ADVANCED
Technologies

THIN FILM EQUIPMENT
&
PRECISION OPTICS

THIN FILM COATINGS & OPTICS

THE COMPANY

The HHV Group is India's premier thin film and vacuum technology group with over 60 years of expertise in the design and manufacture of high vacuum equipment for research and industrial applications.

HHV Advanced Technologies (HHVAT) is a global manufacturer of vacuum coating systems for optical, decorative and functional coatings, astronomical telescope mirror coaters and special purpose vacuum equipment.

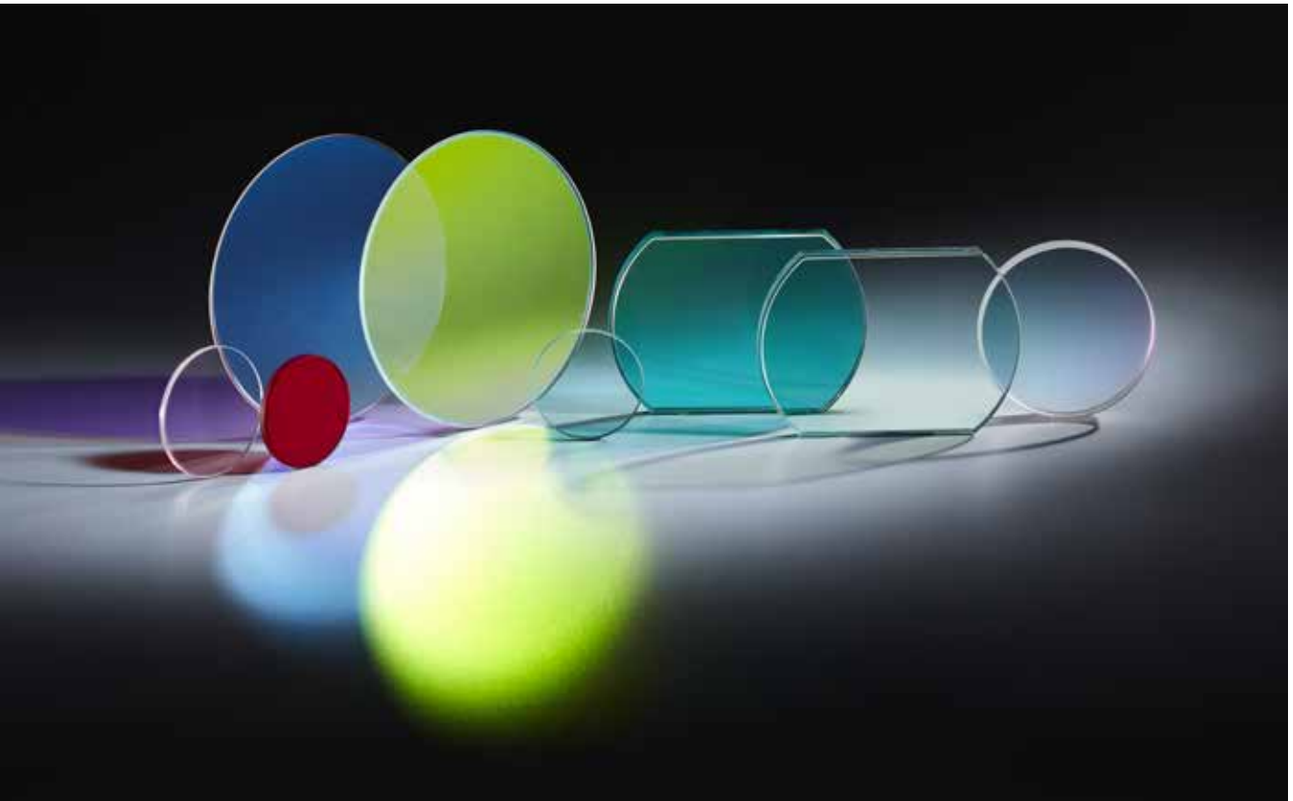
HHVAT is a leading manufacturer of high precision optical components and thin film coatings. Our products are integral to multiple sectors that include Aerospace, Automotive, Defense and Space.

HHVAT has multiple manufacturing facilities located in Bengaluru, India and offices located globally. HHVAT is an ISO 9001:2015, ISO 14001:2015 and ISO 45001:2018 certified company.

