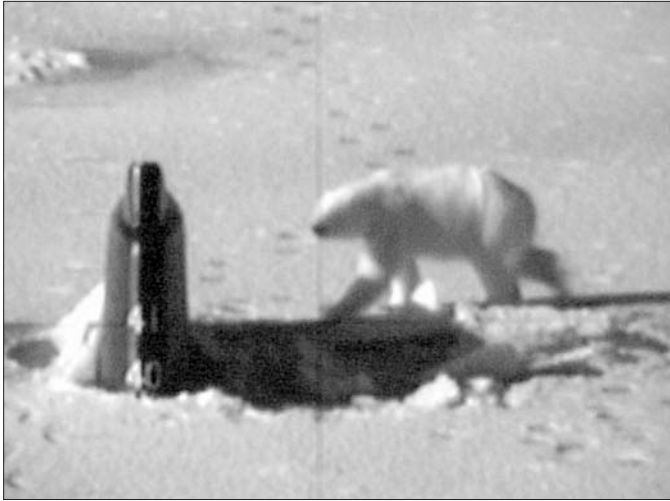


HARD COATINGS
BY
CVI MELLES GRIOT
WHITE PAPER



Hard Coatings



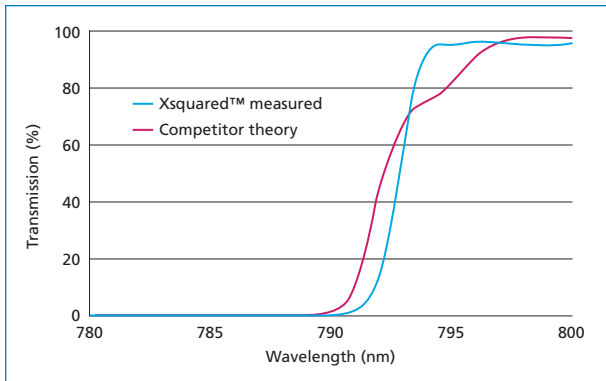
because . . .



you never know
what's out there.

Photos by the US Navy

HARD COATINGS



Xsquared™ Edge filter

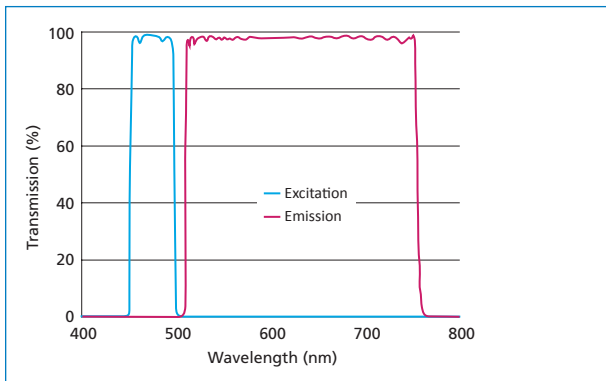
Edge Filters

Zero to 90 in 6.1 nm

Edge transition measured from OD 6 to 90% T

- Steep edges to measure very small Raman shifts
- Deep blocking for maximum laser rejection
- High transmission to detect the weakest signals

Hard dielectric sputtered coatings for proven environmental stability and durability.



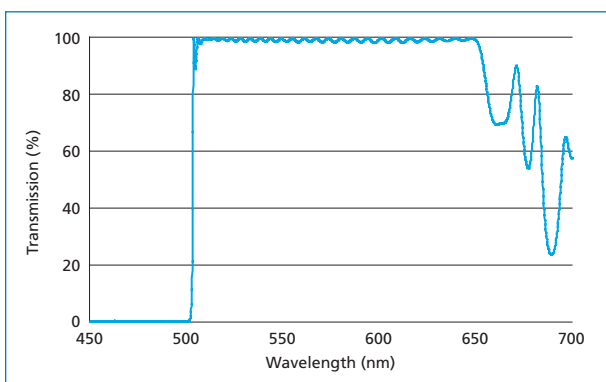
Xsquared™ Emission / Excitation filters

Emission / Excitation Filters

Xsquared™ filters offer the industries “squarest” and lowest loss filter profiles. They are manufactured with an advanced sputtered plasma using durable, hard metal-oxide, front surface thin film.

