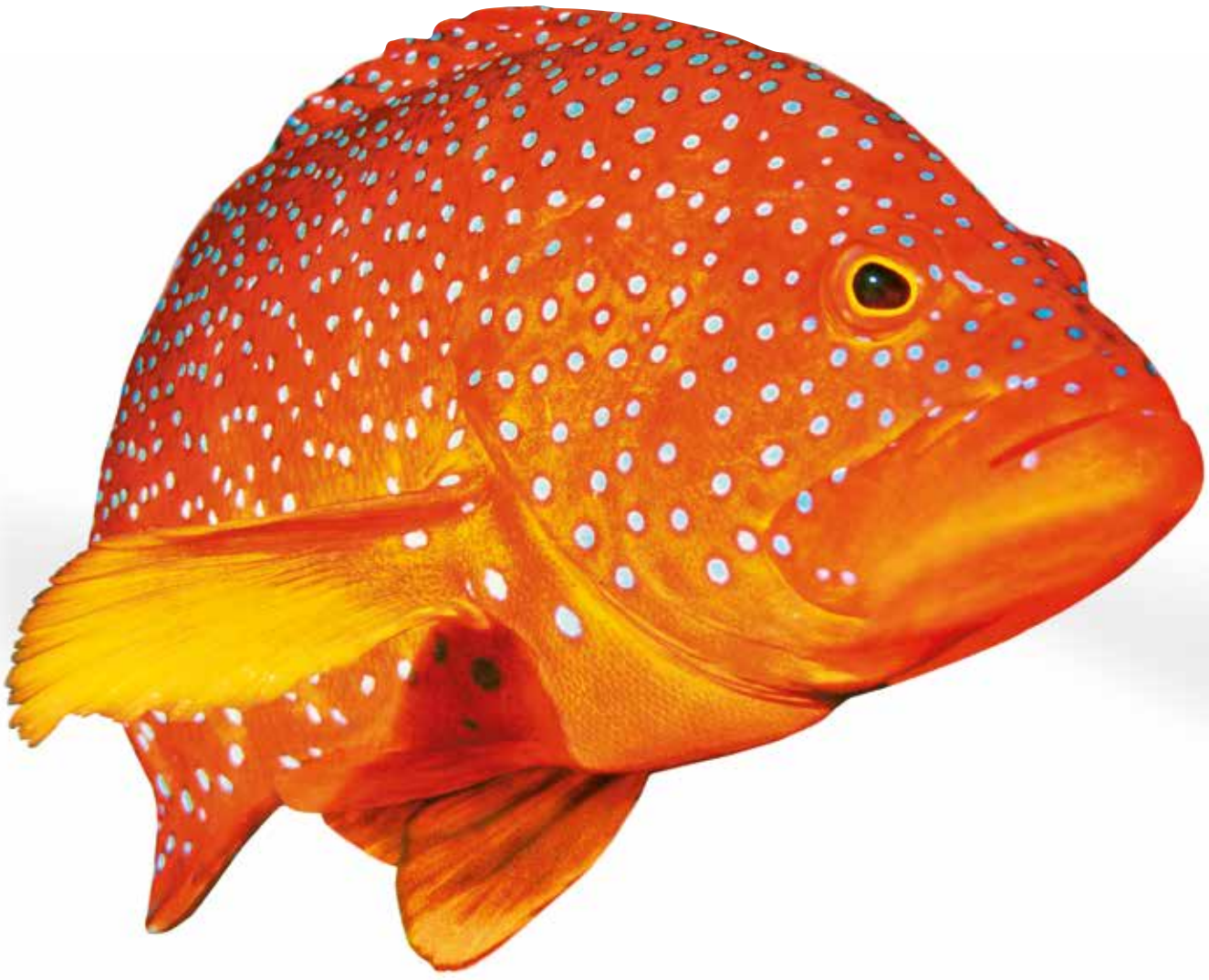
MATERION

// BALZERS OPTICS

Life Science

Optical Solutions for Diagnostic, Analytical and Medical instrument applications



Materion Balzers Optics

Materion Balzers Optics, a global leader in optical thin film coating solutions, emerged in 2020 from the union of Optics Balzers and Materion Precision Optics. This collaboration created a premier market leader in optical solutions, showcasing extensive expertise in the field of photonics technology.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