CONTENTS

TECHNOLOGY & EXPERTISE

PRODUCTS



TECHNOLOGY & EXPERTISE

HHVAT provides end to end services from customized design to supplying the final product. The Thin Films and Optics Division has a wide range of technical coating and optics focused capabilities.

THIN FILM COATING

The Thin Films and Optics Division has a wide range of technical coating and optics capabilities such as:

1. Single and wide band Anti-Reflection coatings
2. High Reflective Metal and Dielectric coatings
3. Beam Splitter coatings
4. Transparent Conductive coatings
5. Short pass, Long pass, Band pass and Notch Filter coatings
6. Custom coatings based on customer requirements

We have numerous coating systems with the capability for coating a full range of optical coating materials. Our coating technologies include:

1. Magnetron Sputtering systems
2. Ion-Assisted E-Beam Deposition systems
3. Resistance Evaporation systems
4. Plasma Enhanced Chemical Vapour Deposition systems
5. Atomic Layer Deposition systems

DESIGN CAPABILITIES

We utilize several software programs including Essential Macleod, TF-Calc and CODE to create coatings with the best possible design, optimisation, and sensitivity.

RESEARCH AND DEVELOPMENT TEAM

The Thin Film and Optics R&D team consists of scientists and engineers who are uniquely qualified to provide a variety of application integration services to customers by creating ideal solutions for thin film requirements. Our R&D team is equipped to develop products through our extensive design and manufacturing resources to create products that meet customer needs.

PHOTOLITHOGRAPHY LAB

Our Photolithography Lab (PLL) develops Thin Film Metallized Circuits on alumina substrates.

The Photolithography Lab produces various types of circuits with multi-layers of metallization for different frequencies.

The Lab is is equipped with a laser writer for mask fabrication, UV exposure systems, an etching room containing a chemical wet bench, dicing machines to cut the metallized substrates to required sizes and high-performance microscopes and profile projectors for inspection and measurement of the patterned substrates.

Our Photolithography Lab has ISO 7, ISO 8 clean rooms and class 100 laminar flow stations that allow us to achieve resolutions of up to 40 microns.

Clean Room

Metallization Lab

Photolithography Lab

Inspection Lab

PRECISION OPTICS FABRICATION LAB

The precision Optics Fabrication Lab (OFL) is equipped with state-of-the-art technology and machinery to fabricate high precision optical components for the visible and infrared spectrum.

We offer end to end solutions, from substrate manufacture to the thin film coated component, for complex optical system requirements, especially for space and defense departments.

We are equipped with high quality machines for slitting, trepanning, curve generation, grinding, polishing, centring and edging for spherical and aspherical optics.

Finished products go through rigorous quality checks with equipment such as Zygo interferometers with transmission spheres to measure surface figures up to 1/10th of lambda, Davidson autocollimators to measure surface angles and parallelism to an accuracy of one arc second, and Trioptics spherometers to measure the radius of curvature of various components to an accuracy of one micron.

Our expertise comes from its superior thin film coating ability and knowledge of handling materials like fused silica, zerodur, optical glass for the visible spectrum and silicon, germanium, zinc sulphide, barium fluoride, calcium fluoride and lithium fluoride materials for the infrared spectrum.

We develop lenses, flats, prisms, aspherics and infra-red domes for applications including visible, night vision optics, binoculars, periscopes, astronomical telescopes and defense products.

Optics Fabrication Lab

We have has the capability to manufacture a wide variety of prisms with tight tolerances, accurate fringe control, and angle precision. We offer different types of prisms such as dispersion prisms, deflection or reflection prisms, rotating prisms and offset prisms.

SINGLE POINT DIAMOND TURNING

Our Single Point Diamond Turning (SPDT) ultra-precision machines fabricate crystalline infrared materials like Silicon and Germanium. Our SPDT systems are used to manufacture spherical and aspherical optical components.

Talysurf PGI Freeform for freeform and aspheric optics

Nanoform systems for Single Point Diamond Turning

QUALITY ASSURANCE

We have the ability to perform a wide range of quality tests to ensure products are compliant to customer standards. All our characterization equipment are tested, controlled, calibrated and maintained to meet the requirements of our Quality System.

Characterization Lab

PRODUCTS

We produce high-quality, standard and custom designed thin film and optics products for a wide range of scientific, industrial, defense and space applications.

