



MATERION

// BALZERS OPTICS

Lighting

Optical Solutions for the Lighting Industry



Materion Balzers Optics

Materion Balzers Optics is a global leader in optical thin film coating solutions. We have been the preferred partner for providing innovative optical coatings and solutions for over 70 years. From the UV through the Far IR, we custom manufacture and supply precision optical filters and coatings. As a high-tech company with five production sites worldwide, our focus is on a variety of markets such as Automotive, Consumer, Defense, Industry, Life Science, Lighting, Semiconductors and Space.

With a full range of unparalleled products, services, and support technologies, our customers benefit from our strategically located global facilities that provide regional manufacturing and technical support. Materion Balzers Optics' superior quality products are fully supported by a large volume manufacturing environment that produces highly repeatable results, contributing to reduced costs and market advantage. We also have scalable processes that are economical for customers who require small quantities. Our technical expertise and access to broad resources throughout Materion, make us uniquely positioned to offer solutions to our customer's most demanding challenges.



Production Balzers/Principality of Liechtenstein



Production Jena/Germany



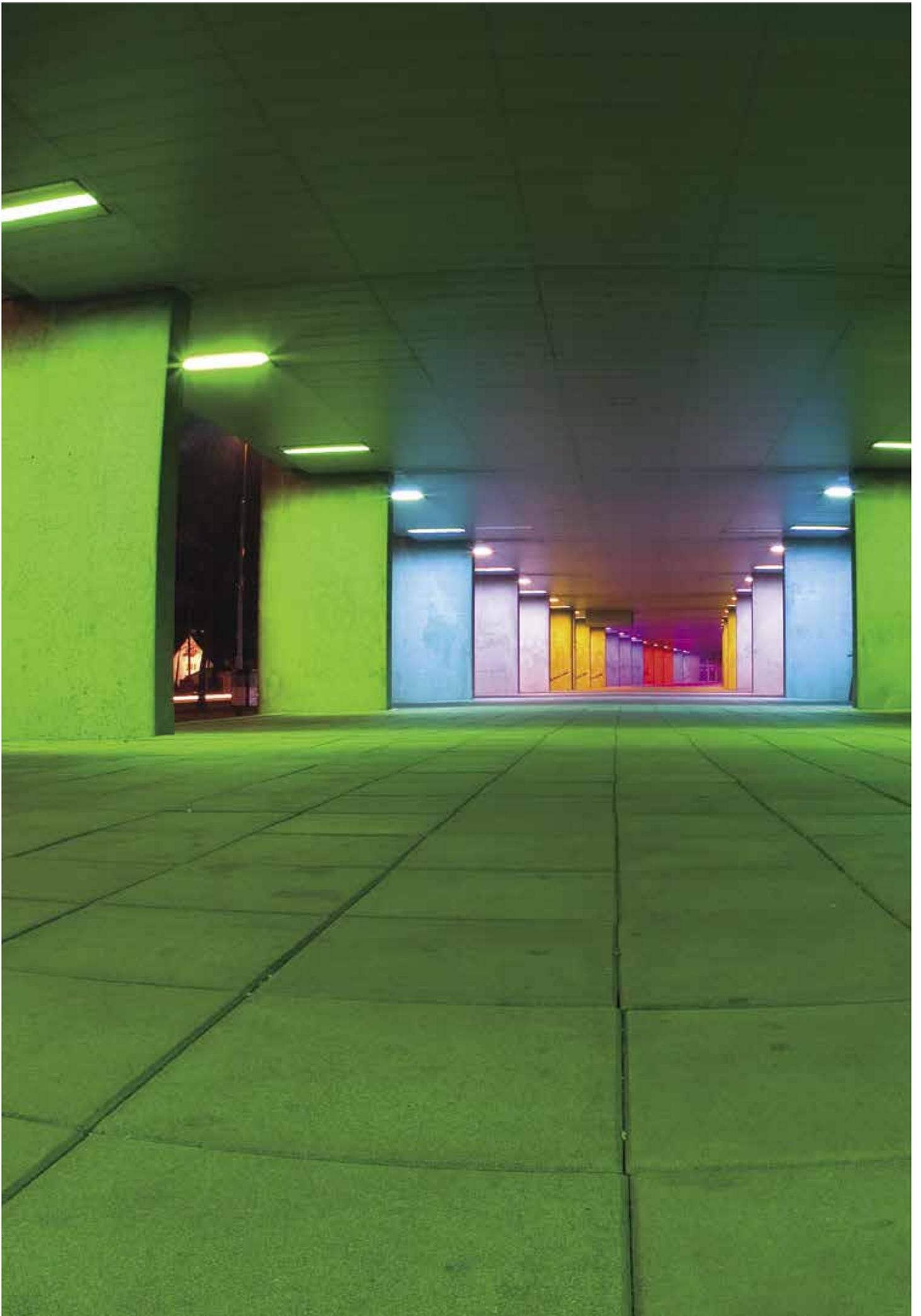
Production Penang/Malaysia



Production Shanghai/China



Production Westford/United States

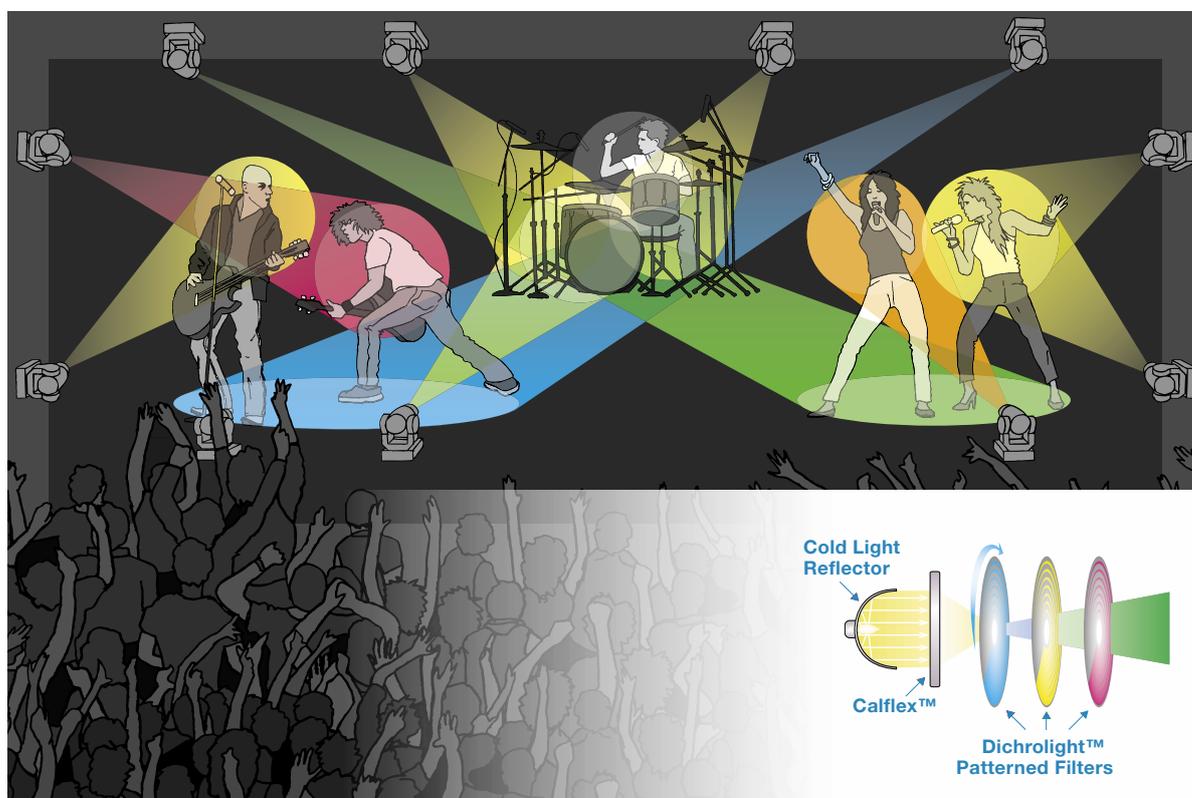


Lighting Solutions & Applications

Whatever you need to illuminate, our optical components guide, reflect, select and alter light for a variety of applications in the lighting industry.

