transmission especially for prisms used in digital projectors. This new product, N-BK7HT, guarantees minimum transmission of 99.6 percent at 400 nm wavelength by a sample size of 25 mm thickness. In the visible spectrum ranging from 400 to 700 nm, the absorption coefficient of our N-BK7HT glass is a magnitude of three lower than our standard N-BK7 product. This substantially reduces heat absorption and the risk of image errors.

Due to our focus on manufacturing highly precise optical components and our continuous ramp up of our processing capabilities, particularly in prism manufacturing, SCHOTT is now in a position not only to make specialized raw glass, but also to offer this material in other forms such as polished and coated prisms with edge lengths ranging up to 200 mm. For smaller dimensions, surfaces with a flatness of up to $\lambda/10$ and a quality of up to 20/10 (Scratch & Dig) can be achieved. In addition, prisms can be coated according to our customer's needs, for example with dichroic or anti-reflective coatings.

Our N-BK7 and N-BK7HT glasses are also suitable for the manufacture of ultra-homogenous optical components that measure up to one meter in diameter. Moreover, the high transparency of N-BK7HT glass makes it ideal for components where light must travel distances of 150 mm and higher in the material, as it is the case with products such as prisms. Since the properties of N-BK7HT glass alter only very slightly, even in the presence of UV radiation, the product is optimal for concentrator photovoltaic applications. For further information about N-BK7 and N-BK7HT glass, contact us.



Prisms from SCHOTT

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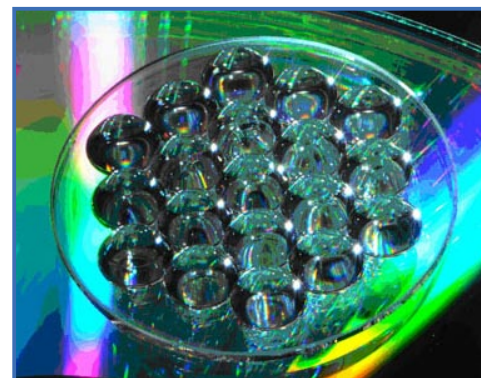
Lens Arrays from SCHOTT - high refractive index aspheres on a small micro-optic to guide light rays

The market for high-brightness Light Emitting Diodes (LED) is expected to grow strongly in the near future. In order to meet the rising demand, suppliers are developing new ways of manufacturing components on a larger scale.

SCHOTT has now patented a precision molding process for producing strips and arrays of mini lenses made of highly refractive glass. Glass types such as P-LaSF47 enable compact light source dimensions with high light throughputs for wavelengths ranging from 350 to 2,000 nm. The manufactured strips hold about 15 high refractive index aspherical lenses and the lens arrays 19 aspherical highly refractive glass lenses with a diameter of 25 mm. Each single lens has a diameter of not more than 5 mm.

With the new arrays and strips, multiple LEDs can be positioned closely together to allow a strong and defined light beam to be formed and a collimation of light from $\pm 90^\circ$ to $\pm 17^\circ$. The lens array can

be made according to customers' needs (e.g. with a wider spacing). Made of glass with high temperature, moisture, and UV light resistance, the precisely shaped lenses enable compact designs of light sources as well as optical systems for applications ranging from medical technology to high power spotlights, such as those used for stage illumination and architectural lighting or even UV applications.



Lens Arrays from SCHOTT with 19 aspherical lenses

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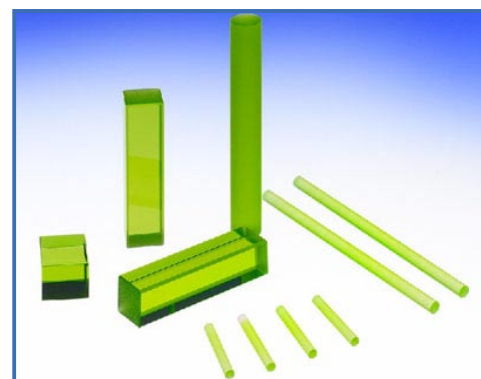
"Eye-safe" laser glass for range finding and medical applications

Operation at 1.5 μm now offered as a fully finished components

SCHOTT has launched its latest phosphate laser glass, the LG-910, an Erbium – Ytterbium – Chromium doped phosphate based laser glass. It lases at 1.5 μm and can be used in flashlamp and diode pumped applications such as laser range finding. Starting with careful control of the purity of our raw materials that go into the composition, and then optimizing the melting and finishing processes, SCHOTT developed a superior product that meets the most demanding specifications in defense systems.