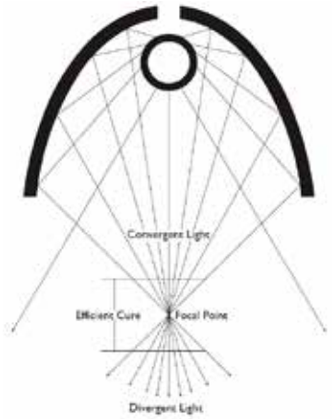
1. UV REFLECTOR
Glass & Aluminium

We are the world's largest manufacturer of UV retflectors. UV reflectors direct UV light on to substrates that are being cured. They play a critical role in UV curing systems by enhancing the efficiency of the curing process.

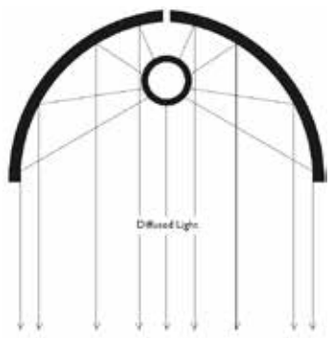
UV reflectors are widely used for flexographic printing where UV curable ink offers images with sharper colours and outputs that consume less energy. Label printing industries use UV reflectors to dry UV curable inks and varnishes. UV dichroic reflectors reflect UV radiation and transmit IR radiation, thus acting as a cold mirror, which significantly reduces the heating up of objects being cured.

Aluminium reflectors are used for low wattage applications, whereas as quartz glass reflectors are used for higher temperature applications.

Our coatings ensure higher output and lower energy consumption and are available in spherical and elliptical profiles. Our coatings provide thermal stability up to 350 °C on glass and 250 °C on aluminium and ensure high reflectivity within the UV spectrum and high transmission and absorption for wavelengths in the visible and IR spectrum.

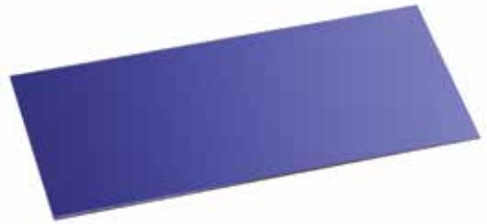


Elliptical Reflector



Parabolic Reflector

UV Reflectors : Glass



UV Reflectors : Aluminium

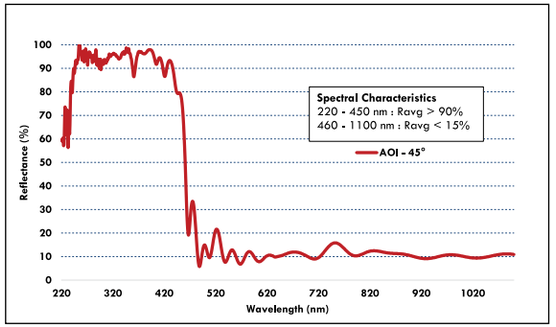
We provide end to end services from cutting and bending the substrate to coating and marking the reflectors.

PRODUCT FEATURES

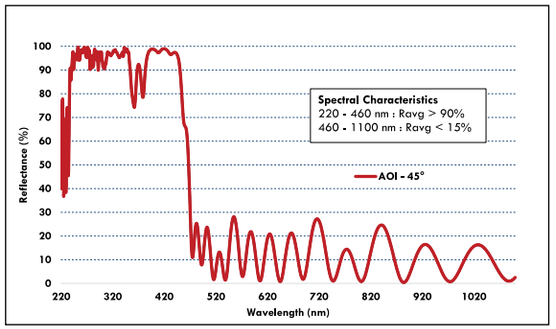
- Substrate: Borofloat Glass, Quartz, Stainless Steel, Aluminium sheets & Extrusions
- Dimension: Lengths up to 1200 mm
- Durability: MIL-C-48497A
- Custom profiles and designs available upon request

APPLICATIONS

- Drying and curing inks for label printing
- Adhesion reduction of semiconductor dicing tape
- Curing optically clear adhesives in LCD panels
- Curing varnishes and paints to process wood
- Curing conformal coatings on electronic components
- Curing adhesives for mobile phone components



Reflectance: UV Dichroic Coating On Glass



Reflectance: UV Dichroic Coating On Aluminium

2. UV REFLECTOR
Fibre Optics

UV curing systems utilize UV reflectors to rapidly and evenly cure fibre optic cables, from core to clad, using high intensity light. Glass optical fibre is produced on a multi-story drawing tower where a preform is heated and pulled to thin strands at high speeds. Fibres cured with UV radiation are especially resistant to abrasion and scratches at higher production speeds.