Entertainment Lighting

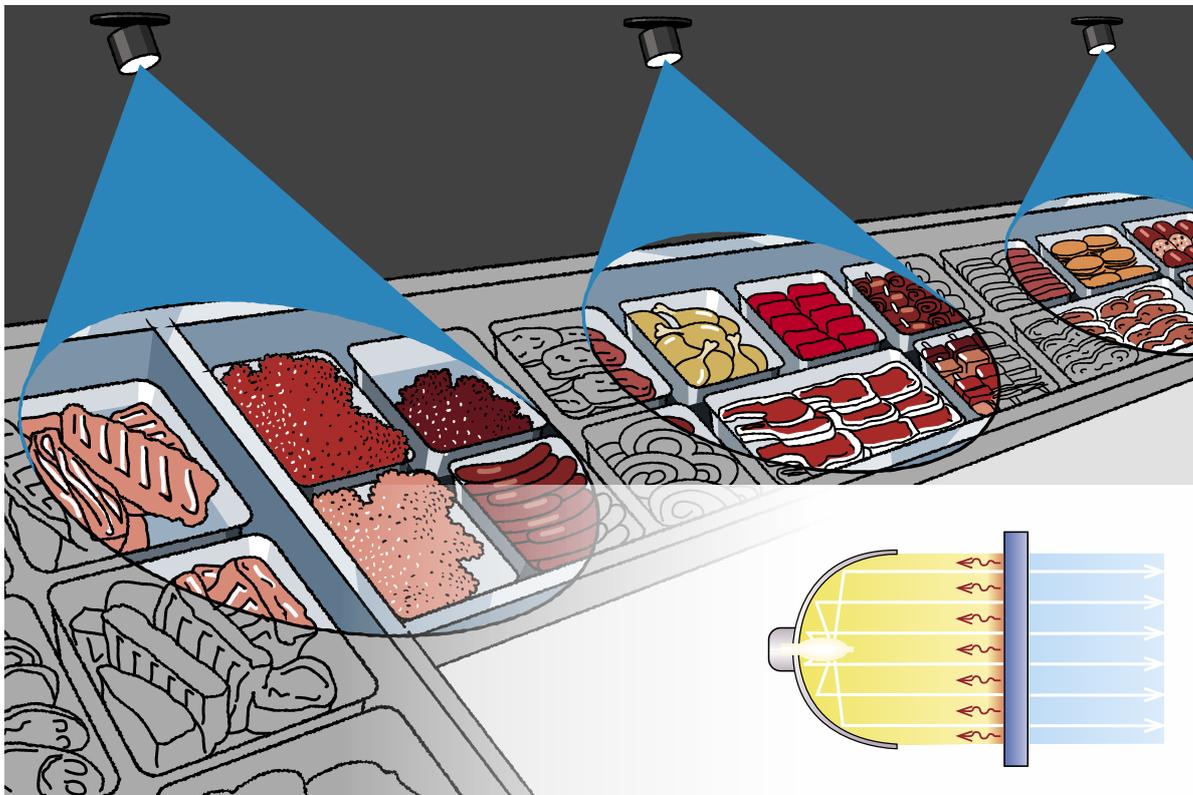
Consistent, exact colors in every possible environment have become a vital part of shows and events. That's why leading entertainment and architectural light manufacturers rely on Materion Balzers Optics' color and patterned filters to provide reliable, durable and precise colors in luminaires for discos, theaters and architectural lights. Our heat management systems further ensure moderate temperatures even in extremely powerful spotlights, projectors and searchlights. Lastly, Materion Balzers Optics' UV blockers prolong luminaire lifetime by filtering out strong UV, which degrades today's complex automated luminaires.



Entertainment Lighting

Technical Lighting

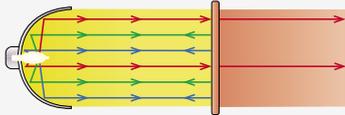
Materion Balzers Optics' components also enhance several technical applications. Our color filters allow merchants in all areas to present their products in the right light. Thanks to UV blocking, IR reduction and emphasis of individual colors, displays in shops always look appealing. We also manufacture filters for signal lights that ensure safety in aviation, shipping and rail.