Phosphate glasses are generally more difficult to polish and to coat while securing a high laser damage threshold. SCHOTT has taken on this challenge for you and supplies its laser glass as a fully finished components. The LG-910

components are finished and coated to customer specifications to achieve optimized laser performance. High laser damage thresholds of $>1.5 \text{ GW/cm}^2$ have been achieved to meet the requirements of demanding applications.



Erbium – Ytterbium – Chromium doped Laser Glass from SCHOTT

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SCHOTT now offers cemented or framed filters

Optical filter glass and interference filters now available as cemented filter combination or assembled into a frame

SCHOTT offers more than 50 optical filter glasses for applications such as heat protection filters, IR cut filters for digital cameras, surveillance systems, and for defined attenuation of the light intensity over a broad spectral range.

These optical filter glasses can have an additional interference filter by applying coating technology for steeper filter edges or for filtering out an undesired wavelength range. The DUG11 filter is one example, where an additional interference filter is added onto the UG11 optical filter glass to block the transmission from about 650 nm to 850 nm.

Besides adding an interference filter, SCHOTT is able to provide a combination of optical filter glasses cemented together. One offered cemented optical filter glass combination of OG570 (1mm thickness) and KG3 (1mm thickness) results in a Bandpass filter of 100 nm bandwidth (50% transmission bandwidth). Two other optical filter glass combinations are already available reflecting our customers' needs.

For the selection of the right filter glass types you can contact our trained application team to assist you or use

our optical filter calculation program available on our website. The chosen optical glass filters will then be provided by SCHOTT and can be supplied in a cemented combination. Additionally optical glass filters, optical glass filter combinations, and interference filters (= optical filters) can be supplied with and without a housing (frame). Depending on customer needs SCHOTT assembles the optical filters into frames such as metal or synthetic housings. Typical dimensions range from 7 mm to 30 mm in diameter of the frame.

Contact us to find your right combination!
Info.optics@schott.com



Framed filter as part of our offered filter portfolio

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Chris Cosma Brings a Glacier to Times Square with SCHOTT Glass

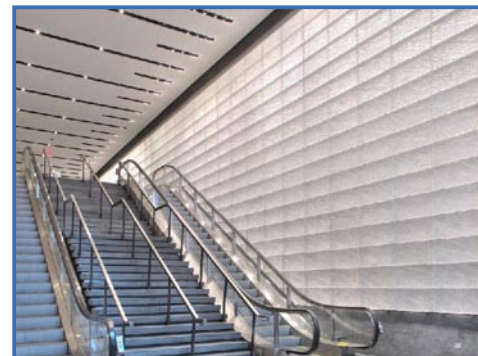
Office buildings in New York are known for being architecturally stunning on the outside, but the lobby at 1515 Broadway holds an architectural surprise on the inside and brings a 4,000 square foot crystal-clear wall of glass right into the heart of midtown. Glass installation artist, Chris Cosma, designed the giant undulating wall, entitled "Aight Embrace," using close to 1,000 textured panels of SCHOTT's LF5 crystal glass.

Cosma created the installation with an eye towards illumination. Aiming to create a "sense of the outdoors" inside a traditional office building, Cosma put a reflective surface behind the glass and used the lighting in front to bounce light and colors from pedestrians' attire in and out of the textured panels, creating an ever-changing visual experience to those passing by the wall. This helps to illuminate not only the installation, but also the surrounding space in a very interesting way.

"Working with SCHOTT glass," the Brooklyn-based Cosma says, "is like being able to do an interior in diamonds. I've

had extensive experience using SCHOTT glass. My main performance criteria for choosing SCHOTT is the color consistency, purity, transmission and uniformity of the glass. It's the finest crystal in the world and I love working with it."

SCHOTT offers customized glass for art and architecture with various surface textures, sizes, shapes, colors and optical characteristics. The company has the capability to melt, fabricate and process glass according to customer requirements.



The wall "Aight Embrace" on Broadway 1515 made of glass from SCHOTT

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“Coating Competence Center” gets into shape

Transfer of the INTERVAC to Yverdon was completed at the end of May

We would like to give you an update on the current status of the establishment of our “Coating Competence Center” of precision engineering optical components in Yverdon.

The transfer of SCHOTT’s Interference Filter vacuum-coating department of the Advanced Optics Segment “Intervac” to Yverdon has been successfully realized and was finished at the end of May. It has been strengthening the coating competences in our site in Yverdon as the “Integrated Competence Center for Optical Components”.