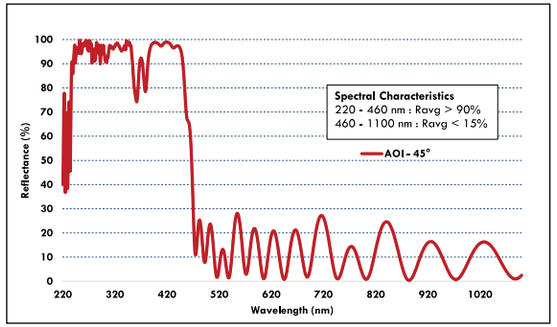
Our fibre optic reflector coatings are carried out through a thin film deposition technique that uses alternate layers of high and low index oxide layers.

The UV cured optical fibre coating is used to close notches that occur during pultrusion. It also prevents cracks and protects and strengthens the optical fibres.

UV paints are applied and cured on optical fibres for colour coding and marking. Vented reflectors are commonly used with microwave powered UV lamp systems that are required to filter ozone out of the system. Based on the configuration and placement of the reflector with respect to the UV lamp source, the reflector can be classified as front or back and act as a hot or cold mirror.

End reflectors include a small hole for holding the UV bulb in the focus position for maximum peak irradiance. The reflectors have precisely shaped geometry to maximise UV light and can directly replace OEM products.

The coatings have high reflectance in the UVA, UVB and UVC regions with high absorbance of IR energy. Our reflectors are available with or without dichroic coatings.



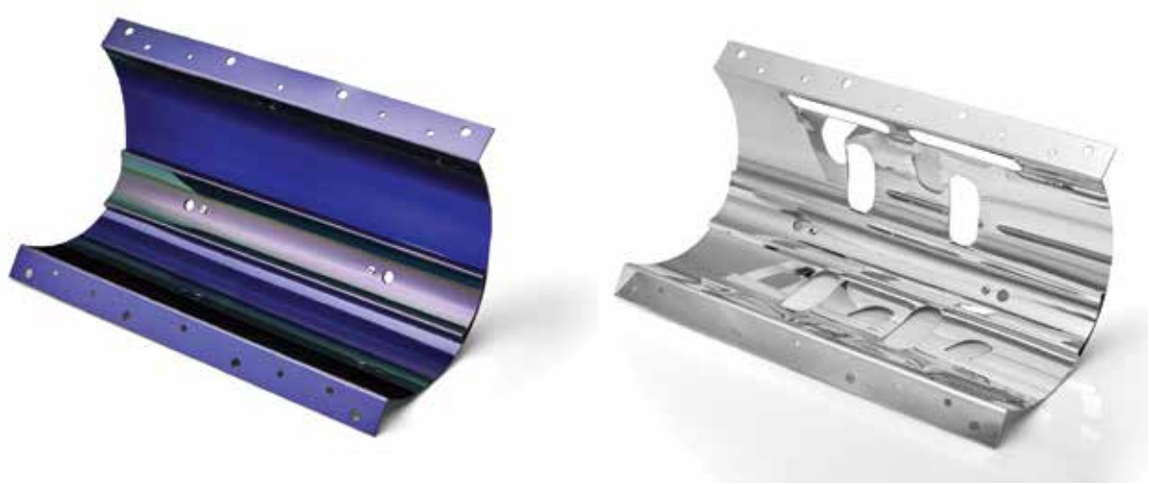
Reflectance: UV Dichroic Coating on Aluminium

PRODUCT FEATURES

- Substrate: Aluminium
- Dimension: Lengths up to 1200mm
- Durability: MIL-C-48497A
- Custom profiles and designs available upon request

APPLICATIONS

- Curing of optical fibres for telecommunications
- Curing of inks on wire and cable products for colouring



UV Reflectors Fiber Optics

3. IR BLOCKERS

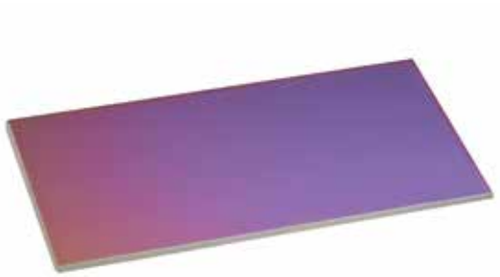
Our IR blocker coatings are deposited on quartz glass substrates and selectively filter ultra-violet energy from the source, while blocking unwanted visible and infra-red energy. IR blockers are used in conjunction with UV reflectors, and the entire system acts as a UV filter. IR blockers are placed in front of a UV lamp source and function as a hot mirror, thus keeping the UV system cool by protecting heat-sensitive materials, lamps and reflectors from ink evaporants. Our IR blocker coatings have thermal stability up to 400 °C and high transmission in the UV range.