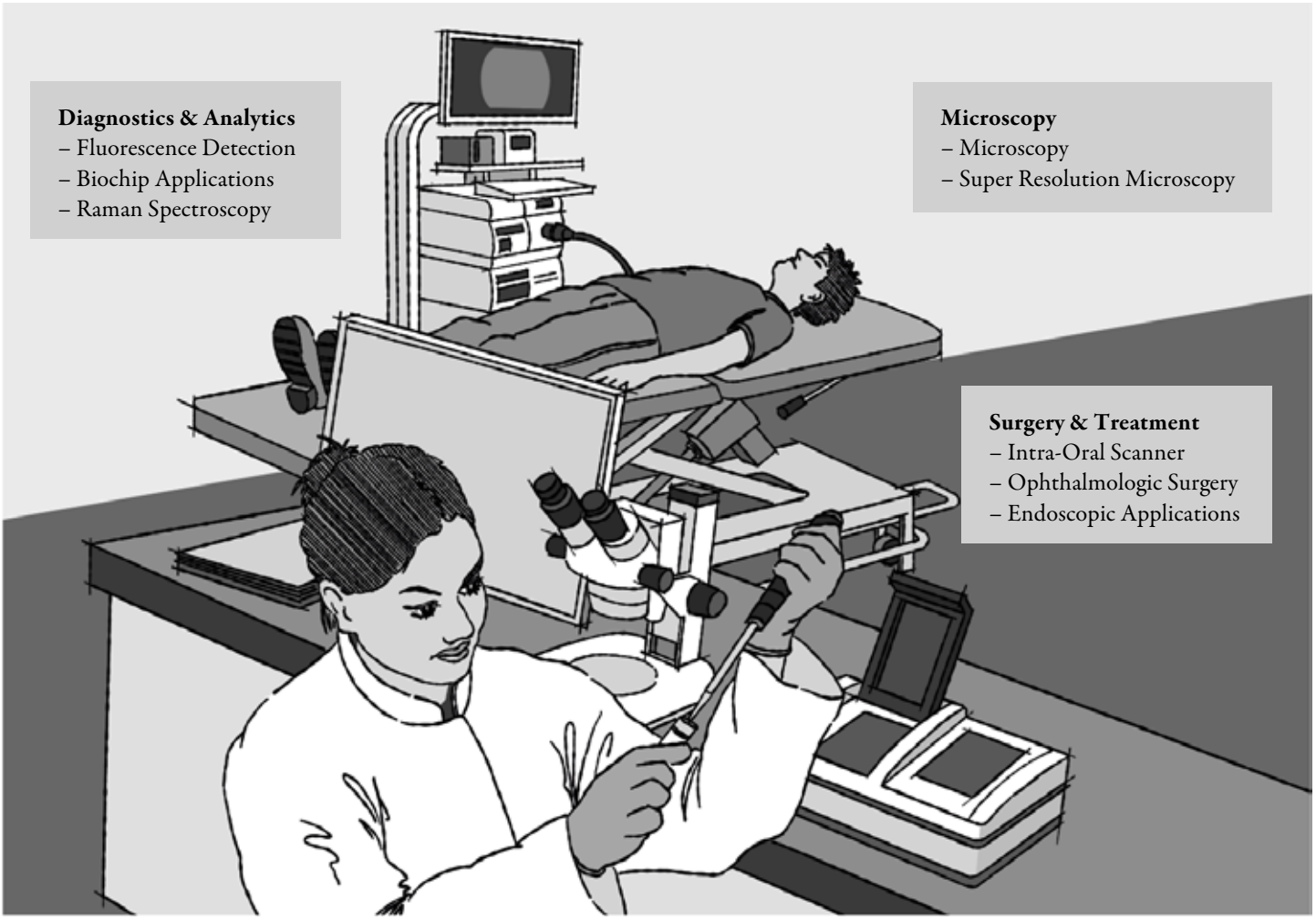
Production Westford / United States

Life Science Solutions

Our optical components precisely manage light to enable life science, fluorescence, and medical instrument applications

The use of light for diagnostics and therapy in life science applications has been steadily expanding for many years, as light is an effective means for the non-destructive examination of living samples or for the manipulation of tissue in laser surgery. Light can be used to image the basic elements of life, as well as to detect single molecules or proteins. The manifold use of light requires sophisticated methods for controlling the light propagation path and its spectral composition. Optical coatings are widely used for both purposes and play a key role for the functionality of optical instruments.