Food Lighting

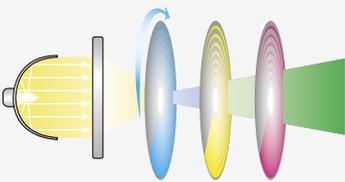
Optical Coatings & Components

The core competencies of Materion Balzers Optics are the design and manufacture of high precision thin-film optical coatings and integrating them into sophisticated optical components. Materion Balzers Optics' coatings and components are characterized by excellent spectral performance, low defect quality and superior environmental stability. The coatings are produced with state-of-the-art evaporation and sputtering equipment platforms with process and product specific adaptations. The components are both customized to the specific product requirements and optimized for high yield production. Continuous process control like monitoring of the coating process or customer specific component characterization ensures consistent and high quality in volume manufacturing.



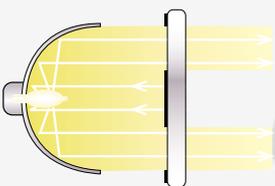
Dichrolight™ Color Filters

Dichrolight™ color filters are mainly used in the fields of entertainment and architectural lighting. The Materion Balzers Optics' Dichrolight™ filters feature highly saturated colors, temperature-independent spectral characteristics, optimum mechanical and thermal stability and close tolerance color characteristics.



Dichrolight™ Patterned Filters

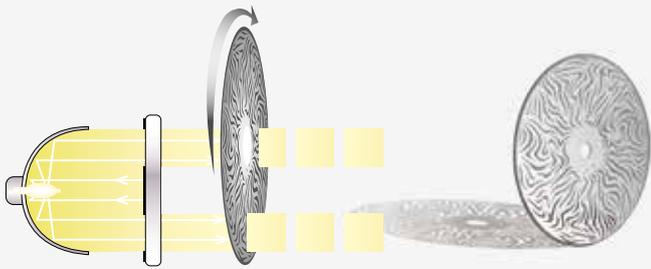
For entertainment and architectural lighting industries, we provide photolithography patterning on any Dichrolight™ color filters. Customers can select patterning on filters produced either by reliable Materion Balzers Optics e-beam or sputtering processes. These can be patterned in 20 micron resolution with sharp and well-defined edges. Since we perform the patterning process in-house, customers have a single source for all lighting component needs.



GoboXtreme™ Dark

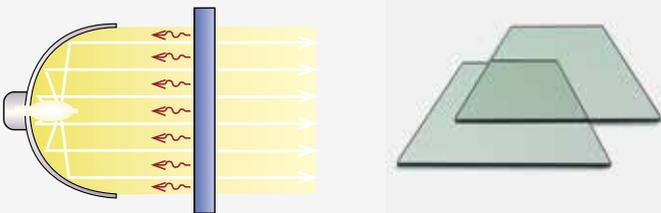
Materion Balzers Optics' GoboXtreme™ Dark is a high performance glass black & white gobo blank that provides extended thermal stability and lifetime compared to conventional gobos. The high performance single side coated design combines both:

- a “white part”: highly reflective aluminum mirror that faces the lamp, transmitting light only where coating is removed to reveal the gobo image pattern, and
- a “black part”: highly absorbing multi-layer coating that faces the lens and absorbs incident light to maximize contrast and prevent image ghosting.



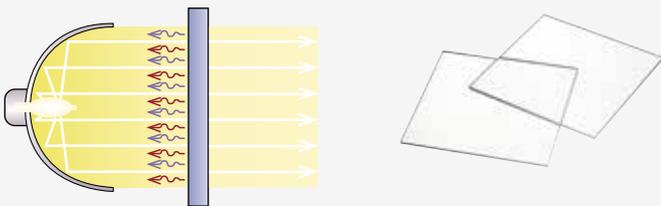
GoboXtreme™ Animation Wheel

The lighting industry uses the Animation Wheel for entertainment lighting. This in its most demanding, picture providing applications. The Animation Wheel pushes contrast and multiple image suppression to new levels. Incorporating the GoboXtreme™ Dark coating known from Gobo applications it performs with the white side and black side as described.