PRODUCT FEATURES

- Substrate: Quartz
- Dimension: Lengths up to 600 mm
  Thickness: 2 to 3 mm
- Durability: MIL-C-48497A
- Custom profiles and designs available upon request

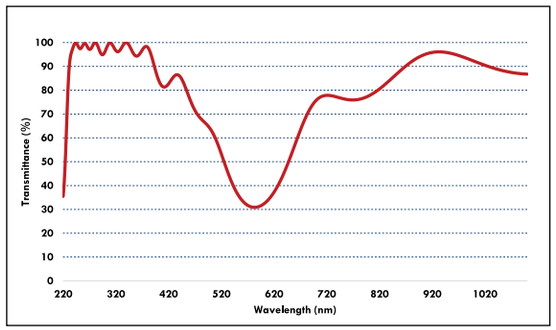
APPLICATIONS

- UV curing systems for temperature-sensitive materials



IR Blocker

UV Curing System with IR Blocker



UV Transmittance: On IR Blocking Window

4. VISIBLE ULTRA-LOW REFLECTION COATINGS

Ultra-Low Reflection (ULR) lenses are designed to eliminate glare, lens flare, and ghosting, ensuring brighter and sharper visuals even in challenging lighting conditions. These lenses are coated with precision-engineered multilayer dielectric coatings that achieve an impressively low reflection rate of 0.25% across the visible spectrum (420nm–680nm), allowing for a remarkable 99.75% light transmission. This advanced optical coating technology is tailored for professional cinematography, and critical industrial applications where image clarity and performance are paramount.

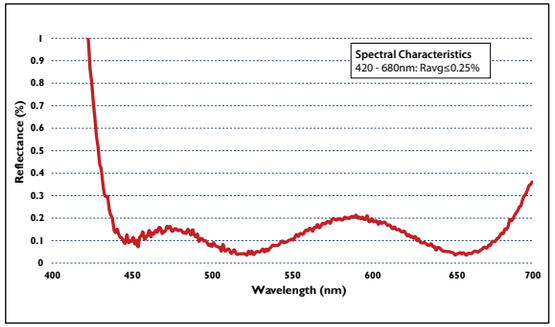
Our ULR coating meets the rigorous quality standards of MIL-PRF-13830B. Designed for reliability, these lenses excel in high-performance environments, ensuring durability even under the most demanding conditions. Additionally, they can be optimized for specific angles of incidence (AOI) at 39° to 51° accommodating a range of optical system layouts used in field applications.

PRODUCT FEATURES

- Substrate: Visible Glass optics
- Dimension: Up to 280mm
- Durability: MIL-PRF-13830B
- Custom profiles and designs available upon request

APPLICATIONS

- Camera Lenses
- Cinematography lenses
- Beam Splitters
- Optical Metrology Set ups



Reflectance: Visible Spectrum 420-680nm

Camera Lens

5. LASER SAFETY GLASSES

We continue to lead the way in technologically advanced laser safety glasses that adhere to international laser safety standards. Laser safety eyewear is designed to reduce hazardous laser eye exposure to safe and permissible levels by providing an optical density (OD) that attenuates the laser that is being used, while allowing enough visible light transmission (VLT) for comfortable visibility.

We offer the highest quality laser safety glasses with ODs suitable for most photonics applications. Our coatings cover visible to near-infrared wavelengths. HHVAT's thin film laser glasses have multi-layer coatings with high ODs and VLT.