Based on our extensive industry experience and years of innovation, Materion Balzers Optics produces a wide range of sophisticated coatings and coated optical components to enable even the most complex diagnostic and analytical instrumentation. Our broad range of coating deposition technologies affords customers flexibility and many design options to achieve the best optical filter solution while achieving budgeted cost goals.



Diagnostics & Analytics

The field of Biophotonics is rapidly expanding, driven by development of breakthrough technologies for a broad range of applications

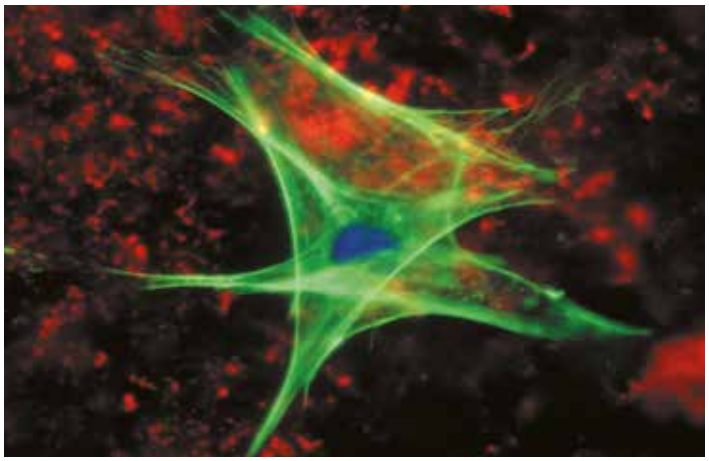
Fluorescence Detection
The detection of fluorescence light is a powerful and widely used method for the investigation of biological samples. Its sensitivity and selectivity to specific substances and cell constituents are highly dependent on the performance of the optical filters and other components in the light path.

Precise alignment of the spectral characteristics to the fluorescent dye and measurement set-up, steep transitions from high blocking to high transmission, broadband high-level blocking, and long-term stability of these optical components are key factors for reliable and conclusive measurement results.

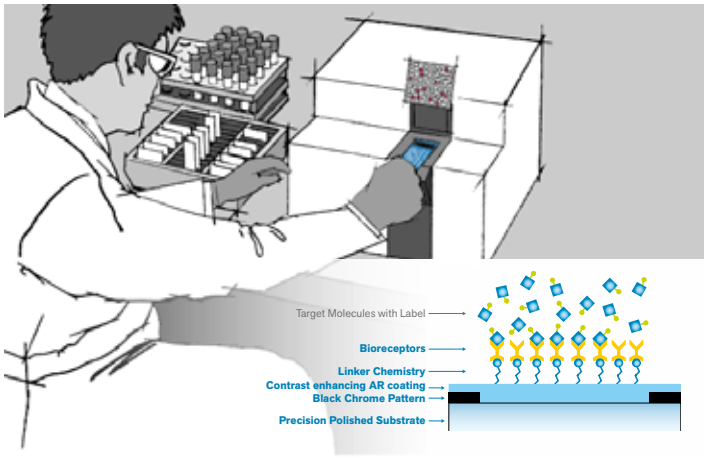
Materion Balzers Optics provides customized high-performance optical filters and optical filter sets for high-performance fluorescence microscopes and fluorescence-based instrumentation.

Biochip Applications
Biochip applications are extremely diverse. They can be used for gene sequencing, water quality monitoring as well as for food screening or cancer diagnostics. Each chip is developed focusing on the particular user needs, with the substrate selection being one of the most critical decisions. Glass is an excellent substrate to add functions for luminescent analysis methods, like waveguide gratings for evanescent field excitation, various optical coatings (e. g. fluorescence filters, IR-mirrors, patterned, antireflective or transparent conductive coatings) or customized 2D or 3D fluidic channel structures. Using wafer scale manufacturing processes, chromium positioning patterns and laser marking are frequent customer requirements to add serial numbers or QR-codes to the wafer.