Calflex™ – IR blocking filter

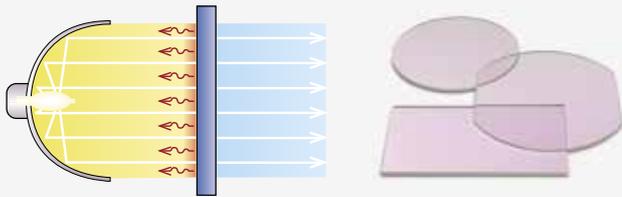
Some designs of entertainment, medical, and architectural lights require additional heat reduction. In entertainment lighting, infrared filtering keeps performers in the spotlight as cool as possible. Materion Balzers Optics' Calflex™ filters reflect infrared radiation while transmitting visible light and allow for differing emission behaviors of various light sources. Calflex™ filters allow maximum transmission in the visible waveband without changing the colorimetric characteristics of the light source.



UV/IR-Blocker

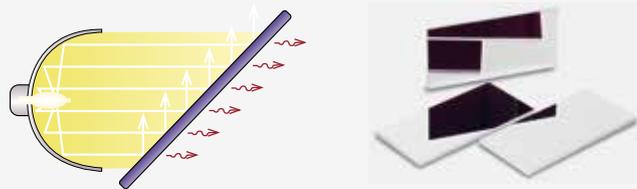
Materion Balzers Optics' UV/IR-Blockers effectively remove damaging ultraviolet and unwanted infrared radiation produced by broadband light sources. A dielectric oxide coating design provides excellent transmission over the entire visible spectrum, without distorting the spectral emission of the light source. Filters are optimized for metal halide lamps and are particularly well suited for use in applications where high thermal loads exist. Where infrared radiation is not critical, use the Materion Balzers Optics UV-Blocker.

Optical Coatings & Components



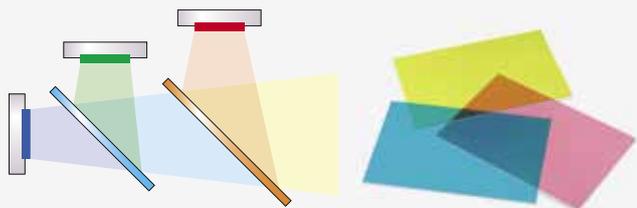
Conversion Filters

Materion Balzers Optics' Conversion Filters match the color temperature of a light source with individual requirements while maintaining good color rendition and high luminance. With Conversion Filters, customers in photography, merchandising and the film industry can set their light sources to the right color temperature.



Cold Mirrors

Cold Mirrors reflect visible light and allow the transmission of infrared radiation. In general, these mirrors are used at an angle of incidence of 45°, thus reducing the temperature load of a light source by heat-light separation. Plane Cold Mirrors are an additional component of a high-performance heat management system.



LED ColorDichroics™ – Dichroic Filters/Mirrors for LED Applications

Materion Balzers Optics' LED ColorDichroics™ dichroic filters/mirrors are used to efficiently transmit and/or reflect the light from light emitting diode (LED) sources. These dichroic filters/mirrors are designed to combine light emitted from different color LEDs into one beam. The thin-film coatings of these LED ColorDichroics™ are specifically optimized for random polarized light. Both the high reflection and the high transmission wavelength ranges are specifically adapted to LED spectral emission characteristics.

Coating Plus: More Than Just Coating

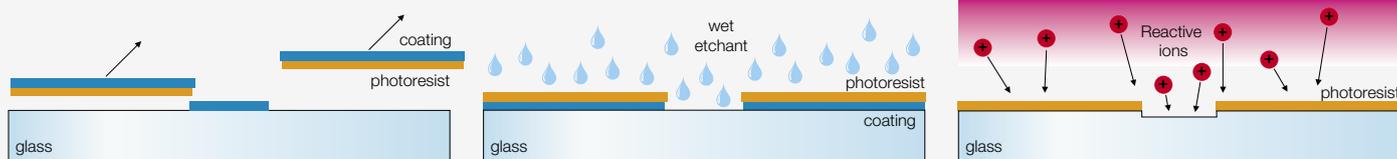
Sophisticated optical thin-film components and subsystems require additional process steps beyond coating.

Patterning

Materion Balzers Optics offers patterning solutions for high quality optical components. Depending on the product and its applications, various patterning techniques such as photolithography, laser ablation or masked coatings are available to meet a broad range of customer requirements for feature sizes and shapes. The lift-off technology allows the deposition of filter arrays onto cover glasses or directly onto photodetector wafers.

