Newsletter
SCHOTT Optics for Devices

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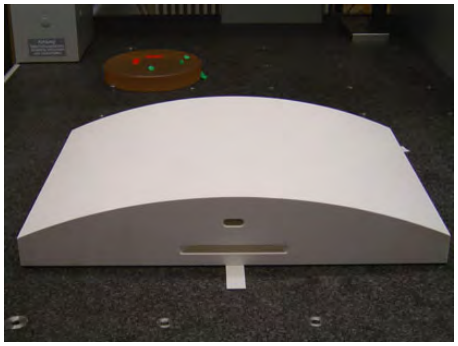
ZERODUR® K20: US Patent granted for a new white glass ceramic material with high temperature stability and low thermal expansion

Glass ceramic materials from SCHOTT have been used worldwide in very different and challenging applications. In September 2006, a US patent was granted regarding a new and promising development in this field. The new material is called "ZERODUR® K20" and is produced by thermal transformation from the well-known semi-transparent ZERODUR® glass ceramics. Due to a high content of Keatite crystals the resulting K20 material now has a brilliant white finish and more ceramic properties than before. It exhibits a low Coefficient of Thermal Expansion (CTE is $2.0 \bullet 10^{-6}$ K^{-1} between 20°-700°C) together with a high long-term temperature stability up to 850°C. Like ZERODUR®, the new glass ceramic is free of pores and can be polished to very low surface roughness levels. Large-scale parts with dimensions of several meters can also be produced.

Potential applications are mechanical and optical components within high energy laser systems, mould materials in hot forming processes, ceramic engine components, and calibration standards for optical and mechanical probes.

http://www.schott.com/optics_devices/english/download/zerodurk20engl.pdf



ZERODUR® K20 used as a mould material for the production of X-Ray telescope mirror segments in astronomy applications

Material samples before and after transformation to the high temperature stability glass ceramic ZERODUR® K20

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New PDF optical glass data sheet catalogue and Abbe diagram - Single datasheets can now be downloaded

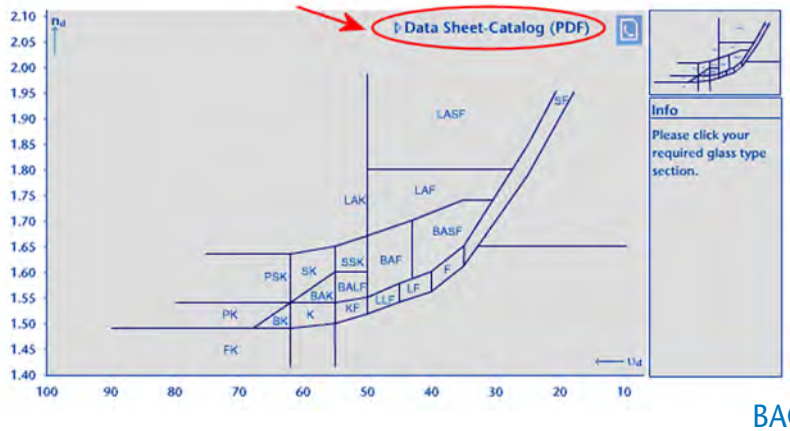
For ease of use, several additions to the database in the Abbe diagram application have been installed on the SCHOTT Optics for Devices website. In addition to printing datasheets, it is now possible to download single datasheets in pdf-file format.

Furthermore, a complete datasheet catalogue containing all available optical glasses can also be downloaded. The PDF datasheet catalogue is generated directly from a SCHOTT database and will hence always contain the latest data.

To increase simplicity of use, an index page has been added. Simply click on the glass name to go directly to the full specifications.

If preferred, a printable Abbe-Diagram can now also be downloaded. In addition to this traditional n_d-v_d Abbe-Diagram, there's a new n_e-v_e Abbe-Diagram and a P_{gF} diagram available. These diagrams are all in color and are printable in dimensions up to a size of 841 x 1189 mm (A0) in excellent quality. Datasheets and diagrams are currently in English and German.

http://www.schott.com/optics_devices/english/products/flash/abbediagramm_flash.html



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Using neutron science for industrial R&D

Neutron-beam instrumentation offers a unique, cost-effective tool for efficient R&D in the development of new materials and processes, controlling emerging technologies or exploring future research avenues. Neutrons have no electrical charge so they can deeply penetrate a material's structure with limited damage, while also producing measurable interactions at the atomic level.