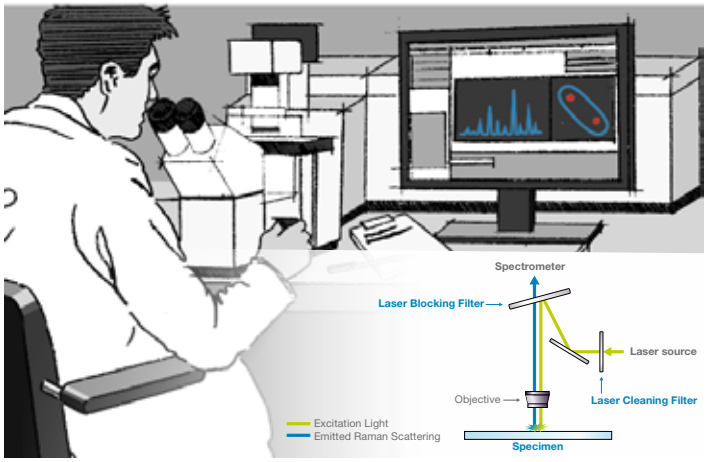
Raman Spectroscopy
Optical filters are key components for highly sensitive Raman spectroscopy applications. Emitted Raman wavelengths are often extremely close to the laser excitation line and only the highest performance optical filters can be used to discriminate between the laser line and resultant Raman signal to be processed. Laser blocking filters (longpass, shortpass or notch), laser clean-up filters (narrow bandpass) and dichroic beam-splitters are available for all laser wavelengths between 260 nm and 1550 nm. The filter performance is realized by all-dielectric hard coatings deposited onto a single substrate, so there is high flexibility for the filter dimensions as required by compact optical set-ups.



Fluorescence Imaging



Biochip



Raman Spectroscopy

Microscopy

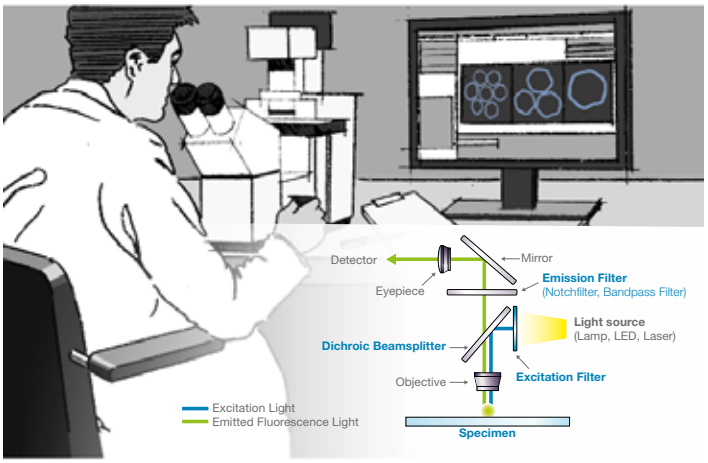
Our optical components optimize the investigation of biological samples

Microscopy

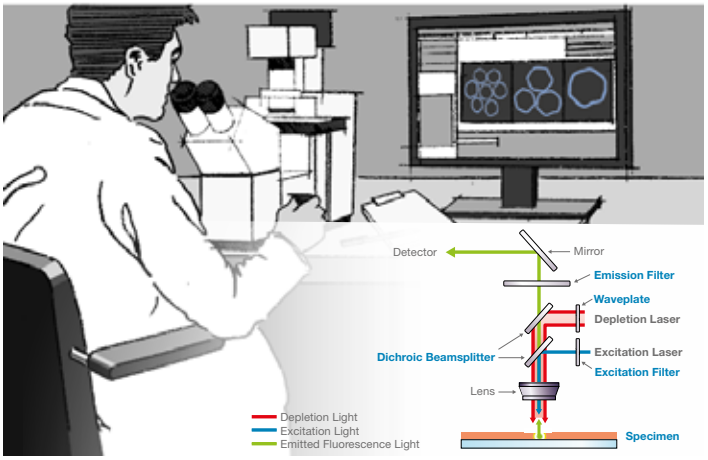
Fluorescence Microscopy utilizes light of specific wavelength to excite (excitation) fluorophores bound to biological samples, to emit (emission) light at longer wavelength for analysis. Materion Balzers Optics fluorescence filter sets enable this interaction and include excitation filters, emission filters (bandpass, shortpass or longpass) and dichroic beamsplitters. Cut-on and cut-off wavelengths of the filters are optimized for the excitation wavelength and the fluorescent dye. The filter performance is realized by all-dielectric hard coatings deposited onto a single substrate. Since absorbing glasses and filter mounts are not needed, there is high flexibility for the filter dimensions in compact optical set-ups.