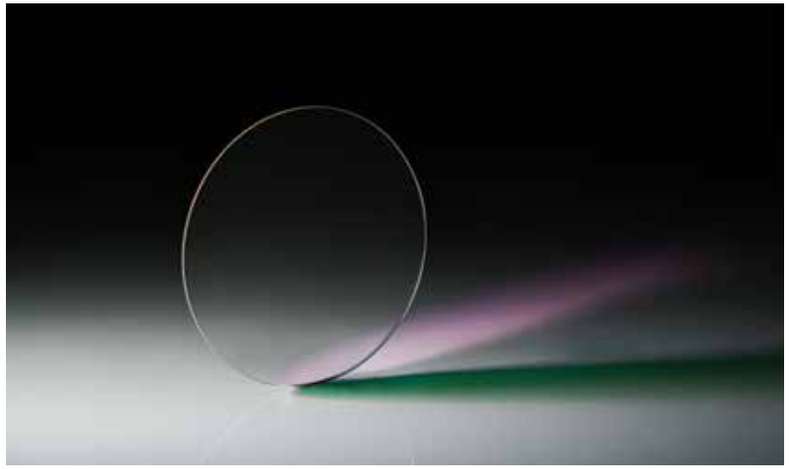
Our laser glasses offer safety against Class 3R, Class 3B and Class 4 lasers

PRODUCT FEATURES

- Substrate: Borofloat, KG5
- Dimension: Diameter upto 230 mm
- Durability: MIL-C-675C
- Custom filters can be designed and produced upon request
- Optical Density: Upto OD 8+

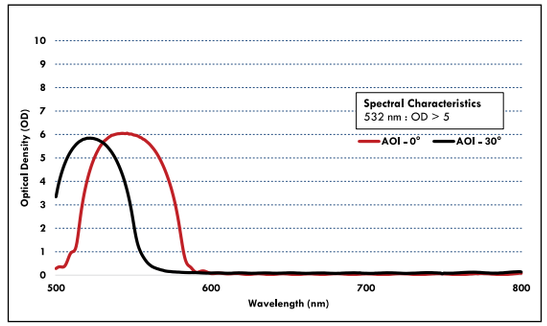
APPLICATIONS

- Laser safety eyewear in the medical industry
- Laser safety eyewear in the military