The *Institut Laue-Langevin (ILL)* in Grenoble, France, the Paul Scherrer Institute in Switzerland and the Technical University Munich in Germany are among the organizations operating powerful neutron sources and an extensive array of advanced instruments to address problems in material science, solid-state

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physics, chemistry and bio-medical sciences.
Around 30 years ago, *ILL* was looking for a glass with enough boron oxide to absorb neutrons. SCHOTT successfully developed the glass Borkron N which was specifically designed for those applications. The mirror substrates incorporate efficient neutron shielding through their Boron10 content and, with additional external shielding, protect both scientists and sensitive instruments from intense gamma rays induced by neutron flux attenuation.

SwissNeutronics, the world's largest producer of neutron guide systems, has put Borkron to work in its neutron-reflecting supermirror coatings. It fabricates low-loss neutron guides with a very high performance by combining the microroughness and waviness of superpolished Borkron N achieved by SCHOTT with SwissNeutronics' own sputtering technology and highly precise grinding processes. This enables production of advanced neutron bending devices (Fig. 3), enabling other major neutron scattering centres in the USA and Europe to profit from the intense collaboration between SCHOTT and SwissNeutronics.
http://www.schott.com/optics_devices/neutron_science.html

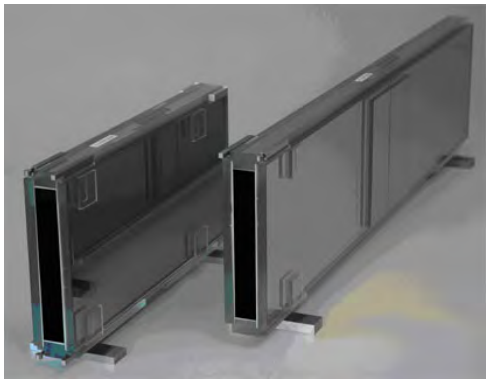

Fig. 1: Neutron guide fabricated by SwissNeutronics for the Institute Laue-Langevin in Grenoble. The glass plates are coated with supermirror m = 2.

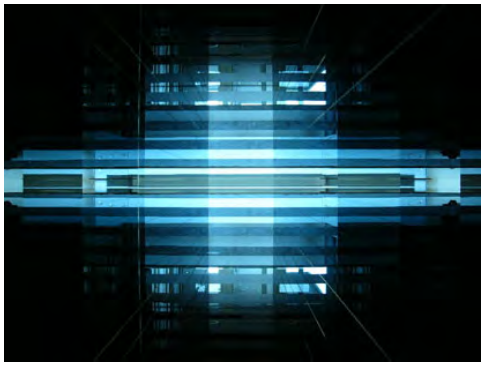

Fig. 2: View of the inside of a neutron guide module

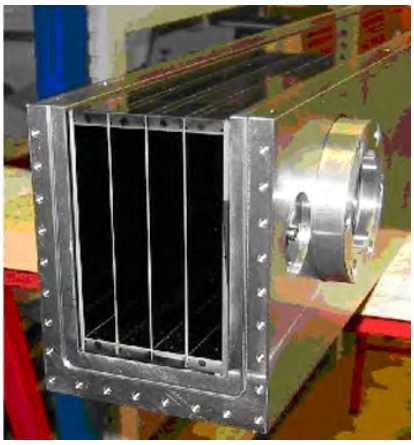

Fig. 3: Multi-channel neutron guide for the Spallation Neutron Source SNS in Oak Ridge National Laboratory (USA). The glass plates are coated with supermirror m = 3.6. The casing is made of stainless steel.

Fig. 4: General view of the hall of experience of ILL in Grenoble (France).

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SCHOTT-donated *Desert Flower* graces University of Arizona College of Optical Sciences

Representatives of SCHOTT and the University of Arizona's College of Optical Sciences gathered in the college's recent addition to the Meinel building to celebrate SCHOTT and artist Christopher Ries' gift of the *Desert Flower* crystal glass sculpture to the college.

Cut, carved, ground and polished from a piece of pure, clear lead crystal cast at SCHOTT's facility in Duryea, PA, the sculpture donation celebrates SCHOTT becoming a Principle level member in the Industrial Affiliates program of the college. With three Nobel Laureates among the faculty and approximately 30 patents generated each year, the institution is one of the world's leading academic centers for optical research and education.

Desert Flower will be among the first things visitors see as they enter the lobby of the $17 million, 47,000 sq. ft. Meinel building addition. With additional light from above, *Desert Flower* offers passersby a visual expression of the power and beauty of the optical research carried out within.

"The donation of a Christopher Ries sculpture to this college by SCHOTT represents a new beginning between our organizations. The SCHOTT name is not unfamiliar in the history of our acclaimed optical sciences program and we are proud and privileged to have received such an enduring and beautiful symbol of what we work each day to achieve - clarity of purpose and extraordinary excellence," said Will Rivera, Director of Development at the University of Arizona's College of Optical Sciences.