These filters are ideal for Raman and fluorescence applications, where maximum blocking of the laser line is required. These filters are designed to withstand aggressive environmental conditions. Ultralow autofluorescence fused silica has a small thermal coefficient of expansion over a large temperature range.

- Notch Filters for Raman and fluorescence applications
- Deep notches for maximum laser rejection
- High transmission outside the notch to detect the weakest signals



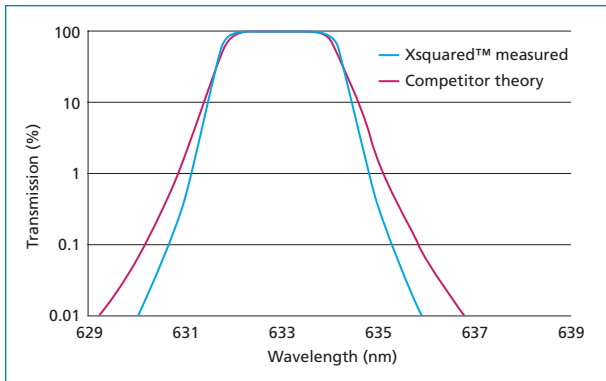
Xsquared™ Dichroic filter

Dichroic Beamsplitters

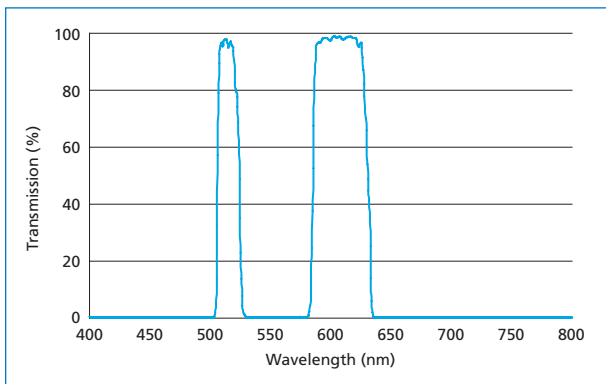
Dichroic beamsplitters exhibit high transmission for a short wavelength band, high damage thresholds, and high reflectivity for a longer band of wavelengths.

Reflectivity bandwidth is determined by coating design, incidence angle, and polarization. For high energy laser applications, specify pulse energy, pulse duration, repetition rate, and beam diameter.

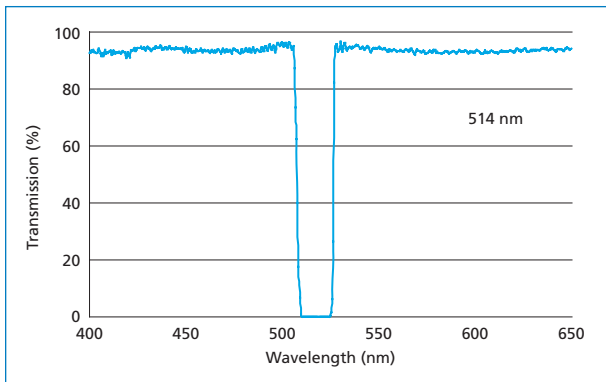
HARD COATINGS



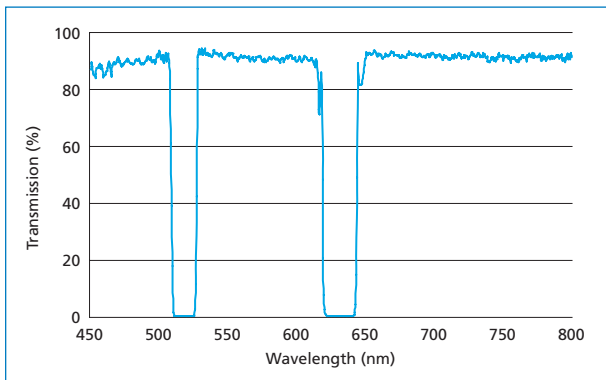
Xsquared™ Bandpass filter



Xsquared™ Multi-Bandpass filter



Xsquared™ Notch filter



Xsquared™ Multi-Notch filter

Bandpass and Multi-Bandpass Filters

Xsquared™ bandpass filters offer the industries “squarest” and lowest loss filter profiles. They are manufactured with an advanced sputtering process using a durable, hard metal-oxide, front surface thin film.