Super Resolution Microscopy

Traditional optical microscopy uses a variety of techniques to image biological structures and activities. However, the spatial resolution that can be achieved with traditional light-based microscopy is limited to approximately half of the wavelength of light that is used to interrogate the sample. This limitation on spatial resolution is referred to as the diffraction limit. Innovations in super-resolution microscopy enhance the resolution of the imaging system beyond this barrier. The three main types of super resolution microscopy are stimulated emission depletion (STED) microscopy, structured illumination microscopy (SIM), and stochastic optical reconstruction microscopy (STORM).



Fluorescence Microscopy



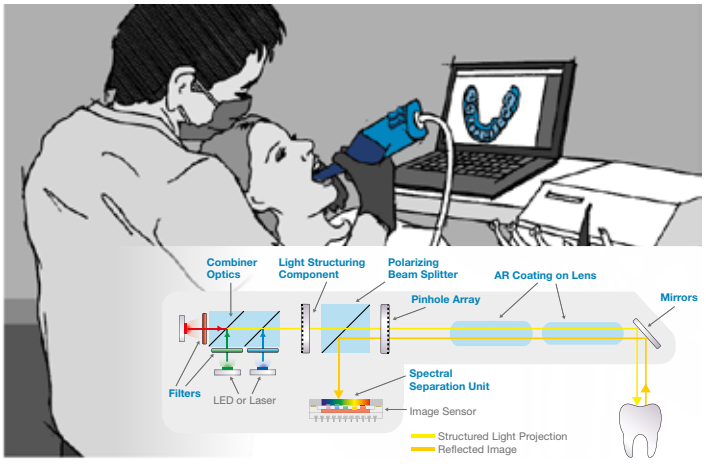
Super Resolution Microscopy

Surgery & Treatment

Light processing and safety are crucial in applications where human health or life is impacted

Intra-Oral Scanner

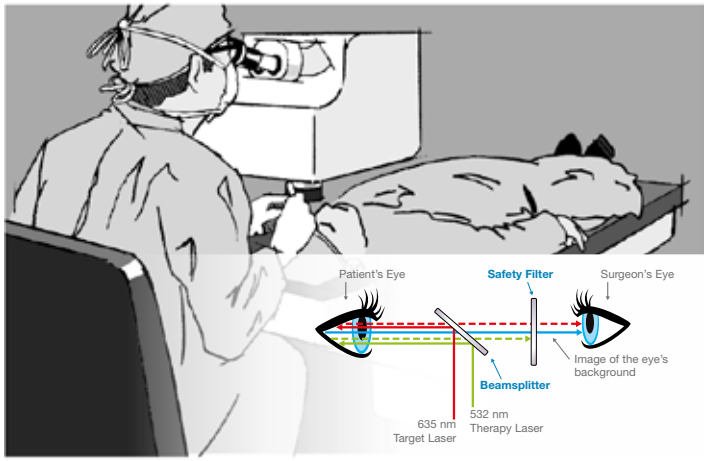
An intraoral scanner is a handheld device that uses light and digital processing software to create a digital impression of the interior of the mouth. Digital intraoral scanner usage is increasing in the dental industry due to the speed of real-time imaging results and patient comfort, compared to traditional mechanical methods of creating an impression. The device is enabled by various optics and coatings, such as combiner optics , mirrors and patterned filters for color separation that are manufactured by Materion Balzers Optics to specific performance requirements.