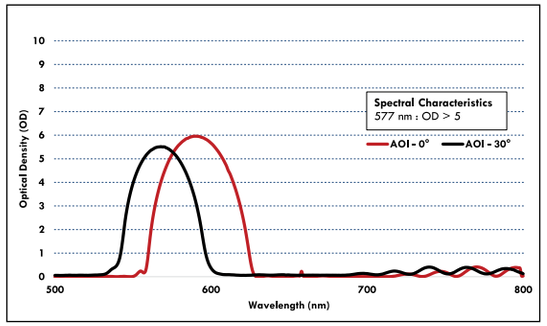


Laser Safety Glass

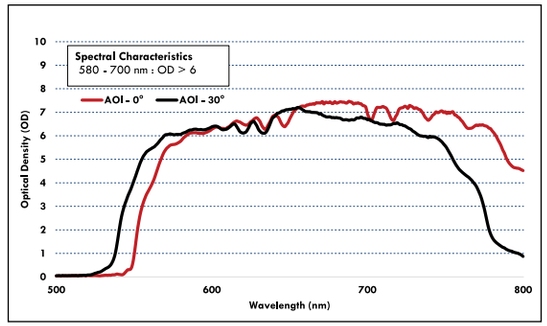
Spectral Graphs



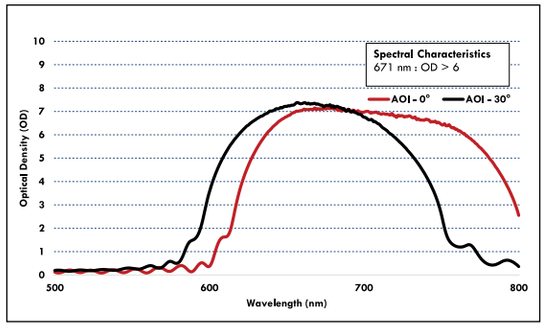
Optical Density: 532 nm



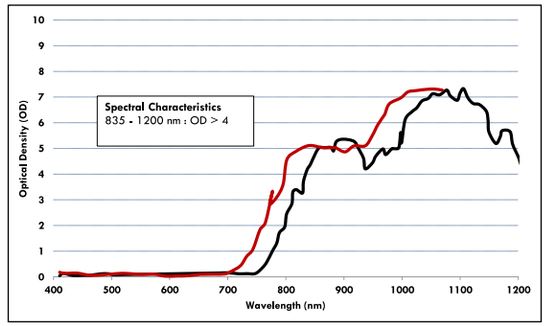
Optical Density: 577 nm



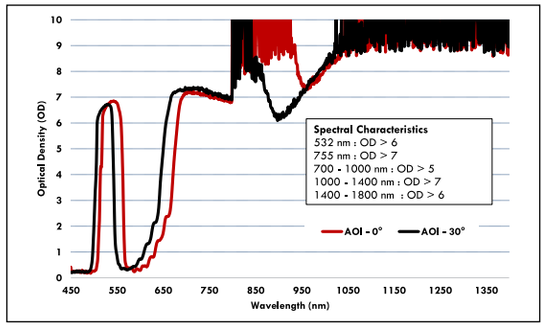
Optical Density: 580 - 700 nm



Optical Density: 671 nm



Optical Density: 830 - 1200 nm



Optical Density: Multi Band

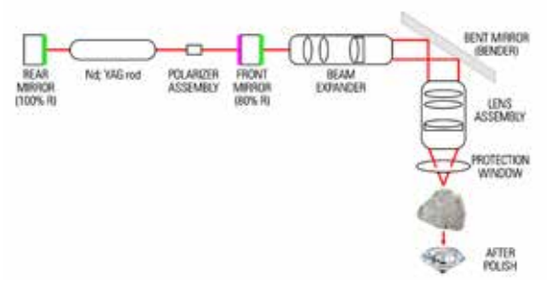
6. LASER OPTICS

High reflective laser mirrors are used in laser resonators to increase the intensity of the beam. HHVAT's multilayer coatings ensure high reflection, durability and high Laser Induced Damage Thresholds (LIDT).

We have proven expertise in designing laser mirrors that offer high damage threshold. Beam steering mirrors are used outside the laser cavity and are used to fold the laser beam. These mirrors are mounted at a 45° angle to the beam direction.

Our laser mirror coatings are hard and durable, have achieved more than 99.95% reflectance and can withstand damage thresholds up to 20kW/Cm^2 for pulse laser at 1064 nm & 107kW/Cm for CW Laser at 1070 nm.

Our cavity laser mirrors for diamond cutting achieve more than 99.5% reflectance and can be used in laser cavities that are designed for single line, multi-line or broadband sources.



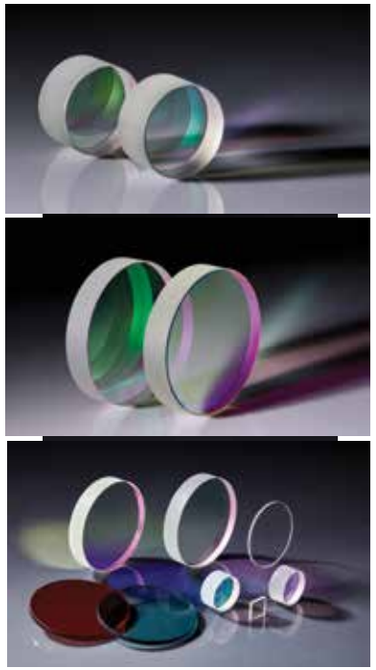
Diamond Laser Cutting setup

PRODUCT FEATURES

- Substrate: UVFS, Quartz, BK7
- Dimension: Diameter upto 280 mm
- Durability: MIL-C-675C
- Custom coating designs are available upon request

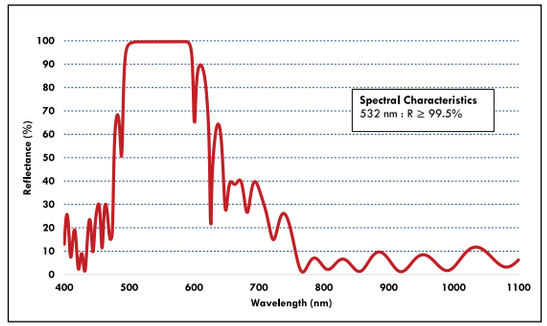
APPLICATIONS

- Additive Manufacturing
- Diamond cutting
- High reflection mirrors in laser gyros
- Industrial lasers for cutting
  Medical lasers for various operations

