Custom Optical Coatings

- High, partial, and anti-reflection
- Edge, notch, band pass filters
- Plate and cube beam splitters
- Wavelength ranges 190 – 2500nm
- Sizes up to 10 x 10 inches
- Various angle of incidence and polarization requirements
- OptoSigma and customer furnished materials
- Optical glasses, crystals, polymers, fibers, fiber assemblies, and cemented substrates

Here at OptoSigma we specialize in custom optical coatings from the ultra-violet to the near infrared. Every day we provide a variety of custom coatings from simple modifications of the catalog specifications to entirely specialized designs.

If the custom coating design is straightforward, we will perform a single test run immediately before the production run. For more complicated designs, a development process will be needed to establish the specifications which can be met in a production environment. This could potentially include multiple test runs, design modifications, and data analysis. We work closely with our customers through every step in the process to determine which specifications are suitable for both their applications and a manufacturing environment. It is in the best interest of OptoSigma and our customers to get through the development stage and on to production as quickly as possible. Once production is reached, the specialized processes and inspection are documented and established to ensure ongoing success.

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Most of our coatings are deposited using a computer controlled electron beam ion assisted deposition process allowing us to provide durable precision all dielectric coatings. Before coating, the substrates are ion cleaned to decrease surface contamination, which helps the coating bind to the substrate. During coating, these energetic ions help densify the coating which both increases the coatings optical performance and reduces the internal stress thus increasing the durability. Because of this process, we are able to maintain a temperature of less than 100°C to accommodate temperature sensitive substrates, such as optical fibers, fiber assemblies, crystals, select polymers, and cemented optics. Additionally, each chamber is equipped with a Polycold system to aid in the pumping of water vapor, which decreases the time required to coat and helps eliminate the moisture within the coating. The coating process is completely computer controlled and monitored by a technician. The final product is an extremely dense durable precision coating.

The substrates are mounted on a planetary system, where each planet measures 15 inches in diameter. In addition to the availability of a wide range of tooling, we have the ability to both aid the customer in the designing process, or to provide complete custom tooling to accommodate their parts.

Durability/Low Stress

Coatings with a high internal stress have a tendency to craze and delaminate or deform the substrate increasing the wavefront error. Our ion assisted process minimizes this stress within each coating layer, and our designs are created to balance the stress over the entire coating. The ion cleaning process prior to coating enhances the adhesion of the coating to the substrate, increasing the durability and longevity of the coating. During coating, the ion bombardment minimizes internal stress build up by increasing the homogeneity within the layers. The final product is an extremely durable coating which maintains the original substrate wavefront error.

High Damage

To produce a coating, which can withstand high levels of incident laser energy, the appropriate design and process must be used. Our ion assisted deposition process produces coatings which are highly homogeneous, dense and completely oxidized. Reducing the inhomogenaities minimizes the internal scattering and increases the thermal conductivity of the coating. Our designs for high damage use all oxides rather than fluorides and metals which reduce the amount of absorption within the coating.

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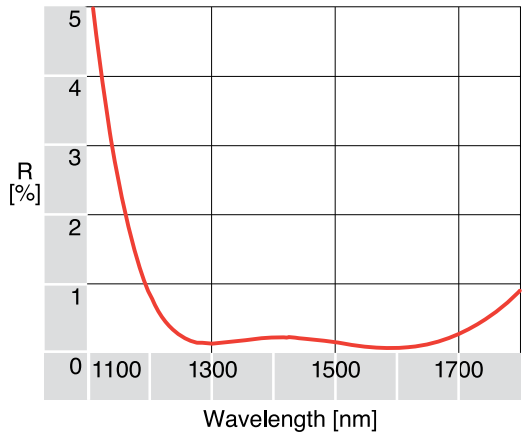
Temperature Sensitive Substrates

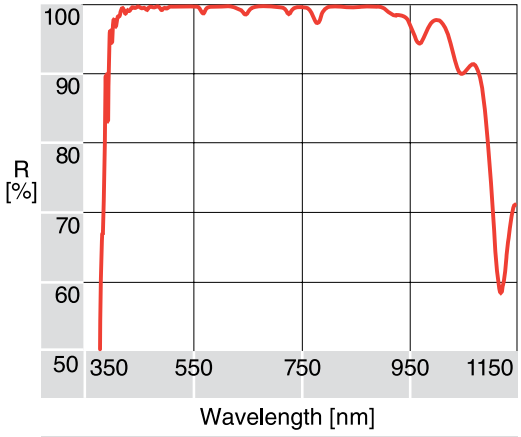
The energy required to produce highly homogeneous and dense coatings comes from our ion assisted process rather than temperature. During our coating runs we can maintain a temperature below 100°C. This allows us to produce precision coatings on a variety of temperature sensitive substrates, such as polymers, optical fibers, fiber assemblies, cemented substrates, and a variety of specialized crystals.