Generic Intra Oral Scanner

Ophthalmologic Surgery

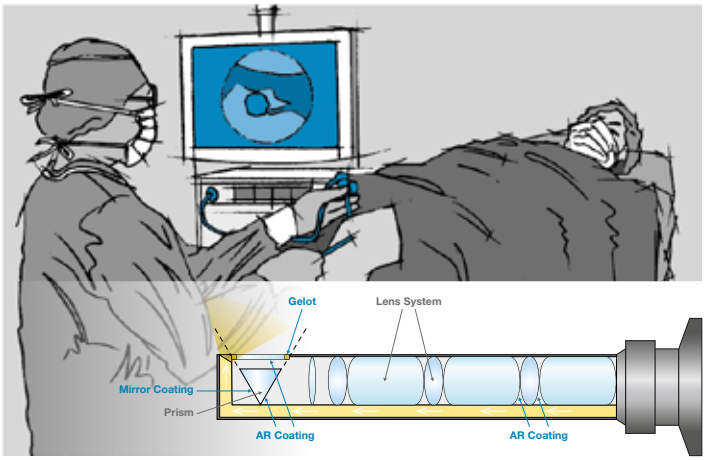
In ophthalmology instruments, laser safety filters block the therapy laser with high optical density, to protect the surgeon's eye while showing a high transmittance for the image of the patient's eye background. A sophisticated filter design with narrow blockband and balanced transmission level over the full visible range optimizes color rendering. The beamsplitter controls transmittance and reflectance for both therapy and target laser. The all-dielectric filters are extremely environmentally stable and hence also display a long-term shift-free spectral performance.



Ophthalmologic Surgery

Endoscopic Applications

Endoscopes require optical components with durable and robust anti-reflection coatings or other functional coatings to manage light. Materion Balzers Optics provides various types of coatings with reliable performance, even on prisms and very small lenses.



Endoscopy

Optical Coatings & Components

The core competencies of Materion Balzers Optics are the design and manufacture of high precision thin-film optical coatings and their integration 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.

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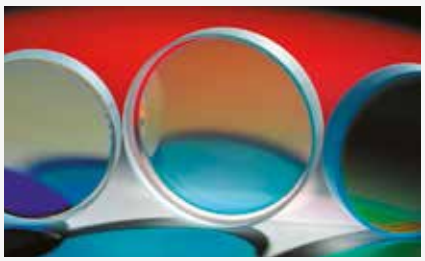
Optical Coatings & Components

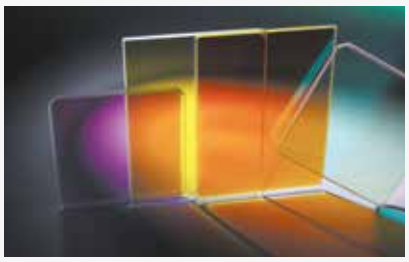


Fluorescence Filter Sets

Materion Balzers Optics fluorescence filter sets include excitation and emission filters (band-pass, shortpass or longpass) as well as a dichroic beam splitter. Cut-on and cut-off wavelengths of the filters are optimized for the excitation light source and for the fluorescent dye. The filter performance is realized by all-dielectric hard coatings deposited onto a single substrate. Because absorbing glasses and filter mounts are not needed, there is a high flexibility for the filter dimensions in compact optical set-ups.

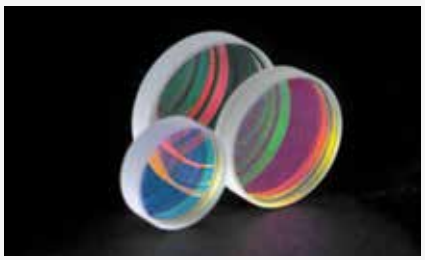
Steep Edge Filters

Materion Balzers Optics filters excel by steep transition between blocking band, passband, and high-passband transmittance (> 95%). Our sophisticated filter designs are optimized according to the requirements of the application. Typically, the filters provide broadband blocking (> OD6) from the UV to the NIR range and even deeper blocking near-band. Even in the case of narrow bandpass filters (e.g. FWHM 2 nm), the filters combine high-passband transmit-tance with a deep broadband blocking level.