With the transfer of Interference and special filter production to Yverdon we have now broadened the existing know-how and equipment using modern coating technologies, thereby meeting

customer needs more effectively through the synergies created by such a center. Now a continuous production flow from raw material, through substrates to its respective final processing can be realized within one location, thereby presenting important advantages such as proximity and greater flexibility. This will enable faster realization of coatings, an enhancement of the coating characteristics, availability of samples in a faster and simpler way and we will see a continuous extension of the available coatings.

For details please refer to our special newsletter distributed in May 2010. If you would like to receive it, please let us know: info.optics@schott.com



The building in Yverdon

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ISO External Audits Performed in Germany and the US

The basic requirement of running production is to produce quality products both efficiently and effectively. Naturally, the standard for Quality Management within the global operations of the business segment Advanced Optics is the ISO 9001:2008. During the past few months, the segment had 12 days of audits performed by external certification companies. In March, the plant Mainz passed the recertification - integrated with the ISO 14001:2009 for Environmental Management System - and in May the Quality Management System of plant Duryea passed the surveillance audit - both with excellence.

This indicates the high demand of Advanced Optics not only to fulfill the requirements of QM-Standards, but to also include the key elements of the Production System Optics such as 5S, running improvement projects, maintenance concepts, Zero Accidents and Health programs, an innovation

avenue, etc. to advance forward to people and production excellence. Advanced Optics is committed to follow its strategy to live the continuous improvement process - in daily production and daily service to customers.



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SCHOTT: exhibition partner in the German Pavilion at EXPO 2010

SCHOTT solutions are incorporated into Germany's "balancity" Pavilion – a city in balance – at EXPO 2010 in Shanghai. As an international technology company, SCHOTT is committed to fostering a new balance in today's world. For SCHOTT, it has always been more than just glass. SCHOTT continually challenges the limits through innovation and entrepreneurship to develop expert solutions that serve to improve the living and working conditions of people all around the world. SCHOTT has been pursuing this mission for more than 125 years and will continue to do so in the future.

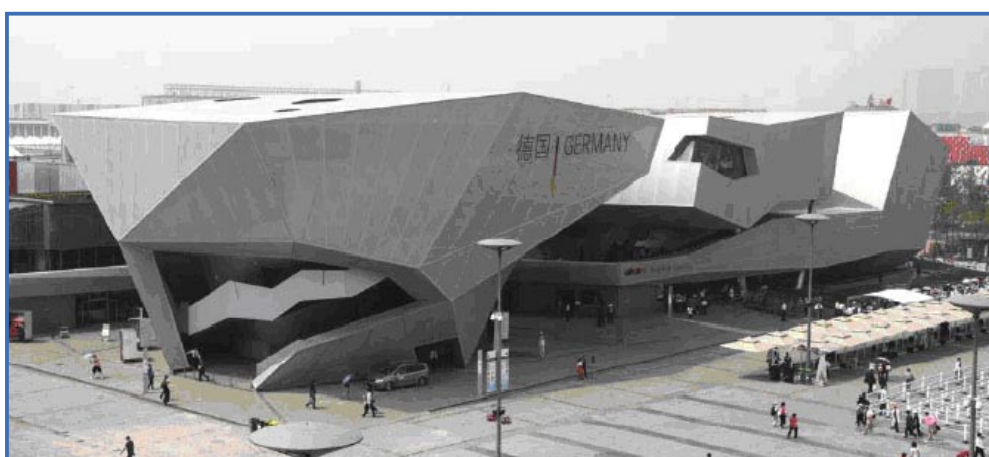
Using experiences gained in the past, the company has developed and implemented new and environmentally-friendly technologies for today and the future. The Optics division made the switch with respect to its lineup of optical glasses already more than 10 years ago by introducing 66 glasses which do not contain neither lead nor arsenic. All of the glasses that have been developed since then are also free of both lead and arsenic. But also the CERAN® glass-ceramic cooktops, without the use of the toxic heavy metals arsenic and antimony, and our solar energy systems are two examples of innovation born on tradition.

The "Factory" as part of the German

Pavillion shows the innovations, products and processes created by German companies and institutions addressing the "Better City, Better Life" EXPO theme. SCHOTT presents its SCHOTT PTR® Receiver for Concentrated Solar Power plants, and building integrated photovoltaic modules made of ASI® THRU BIPV glass as well as ZERODUR® glassceramic with zero thermal expansion for applications in astronomy such as telescopes that enable us to peer into outer space or other areas requiring the highest accuracy.