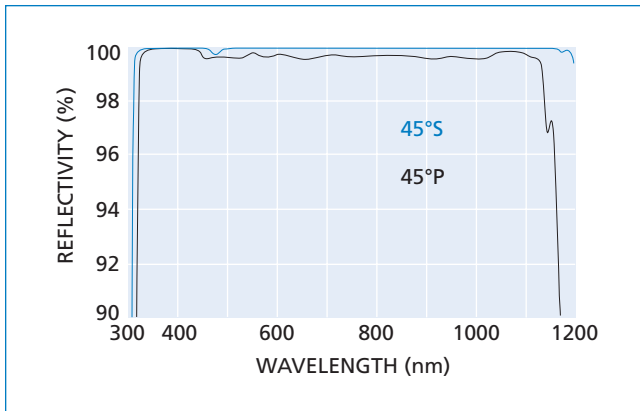
- Bandpass Filters for biomedical, industrial and aerospace applications
- Highest laser-line transmission
- Sharp edge transition to minimize the distance from rejection to transmission
- Deep rejection out of band for maximum signal-to-noise reduction
- Hard dielectric sputtered coatings for proven environmental stability and durability

Notch and Multi-Notch Filters

These filters are ideal for Raman and fluorescence applications, where maximum blocking of the laser line is required. These filters are designed to withstand aggressive environmental conditions. Ultralow autofluorescence fused silica has a small thermal coefficient of expansion over a large temperature range.

- Notch Filters for Raman and fluorescence applications
- Deep notches for maximum laser rejection
- High transmission outside the notch to detect the weakest signals
- Hard dielectric sputtered coatings for proven environmental stability and durability

HARD COATINGS

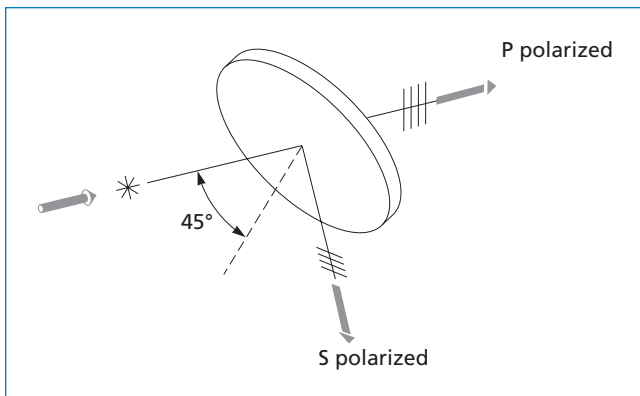


Reflectivity vs wavelength of BBDS broadband VIS/NIR mirror

Broadband Mirrors

Key attributes of the BBDS mirror are that it exhibits greater than 99% reflectivity for all wavelengths from 350 nm to 1100 nm for any polarization state, and for all angles of incidence from 0° to 50° simultaneously yet with high laser damage threshold. The BBDS is useful in any application that calls for steering a diverse range of wavelengths of arbitrary polarization, especially from multi-wavelength laser systems such as Nd:YAG lasers operating at 1064nm, 532 nm and 355 nm.

- Near UV, all visible, and near IR
- $R > 99.0\%$ for all angles up to 45°
- Nd:YAG fundamental and harmonic wavelengths
- Mirror mounts are available



TFPN 45° thin film plate polarizers

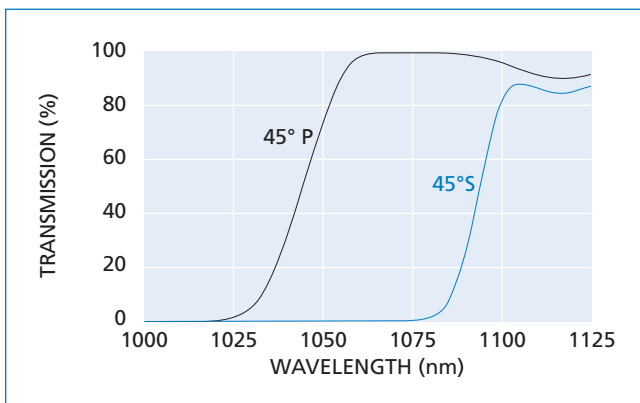
Thin-Film Plate Polarizers for 45°

TFPN thin-film plate polarizers are an ideal choice when high laser damage threshold and a 90-degree reflection angle are necessary. The TFPN is ideal for use as either a polarizing beamsplitter or beam combiner.