Low-Loss Dichroic Beamsplitters

Materion Balzers Optics dichroic beamsplitters separate the incoming light in a highly reflected and transmitted part. The transition zone can be reduced to approx. 3% of the transition wavelength for random polarized light. The all-dielectric interference filters are deposited by plasma-assisted processes and show extreme environmental stability. Filter dimension, spectral performance and angle of incidence can be customized. Shortpass and longpass beamsplitters are available.

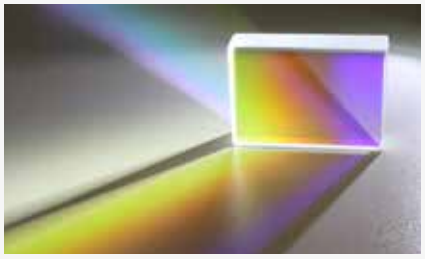


Notch Filters

Notch filters allow blocking a specific wavelength of light (up to >OD6), while showing high transmittance for the remaining part of the spectrum. The bandwidth of the blockband can be as narrow as 10 nm in the VIS range. Multi-notch filters block up to 4 different wavelengths. Notch filters are composed of a complex multilayer stack deposited onto glass substrates. They can be designed for user defined blocking wavelength, blocking depth and angle of incidence.

Laser Safety Filters

In ophthalmology instruments, laser safety filters block the therapy laser with high optical density, while showing a high transmittance for the image of the patient's eye background. A sophisticated filter design with narrow blockband and balanced transmission level over the full visible range optimizes color rendering. The hard-coated filters are longterm stable and available in flexible dimensions.



Linear Variable Filter (LVF)

LVF Filters are an innovative and flexible solution for the technological demands of the fields of diagnostics and analysis. They are available as a bandpass or as an edge filter, such as a longwave pass or shortwave pass. In either configuration, they are designed to shift in wavelength as a function of linear position on the filter. The covered wavelength range is customized to optimize the hyphenate application.

Optical Filter Arrays

Filter arrays address requirements for multi-spectral sensor systems and replace traditional filter wheels for applications requiring multi wavelength functionality. The array is mounted directly above the focal plane and is a solid-state solution enabling simultaneous wavelengths to be utilized.

Optical Coatings & Components

Polarizing Beamsplitter Assemblies

We have developed technologies to miniaturize our Polarizing Beamsplitters (PBS) without compromising its excellent light throughput characteristics. Chamfer-free manufacturing and our edge-to-edge coating procedure reduce the non-functional area to zero. And this improved utilization of substrate surface enables smaller component design. As a option, patterned or uniform black chrome coating may be added to eliminate unwanted stray light.

Microoptics

Materion Balzers Optics offers a range of different anti-reflection coatings for microlenses and rod lenses for endoscope applications with dimensions down to 1 mm. Other functional coatings can also be provided.

Patterned Chrome

Full-surface and patterned chrome coatings on planar components are widely used in the optical industry. Materion Balzers Optics puts its emphasis on high resolution, low defect patterns – optionally in combination with low defect functional coatings. With CrBlack™ coating, Materion Balzers Optics also offers an optical black coating, characterized by high absorption and low reflection in the VIS range. Applications include background noise reduction in fluorescence sensors and precise alignment.

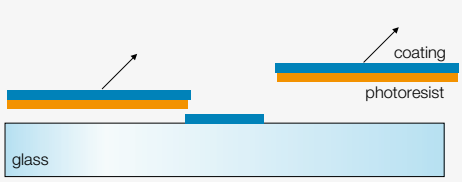
CoatingPlus™: More Than Just Coating

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

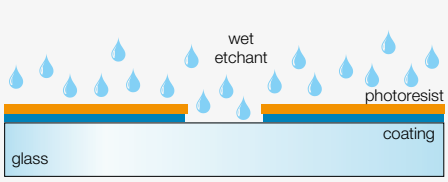
Patterning

Most advanced thin film optical components require various additional process steps beyond dedicated coating processes to achieve their full functionality and performance in customer specifics.
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 wide range of customer requirements for feature sizes and shapes.

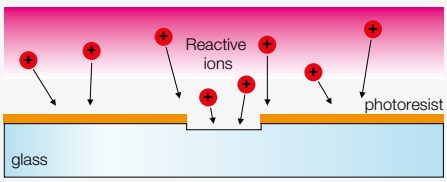
Photolithography
Photolithography capabilities such as lift-off and etching techniques allow the production of precision patterned coatings and submicron gratings. The photolithography techniques are specifically used in producing biochip substrates and advanced microscopy slides.



