

Newsletter

SCHOTT Advanced Optics

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40th anniversary of an outstanding material

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Happy birthday ZERODUR®

40th anniversary of an outstanding material

It is now 40 years ago, when in 1968 SCHOTT's famous glass ceramic ZERODUR® was developed by a committed glass developer. Ever since, ZERODUR® has been providing the basis for precise measurements.

As early as 1973, the first four-meter class monolith was poured for a telescope of the Max Planck Observatory in Calar Alto, Spain. Then the NTT (New Technology Telescope) at the European Southern Observatory ESO in La Silla, Chile was installed in 1989 as the first telescope that uses a thin actively bendable mirror made of ZERODUR®. But with the VLT (Very Large Telescope) operated by ESO in the Atacama Desert in Chile, for which SCHOTT supplied four mirror substrates 8.2 meters in diameter, the reasonable limitations with respect to monolithic mirrors for use in astronomy had definitely been reached. The rising demand for even larger mirrors led to the development of segmented mirrors consisting of hexagonal mirror segments. Here, the two Keck Telescopes operating since 1992 and 1996 in Hawaii with two 10-meter mirrors each consisting of 36 ZERODUR® segments were major breakthroughs.

In the near future, two major projects are planned that call for even considerably larger diameters. The TMT (Thirty Meter Telescope) in the United States is to receive a mirror with a diameter of 30 meters that consists of approx. 500 mirror segments. The European Extremely Large Telescope (E-ELT) planned by ESO for the year 2017 is expected to have a mirror 42 meters in diameter that consists of more than 900 hexagonal segments. This would make the E-ELT the world's largest optical telescope.



One of the earliest 4 meter ZERODUR® meltings in the beginning of the 70's. Since then equipment and processes have been modified significantly to meet the market's requirements.

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glass made of ideas

Besides the impressive projects in the field of astronomy enabled by ZERODUR®, this glass ceramic is also particularly well-suited for use in industrial applications that need extremely high precision such as standards in measurement technology, in ring laser gyroscopes, but also as precision components in microlithography and LCD lithography. The material is used as movable elements in wafer steppers or scanners to obtain exact and reproducible positioning of the wafers and therefore functions as the “enabler” of the production of the designs of tomorrow’s microchips. In the field of LCD lithography as the “macrolithography”, ZERODUR® also is a key material being used for the larger optical systems and masks, securing the projection

of exact structures in the micron range.

ZERODUR® is one of the key products of SCHOTT and in particular for its Unit “Advanced Optics”. To have a broader recognition of this material and to celebrate its 40th anniversary we will start an individual “News Flash” in English about this topic, which will be sent to relevant people. If you are interested in receiving this “News Flash”, please send an email to: optics.newsletter@us.schott.com.

Besides a publication named “Special SOLUTIONS”, a special issue of the customer magazine “SCHOTT Solutions”, will be available describing the milestones in the successful history of ZERODUR®.

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SCHOTT hosts Experts Workshop at SPIE Optics & Photonics

“Optical Glass News”
by Dr. Bernhard Hladik,
Product Manager Optical
Glass, SCHOTT AG

For the second consecutive year, SCHOTT hosted a workshop during SPIE Optics & Photonics 2008. Over 30 guests attended a

luncheon followed by presentations from some of SCHOTT’s experts including:

Today’s driving markets of optical glass have to consider the well established trends for further miniaturization for higher light efficiency, for increasing performance of optical systems and for meeting established environmental regulations. Dr. Hladik’s presentation described how those trends have been considered in the glass development process to achieve high refractive index glasses, glasses with high transmission in the blue area, low dispersion glasses, glasses with anomalous partial dispersion behavior and glasses with low transformation temperatures (so-called low T_g glasses). His

presentation also gave an overview of which focal areas are considered for the development of optical glasses in the future.



Dr. Bernhard Hladik presenting an overview of optical glass trends

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“UV to Visible and Now Beyond: IR Materials from SCHOTT” by Ed Hart, Product Manager IR Material, SCHOTT North America, Inc.