The hard dielectric coating is both durable and dense, making it easy to clean, simple to align and impervious to the wavelength shift inherent in most thin film polarizers.

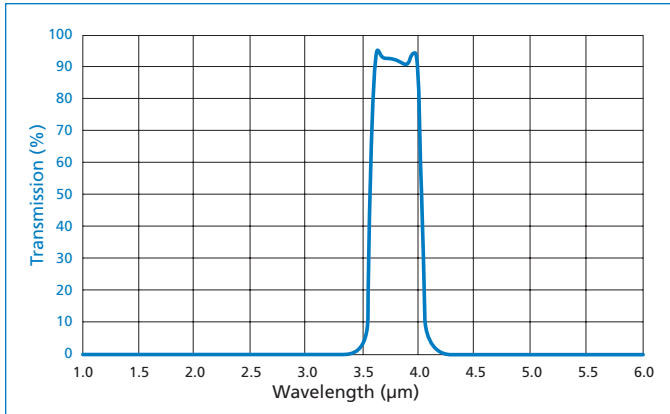
Other features of the TFPN plate polarizer include high extinction ratio, low transmitted wavefront distortion, and a high transmission efficiency for p-polarized light.

- High-energy laser line polarizer
- Reflected and transmitted beams separated by 90°
- No angle tuning required
- Easy to align, handle and mount
- Larger clear aperture than Brewster plate polarizers



Transmission vs wavelength of TFPN series 1064 nm thin film plate polarizers

HARD COATINGS



CO 40BP-c4 Bandpass filter for Germanium

Bandpass filter for Germanium 3.6 - 4.2 μm

This coating is designed for thermal imaging applications and offers maximum transmission combined with wide blocking bands. This coating can operate at 77°K and does not contain any radioactive materials.

SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Germanium substrate.

TRANSMISSION > 90% (average) from 3.6 - 4.0 μm

TRANSMISSION > 85% (absolute) from 3.6 - 4.0 μm

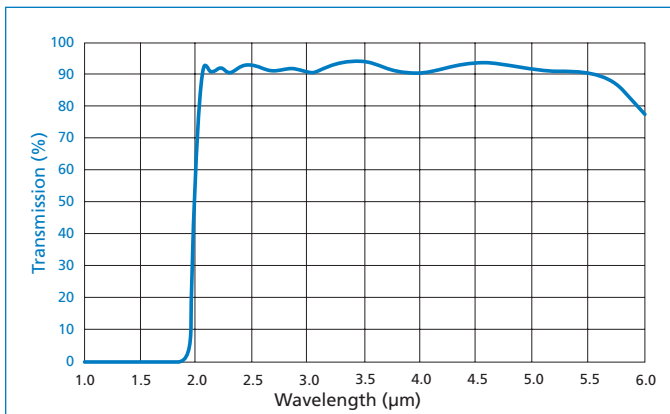
TRANSMISSION < 0.1% (absolute) from Visible - 3.4 μm

TRANSMISSION < 0.1% (absolute) from 4.3 - 6.0 μm

This coating is representative of our coating technology and multiple variations can be designed to cover the 1 - 7 μm band.

ENVIRONMENTAL PERFORMANCE

This coating will withstand the industry environmental tests which will be carried out on a representative witness piece coated in the same batch.



CO 34LWP-C1 Longwave pass filter for Silicon

Longwave pass filter for Silicon 2.1 - 5 μm

This coating is designed for thermal imaging applications and offers maximum transmission combined with wide blocking bands. This coating can operate at 77°K and does not contain any radioactive materials.

SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Silicon substrate.

TRANSMISSION > 90% (average) from 2.1 - 5.5 μm

TRANSMISSION > 85% (absolute) from 2.1 - 5.5 μm

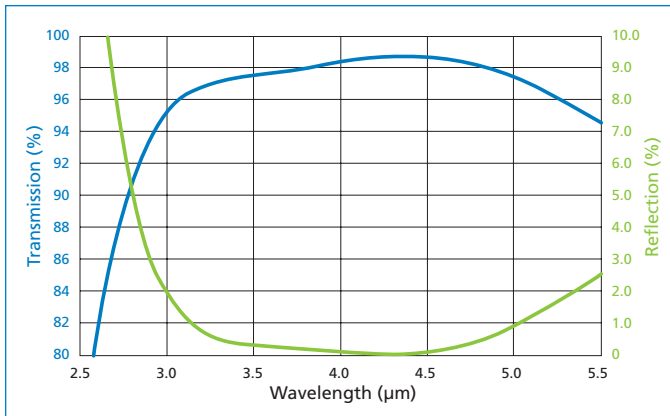
TRANSMISSION < 0.1% (absolute) from Visible - 1.9 μm

This coating is representative of our coating technology and multiple variations can be designed to cover the 1 - 7 μm band.