ZERODUR® presented at the "Factory" within the German pavilion



"balancity" – the German pavilion at EXPO 2010

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SCHOTT Scholarships awarded to University of Arizona Students

On an annual basis SCHOTT's Advanced Optics Business Segment awards a scholarship to undergraduate students who are enrolled in the College of Optical Sciences at the University of Arizona. The goal is to promote scientific and application related research for the optical industry. This year SCHOTT increased the award to two students, Robert Klug and R. Garrett Richards, whom demonstrate an interest and good grades in the fields of optical materials, processing design and manufacturing or closely related fields:

Robert Klug: "I was attracted to optical sciences primarily because of an interest in fiber optic telecommunications and the last mile problem. Working on the challenges of meeting ever-increasing demand for bandwidth, as well as optical switching, sounded intriguing and like a very imminent problem. To that extent, my focus has been heavily biased toward electro-optics, taking many ECE courses in addition to normal optics coursework. I'm thankful for receiving the SCHOTT scholarship which helps with the cost of education."

R. Garrett Richards: "I hadn't considered optical sciences until after I became a student at the "U of A" when I read a newsletter that highlighted the key aspects of the field (lasers, fiber optics, etc.) I grew curious and found out how massively influential optics really is in our lives. My academic focus in optical sciences is opto-mechanics and I'm particularly interested in the design of lens systems, stress tolerancing, and general real-world applications. I really appreciate being recognized by SCHOTT for all my efforts."

The renowned College of Optical Sciences at the University of Arizona is the world's premier institute for optics education offering undergraduate and advanced degrees. The notable faculty are pre-eminent in their respective fields and challenge the international student body in both the classroom and laboratory. As with SCHOTT, the students and faculty enjoy collaborative and mutually beneficial relationships with the optics industry. During the scholarship award ceremony the importance of the support received by the forward thinking corporation with SCHOTT was recognized due to its positive impact to the lives of students and ultimately to the optics industry.



R. Garrett Richards and Robert Klug – the two scholars

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Advanced Optics at OPTATEC

SCHOTT
professionals
supporting
conferences in
Germany and the US

“OPTATEC – The International Trade Fair for future optical technologies, components, systems and manufacturing” – will be held this coming June 15 - 18,

in Frankfurt, Germany. The overarching theme of this year’s OPTATEC will be “Meet the future of optics”.

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Experts from our Advanced Optics department are eminent contributors at SPIE’s Astronomical Instrumentation Exhibition & Conference and ESTO, the ESO Symposium on Trends in Optical Technologies

Thursday, July 1st, 6:00 – 7:30 pm – Poster 7739-118

Lightweight high-performance 1-4 meter class space borne mirrors: emerging technology for demanding space borne requirements

Session 3, Sunday, June 27th, 4:00 - 6:00 pm
Materials/Metrology will be chaired by Dr. Peter Hartmann from SCHOTT AG with the following papers presented by SCHOTT professionals

Modeling of the thermal expansion behavior of ZERODUR® at arbitrary temperature profiles (Paper 7739-16)

Manufacturing of the ZERODUR® 1.5 m primary mirror blank for the solar telescope GREGOR as preparation of the light weighting of blanks up to 4 m diameter (Paper 7739-20)

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ESTO, June 15th – 18th, 2010, Frankfurt, parallel to OPTATEC

Wednesday, June 16th, 2:30 – 3:00 pm
Optical glass standardization – status and outlook

Thursday, June 17th, 10:15 – 10:45 am
Glass and glass ceramics for challenging optics

Thursday, June 17th, 10:45 – 10:15 am
Zero expansion glass ceramics for space applications: strength and design rules

SPIE Astro Show, June 29th – July 1st, 2010, San Diego, CA

Sunday, June 27th, 6:00 – 7:30 pm
– Poster 7731-143

ZERODUR® 8 m Mirror for Space Telescope

Upcoming Events

Here you can find the list of the events where “Advanced Optics” proactively attends as an exhibitor, speaker or has an active part such as “chair of technical conferences,” etc.

OPTATEC, June 15th – 18th, 2010, Frankfurt, Germany, Hall 3, Booth D12

SPIE Astronomical Instrumentation, June 29th – July 1st, 2010, San Diego, CA

SPIE Optics & Photonics, August 3rd – 5th, 2010, San Diego, CA

CIOE International Optoelectronic Expo, September 6th – 9th, 2010, Shenzhen, China

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