Photolithography

Photolithography capabilities such as lift-off and etching techniques allow the production of precision patterned coatings and submicron gratings. The photolithography techniques are specifically used in producing masked cover lids for MEMS devices and CCD/CMOS image sensors.



Masked Coatings

Precision etched metal masks attached to the substrates provide patterned coatings during the coating process. While the achievable feature sizes and shapes are limited with direct masking, patterning can be applied with almost any coating process and coating material, also with processes that require higher temperatures.

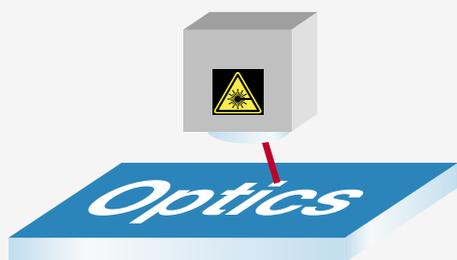


Marking

Application of thin-film optical components may require unambiguous marking and labeling, either on the substrate surface or on the coating. The pattern can be generated according to customers' specific needs.

Laser Ablation

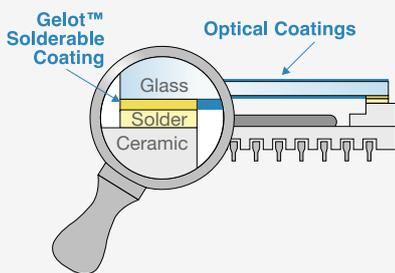
Laser ablation offers novel opportunities in patterning of optical filter coatings. By using adapted processes for each specific application, high precision patterns can be produced on the coated components. Laser ablation offers excellent flexibility for customized shapes and patterns together with high speed processing capabilities.



Coating Plus: More Than Just Coating

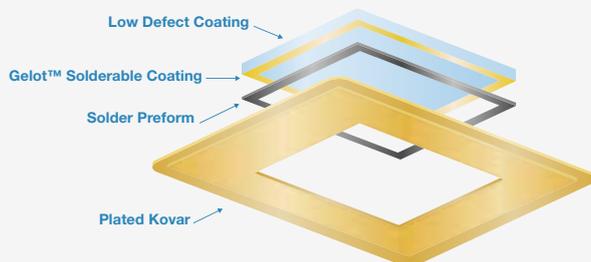
Bonding and Sealing

Light sensitive semiconductor devices require protection by applying a transparent glass lid. Materion Balzers Optics offers bonding and sealing technologies along the entire value chain of optical sensors – ready for assembly and if required with integrated optical aperture.



Gelot™ Solderable Coatings

Soldering is the assembly technology which provides best hermeticity values of such packaging. Gelot™ solderable coating gives the glass a surface with good adhesive properties for soldering with materials such as gold or palladium. Gelot™ is applied to the lid as a frame pattern with a clear aperture.



Soldered Kovar Lids

On top of the Gelot™ solderable coating an assembled glass-to-metal solution can be offered to satisfy stringent hermetic requirements. The soldered Kovar Lids are the first choice for demanding applications such as sensors in space or in the shortwave infrared range.

Glass Processing

Economical production of thin-film coated components often requires wafer based substrate processing. Low defect substrates additionally require clean edge work to prevent glass chipping. With its advanced dicing and scribing capabilities, Materion Balzers Optics manufactures thin-film components with high precision to customer specific shapes and sizes, optionally with chamfered edges.

Varnishing

High-accuracy dispensing technologies enable continuous or selective blackening of optical parts and complement the low reflection, high absorption coating portfolio from Materion Balzers Optics.

Subassembly

Materion Balzers Optics offers customized optical subassemblies to support its customers' ever increasing demands. We develop individual solutions for and together with our customers.

Volume Production

The utilization of high-tech singulation equipment paired with sophisticated manufacturing processes allow for a cost-effective mass production of optical parts with small physical dimensions.