Christopher Ries creates his large pieces at a workshop located on the premises of the SCHOTT Optics for Devices plant in Duryea, PA. He also has a gallery and workshop in Tunkhannock, PA.

(Photo from left to right) Mr. John Greivenkammp, Professor & Building Project Manager for the College of Optical Sciences at the University of Arizona, Mr. Christopher Ries, Artist, Ms. Leslie Tolbert, Vice President of Research & Development for the University of Arizona.

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Fine annealed optical glasses now available in the Asia Optical Warehouse

Since October 2006, SCHOTT has expanded its inventory of optical glass maintained in the Asia Optical Warehouse in Malaysia by 27 fine annealed glass types. This will allow deliveries off the shelf within 1 week to customers throughout Asia.

The selection of 27 fine annealed glass types includes mass glass types including N-BK7, N-BAK4 and N-SK2 as well as specialties like N-KZFS11, N-FK51A, N-PK51 and N-LASF31A. The current selection of fine annealed glasses is based on past requirements from customers within Asia and will be reviewed annually. The quantities in stock are determined by market forecasts received from customers within Asia.

For larger quantities (e.g., more than 500 kg of N-BK7) orders will be directly prepared by the production plants in Mainz, Germany or Duryea, USA.
For further information, the respective local sales offices will be glad to be of service.

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SCHOTT adds coating system to Malaysia operations

SCHOTT has been processing optical glass at its Penang, Malaysia plant for more than 30 years, supplying both Asian and European markets. As part of its continual expansion of operations, in Spring 2006, a Balzers BAK 760 high vacuum coating system began operations in the plant in Penang.
SCHOTT has installed the Balzers BAK unit to produce coated substrates as finished products ready for assembly, in response to demands for single-source supply of polished and coated optical parts such as prisms or filters.
The new system produces interference filters with excellent mechanical and spectral characteristics by means of ion assisted electron beam evaporation. Thin interference layers are deposited on glass in a high vacuum evaporation process (PVD = Physical Vapor Deposition). Interference layers form the basis for optical functions such as anti-reflection. PVD processes are especially well suited for coating at varying temperatures between 80° and 350 °C.
The coating is then compacted by bombardment with oxygen ions, causing it to become highly transparent. During the coating process, the parts are evenly rotated, in order to achieve a uniform coating thickness at every point.
Optical filters play an important role in sensor technology for the automotive sector, medicine, engineering and scientific research.

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ZERODUR® mirror substrates for Magdalena Ridge Observatory Interferometer Telescope Array

The Magdalena Ridge Observatory (MRO) in New Mexico, run by New Mexico Tech, the University of Cambridge (UK) and others, will bring powerful deep sky and near-earth observing capabilities to the fourth highest observatory elevation in the world. A fast-slewing telescope, capable of responding quickly to targets of opportunity such as earth-grazing asteroids, is already in place.

Scheduled for completion in 2008, the deep sky part of the observatory consists of an interferometer composed of up to ten 1.4 meter telescopes, with primary, secondary and tertiary mirrors made of ZERODUR® glass ceramic. An interferometer is an array of telescopes coordinated to focus simultaneously on a single object. Already accomplished with great success with radio telescopes in the Very Large Array, also in New Mexico, the Magdalena Ridge Observatory will extend this measurement method to visible and infrared light.

The concave primary 1.4 meter mirrors of the MRO interferometer array are made of ZERODUR® blanks 1.425 meters in diameter with a thickness of 0.190 m. The secondary and tertiary mirrors will be light-weighted to 0.3 kg (0.7 pounds) and 1.9kg (6.4 pounds) respectively.

The telescopes will be mounted on a "Y" shaped set of tracks, spaced at distances of up to 400 meters. By synthesizing their light gathering into a single image, the MRO interferometer will simulate a single telescope of 400 meters, with a resolving power 100 times greater than that of the Hubble Space Telescope. With so many telescopes in the array, the MRO will be able to make accurate images of astronomical objects many times faster than other existing or planned interferometric arrays.

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UPCOMING SCHOTT EVENTS

Photonics West - January 23-25, 2007
San Jose, CA (USA)

Laser Shanghai - March 21-23, 2007
Shanghai (China)

Defense & Security Symposium - April 9-13, 2007
Orlando, FL (USA)

Laser Expo 2007- April 25-27, 2007
(Lens Design & Manufacturing Expo 2007)
Yokohama (Japan)

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