Lift-off

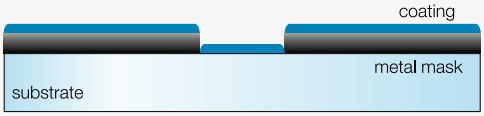


Wet etching



Reactive ion etching

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.



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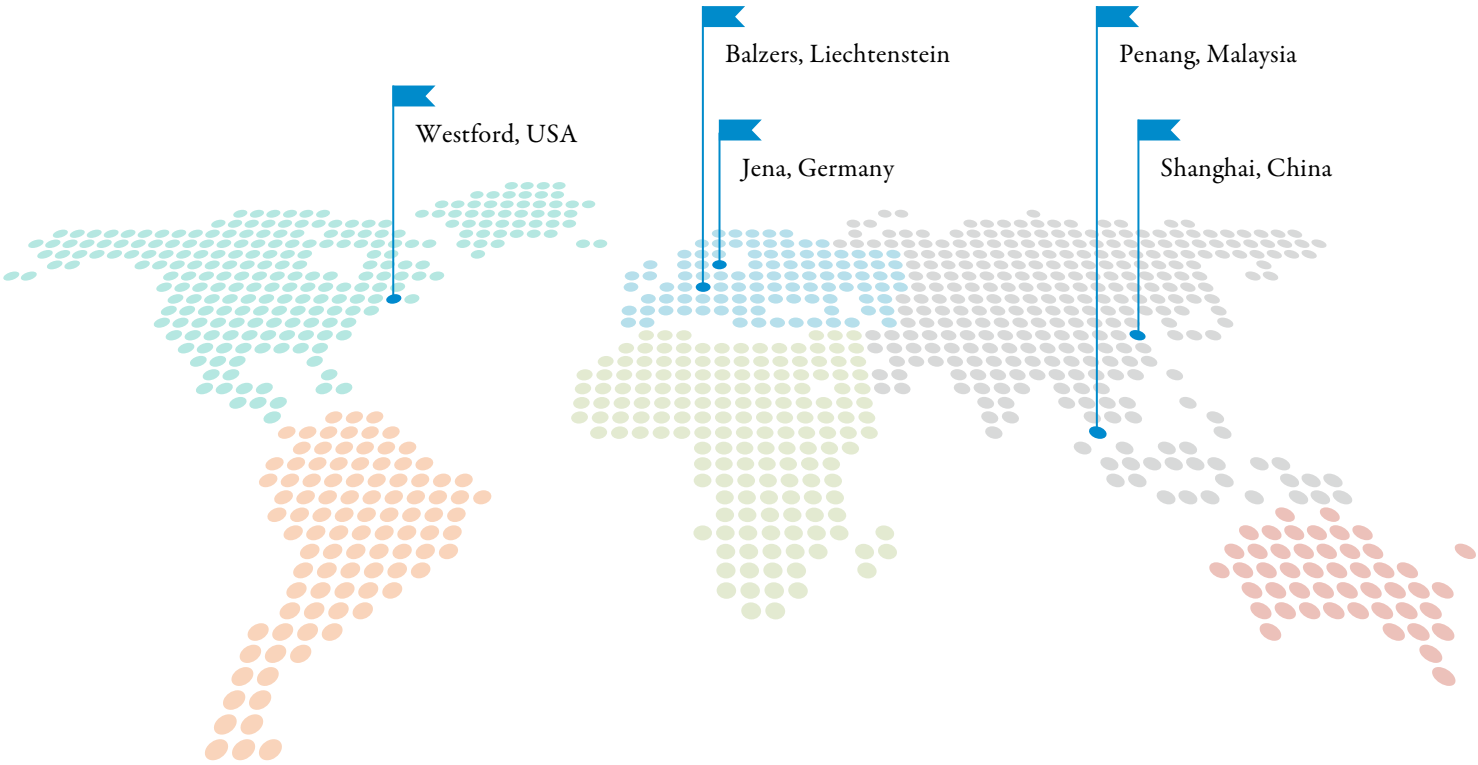

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