Packaging and Handling

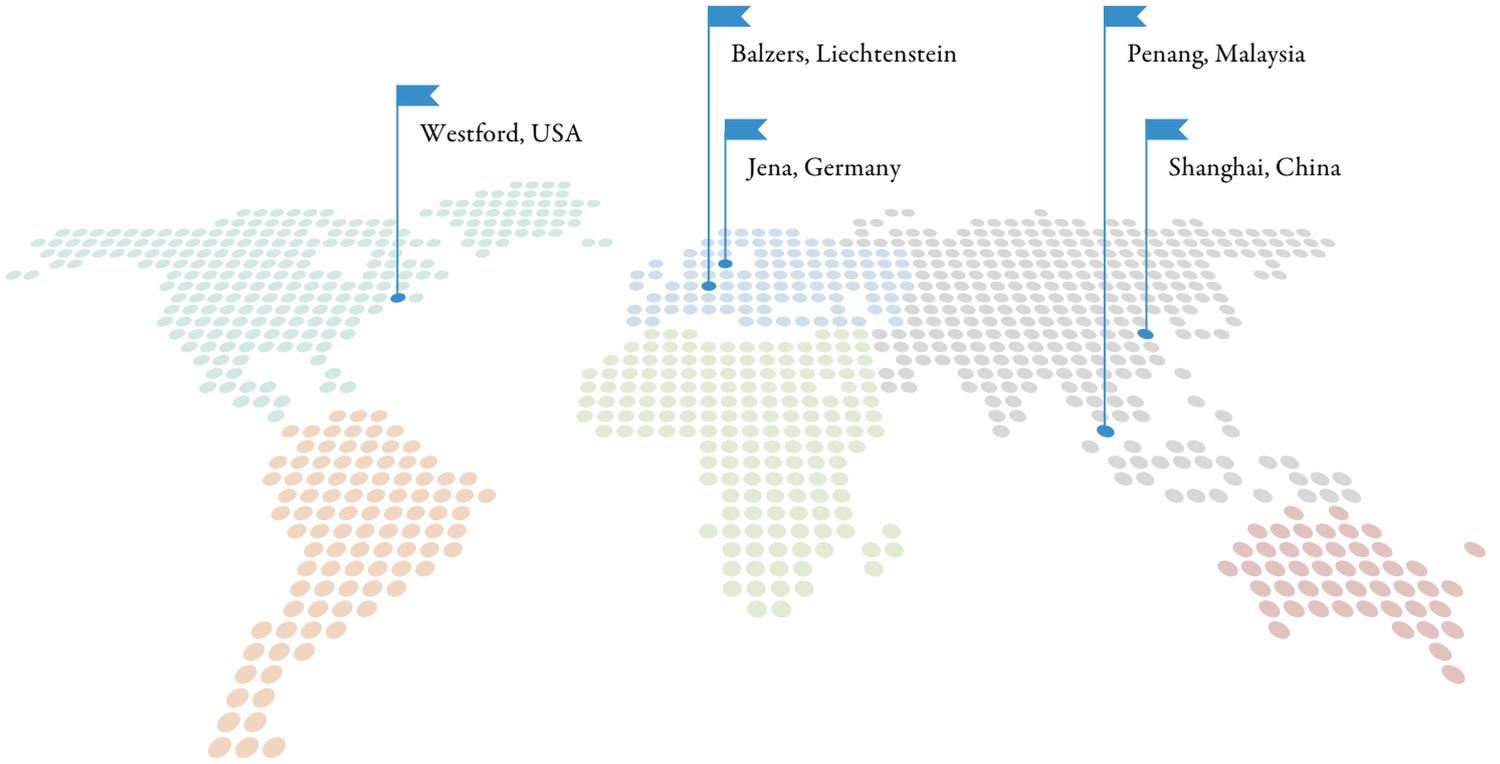
Customized packaging and shipping ensures top quality in surface protection and cleanliness during transportation and in subsequent process steps at the customer's site.

Development Partners

Materion Balzers Optics relies on strong partnerships. Therefore our competence centers in Liechtenstein and Germany count on the close cooperation with scientific institutes, universities, and colleges. Those partnerships allow our teams of engineers to develop innovative solutions, tailored to the individual requirements of our customers.

Project Management

Challenging projects with demanding product properties can be realized successfully only by high level organized and well educated project management teams. Therefore Materion Balzers Optics supports your product request with a dedicated project team, to bring your idea into a real success story. Close cooperation, a permanent exchange of information, and at last but not least, a company with tradition, are the basic elements for a strong long-term partnership.



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