SCHOTT has over 120 years of experience developing optical glasses and optical glass manufacturing techniques. Additionally, SCHOTT has developed these capabilities at facilities located around the world. While SCHOTT offers a broad portfolio of materials and components spanning from the UV to the Visible, they stopped at the Near-Infrared part of the spectrum. SCHOTT has decided to continue its innovative approach and sees strong potential in being the only leading optical manufacturer with a portfolio from the UV to IR. A new business model, currently in the approval process, positions SCHOTT to be the supplier capable of being a single source for today’s multi-spectral applications through adding IR materials. SCHOTT’s experience can then be

applied to assist our customers in optimizing their material selection for multi-spectral applications. This broadened portfolio of materials from SCHOTT is provided to our customers at the quality level they have come to expect from SCHOTT. The recent addition of IR materials includes a family of 5 chalcogenide glasses and both grades of ZnS (FLIR and CLEAR).



Ed Hart during his presentation on IR material

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“Calcium Fluoride and Fused Silica LITHOSIL® for High Performance Laser Applications” by Dr. Gordon von der Goenna, Product Manager Optical Materials, SCHOTT Lithotec

In his presentation, Dr. Goenna stated, “Besides Moore’s law, lowering the Cost of Ownership of a chip fab is the driving force of the Litho market. Downtime due to exchange of optical subsystems must decrease with every new generation of Litho lasers. For material manufacturers, this means developing optical materials with a higher durability to laser irradiation of further increasing power.”

His presentation also described how Calcium Fluoride and Fused Silica LITHOSIL® are made and characterized to meet the customers’ needs today and in the future. A multi-level damage model for Fused Silica LITHOSIL® and a system for the laser durability qualification of Calcium Fluoride were introduced.



Dr. Gordon von der Goenna – an expert for Calcium Fluoride and Fused Silica LITHOSIL®

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SCHOTT hosts Senator Barack Obama

Senator Obama praises SCHOTT for being cutting-edge employer

On Friday, September 5th, SCHOTT's Advanced Optics site in Duryea, Pennsylvania was visited by U.S. Senator and Presidential candidate, Barack Obama. The stop was part of a tour of eastern Pennsylvania, a key battleground state for November's U.S. presidential election.

During his visit, the Senator met with several SCHOTT employees, including Dr. Gerald J. Fine, President of SCHOTT North America, and Stephen Krenitsky, Vice President and Site Manager of Advanced Optics in Duryea, PA. In total, Senator Obama spent approximately four hours at the site where he held a "town hall" style meeting in front of approximately 200 guests and toured the site. During his speech, which was broadcast live on the National news network, CNN, Senator Obama praised SCHOTT for being a cutting-edge company involved

in industries that were important for America, and for the "great manufacturing work that is being done." "The visit of Senator Obama was an exciting experience and strongly underlines the importance of SCHOTT in Duryea as being the last melting facility of optical glass in the US." comments Dr. Marita Paasch, Vice President of the Business Segment Advanced Optics.



Barack Obama with employees from SCHOTT in Duryea and representatives of other SCHOTT locations in the US

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SCHOTT adding capacity due to customer demand for components and constantly upgrading its customer service

SCHOTT Advanced Optics has a global network of employees and facilities in Europe, the USA, and Asia developing and producing a multitude of different products for your worldwide needs. While each location has its special areas

of focus, one thing is consistent everywhere: the determination to continuously challenge ourselves to exceed expectations. Here you will find a selection of what has been done recently in the various regions:

SCHOTT in Yverdon adds capacity in double-sided polishing

At SCHOTT's production site in Yverdon, Switzerland the competence center for high end components received this August another 2 meter diameter double-sided polishing machine, enhancing further its lapping and polishing capabilities.

In Yverdon SCHOTT produces plane-parallel polished glasses out of optical materials, Fused Silica, ZERODUR®, filter glass, etc. in sizes up to 680 mm diameter, with very good flatness and roughness values. Minimal thicknesses can go down to 0.1 mm, depending on substrate size. Other customer-specific products include aspherical and cylindrical lenses, CNC machined

precision blanks, as well as sub-assembled parts.

In-house vacuum coating capabilities further answer customer demand for full-service supply.