ENVIRONMENTAL PERFORMANCE

The coating will withstand the industry environmental tests which will be carried out on a representative witness piece coated in the same batch.

HARD COATINGS



CO 3435 STAR Si 3-5 Sea salt rugged, high durability AR coating for Silicon

Harsh Environment Antireflection Coating

This coating is designed for use on the external surface of lenses and windows that are exposed to harsh (in particular, marine) environments, in those cases where the residual reflectance and lower transmittance of hard carbon (CO 3404) is undesirable. In addition the coating can be designed to match the response curve of particular detectors in order to minimise narcissus.

SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Silicon substrate which has been coated on one surface with CO 3435 and on the second surface with CO 3429 (High Efficiency Coating)

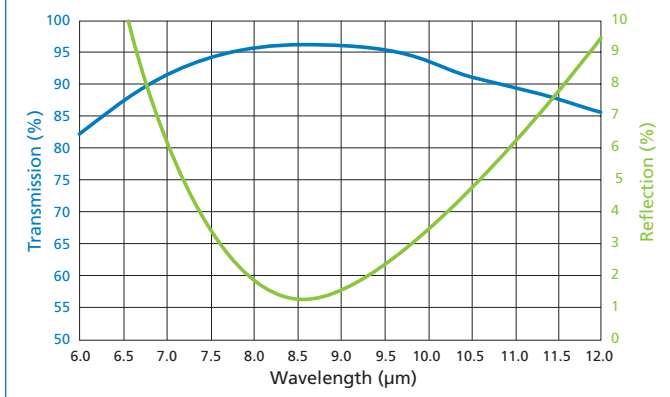
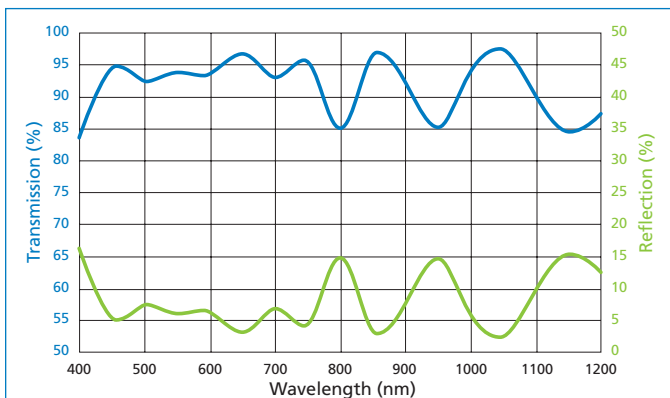
TRANSMISSION > 97.5% (average) from 3 - 5 μm , or > 98% (average) from 3.5 - 5 μm

Reflection values are for a single Silicon surface coated with CO 3435

REFLECTANCE < 0.5% (average) from 3 - 5 μm , or < 0.3% (average) from 3.5 - 5 μm

ENVIRONMENTAL PERFORMANCE

This coating will withstand the industry environmental tests which will be carried out on a representative witness piece coated in the same batch.



CO 2202E ZnS Multispectral Wiper resistant multispectral AR coating for Zinc Sulphide

Multispectral ZnS Antireflection Coating

This coating is designed to give maximum transmission at wavelengths in the visible - 12 μm region. Typically used in optical systems operating at more than one wavelength region and is suitable for external surfaces.

SPECTRAL PERFORMANCE

Transmission values are for a 2 mm thick multispectral Zinc Sulphide substrate which has been coated on both surfaces with CO 2202.

TRANSMISSION > 92% (average) from 450 - 650 nm

TRANSMISSION > 95% (absolute) at 1064 or 1540 nm

TRANSMISSION > 93% (average) from 8 - 11.5 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the industry environmental tests which will be carried out on a representative witness piece coated in the same batch.