If you do not find the coating specifications you need in our catalog, please call with your request.

Broadband All Dielectric

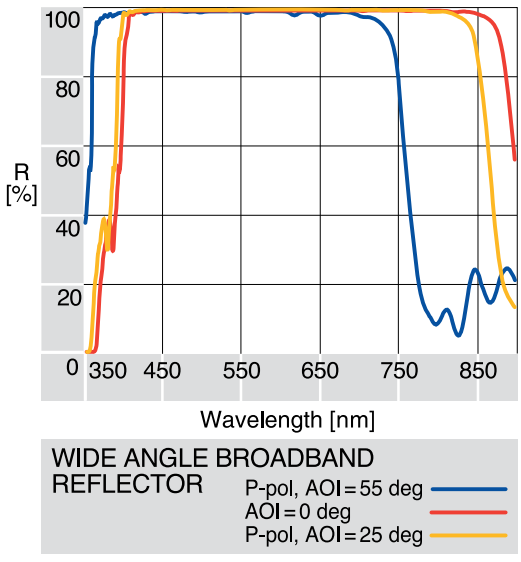
All dielectric multi-layer coatings are much more durable and of higher optical performance that those which involve metals. These can be offered with almost zero absorption and reflectivities greater than 99%. The all dielectric design is limited to a specific spectral bandwidth around the center design wavelength. Large bandwidth requirements demand the use of high precision coatings. These types of coatings are performed regularly at OptoSigma. Two actual spectral curves demonstrating this type of coating can be seen in the following plots.

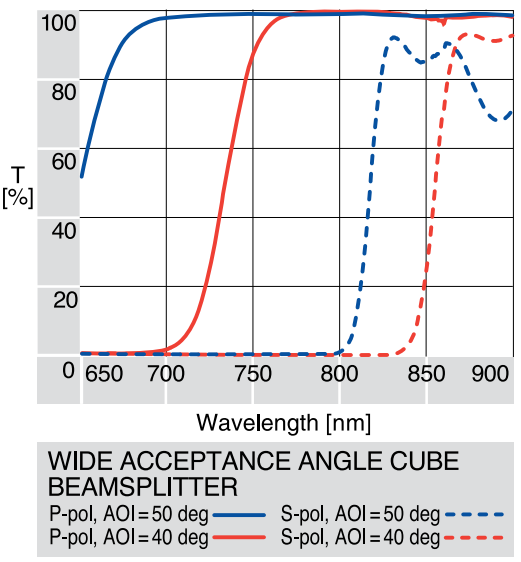




Wide Angle

Particular applications demand the use of all dielectric coatings due to their durability and superb optical performance. The all dielectric design is however highly sensitive to angular variation, which can create problems for broadband applications involving large angular variations, such as those with non-collimated beams or rotating substrates. To accommodate the need for angular variation, a coating bandwidth substantially greater than the source bandwidth is required. This requires a highly precise all dielectric coating. Two actual spectral curves demonstrating our capabilities follow.