Delivery of new double-sided polishing machine at SCHOTT in Yverdon

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Increase of capacity in the pressing manufacturing in Malaysia

In July 2008 SCHOTT increased the production capacity for middle weight pressed parts (about 20 g to 120 g) in the re-heat pressing production site in Penang, Malaysia. The new, multiple head press line is especially designed to press middle to big quantities of prism pressings. In addition, this press line can also deal easily with other dimensions. With this new

production line, SCHOTT is able to increase the monthly output capacity of pressed prisms by roughly 200,000 pieces/month.

For supplementation and service to our customers, SCHOTT is also able to offer certain additional process steps like milling and polishing (polishing only for plane optics and prisms) in the same facility.

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New Spectrometer for the Application Center in China

A new measurement technique that was put to use in April 2008 at the SCHOTT Application Center Asia (ACA) in Suzhou, a very important site for R&D work in Asia, now makes it possible to determine optical properties, such as the

index of refraction and dispersion. Customers and partners in China benefit from this professional, fast and precise metrological support for research and development as well as quality assurance.

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Advanced Optics, Duryea, PA, USA facility adds capacity for improved customer service

Our ongoing program to continuously expand capabilities and improve customer service has resulted in recent capacity increases related to 3 key fabrication areas.

A second 2 meter capacity diamond wire saw was added to our bulk glass cutting area. This will allow a faster reduction of glass castings and blocks to sizes required by our markets. This additional capacity allows a wider range of inventory geometries to be quickly processed into sizes ready for finish machining.

A Satisloh PR150SL was installed to provide additional capacity for precision milled parts up to

150 mm diagonal to shorten delivery lead times.

Combined with the PR150SL installation a HAAS VF3-SS vertical mill with 5 axis capability was installed to augment existing capacity for precision machined parts.



The HAAS VF3-SS Vertical Mill machine newly installed in Duryea.

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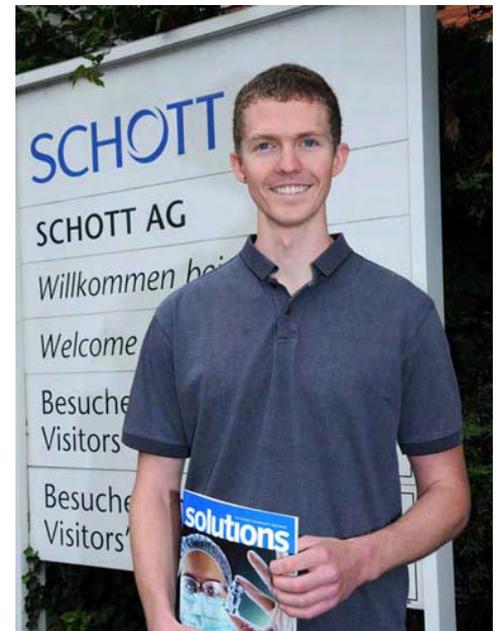
Fostering Youth with Potential

Matthew Schwab, an undergraduate student of Optical Sciences and Engineering, is the first person to receive the SCHOTT Scholarship at the University of Arizona. As a result, he will receive \$3,000 of support for his next year of studies. "Thanks to SCHOTT, I'm now able to concentrate completely on my studies and will no longer have to look for a time-consuming part-time job on the side in order to be able to afford the tuition," notes Schwab. "Matthew is extremely smart, curious and ambitious. His excellent grades also reflect this," says Dr. Johannes Hain, Head of the Business Unit "Advanced Materials" and a member of the College of Optical Sciences Development Board at the University of Arizona. Hain adds: "As a student who deals closely with optics at the scientific level, he is already actively working in an area that is of great interest to SCHOTT."

SCHOTT has been represented on the development board at the College of Optical Sciences at the University of Arizona for 3 years. To support the school and to ensure the education of specialized

employees, SCHOTT has decided to promise a yearly award of \$3,000 for the relevant students depending on their grades and field of interest and encourages the students to participate in the SCHOTT internship program.

At the end of August, Matthew finally received a chance to visit SCHOTT in Mainz, Germany. He was visibly impressed by the size of the site and the wide range of innovative glass products.



Matthew during his visit to SCHOTT in Mainz, Germany

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Upcoming SCHOTT Events

SEMICON Japan, December 3 - 5, 2008 – Makuhari, Chiba, Japan (SCHOTT Lithotec)

Photonics West, January 27 - 29, 2009 – San Jose, CA, USA

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