Anti-Reflection Specifications & Tolerances

Substrate material:
BK7 Grade A

Angle of incidence:
0 degrees
%R <0.3:
1250-1650nm

High Reflector Specifications & Tolerances

Substrate material:
BK7 Grade A

Angle of incidence:
0 degrees
$\%R_{ave}$ >97.0:
400-1000nm

Reflector Specifications & Tolerances

Substrate material:
BK7 Grade A

Angle of incidence:
40±15degrees
$\%R_{ave}$ >98.0:
450-650nm

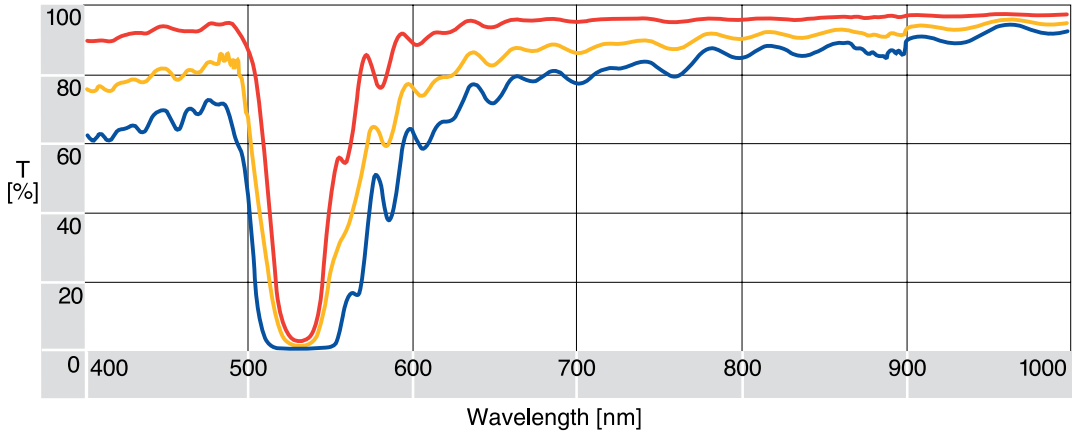
Cube Specifications & Tolerances

Substrate material:
BK7 Grade A

Angle of incidence:
45±5degrees
$\%T_p$ >98: 780nm
$\%T_s$ <1.0: 780nm

Filters

Many standard types of custom filters, such as short wave pass, long wave pass, multiple notch, and band pass filters are manufactured at OptoSigma. In addition, a variety of highly customized coatings which do not fall into a general category are produced regularly at OptoSigma. Our engineers design to the specific targets established by our customers' needs. The designs are then tested in our chambers and we work closely with our customers to arrive at a final manufacturable coating. Two actual spectral curves demonstrating our capabilities follow.



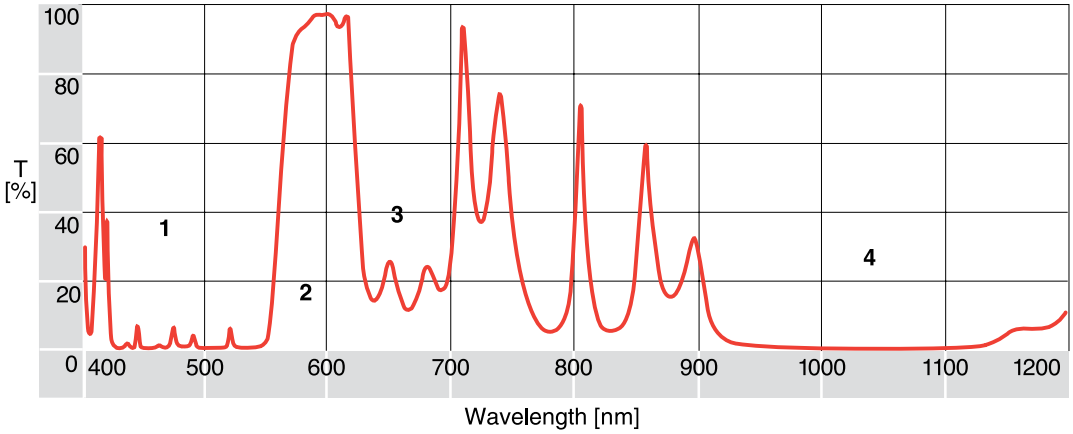
CUSTOM NOTCH FILTER

P-POL
AVG-POL
S-POL

Specifications & Tolerances

Substrate material: BK7 Grade A
Angle of incidence: 45 degrees

%T <3.0: 532nm
%T >85: 488, 632.8, and 1064nm



CUSTOM FILTER

Specifications & Tolerances

Substrate material: BK7 Grade A
Angle of incidence: 0 degrees
Region 1: %T <5.0: 425-525nm

Region 2: %T >90: 590nm
Region 3: %T = 20±10: 670nm
Region 4: %R >99.0: 1064nm

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