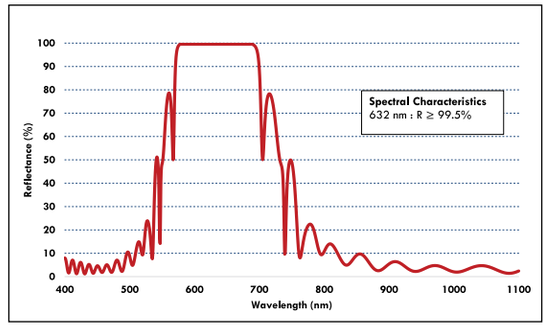


Laser Optics

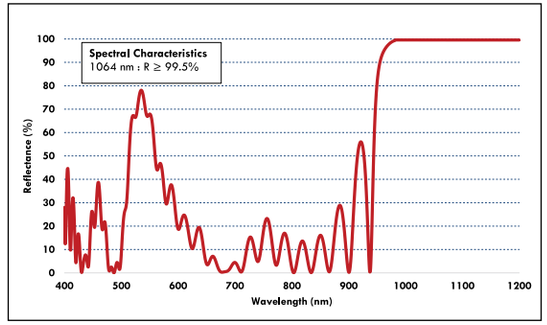
Spectral Graphs



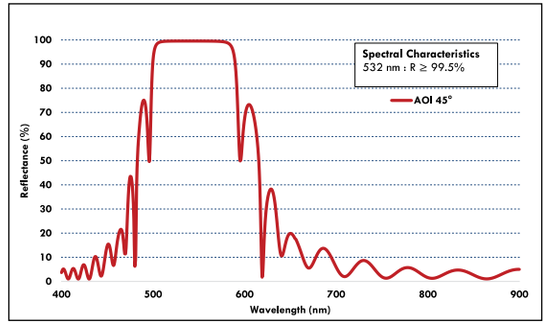
HR Mirror: 532 nm



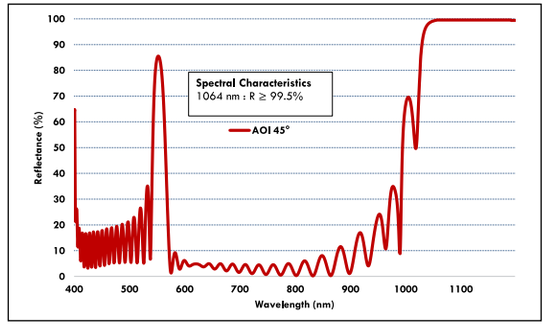
HR Mirror: 632 nm



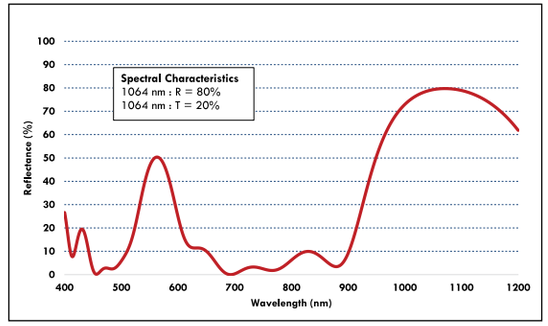
HR Mirror: 1064 nm



Beam Bender: 532 nm



Beam Bender: 1064 nm



Output Coupler: 1064 nm

7. NIGHT VISION OPTICS

Night vision technology uses infrared radiation for imaging in a dark environment. The three main classes of night vision technology are NIR, low-light and thermal imaging. NIR imaging uses an infrared illuminator to provide grey-scale images. Low-light imaging uses an image intensifier tube to amplify available light.

Thermal imaging creates an electronic image from an object's heat signature. We offer a variety of coatings for Night Vision Devices (NVD) on silicon and germanium. For applications such as thermal windows, a high efficiency and high durability anti-reflection coating is coupled with a hard and adherent Diamond-Like Carbon (DLC) coating to provide superior properties in terms of transmission and hardness.

Our AR coatings contain no radioactive materials and have a high transmission in the MWIR band for Silicon and LWIR and MWIR bands for Germanium.

Germanium Window

The DLC coatings possess high hardness and high transmission in the MWIR band for Silicon and LWIR and MWIR bands for Germanium.

PRODUCT FEATURES

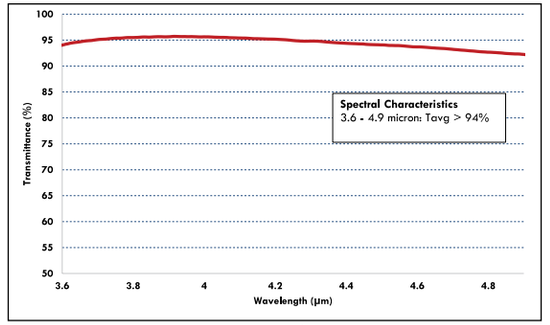
- Substrate: Silicon, Germanium, Zinc Sulphide, Zinc Selenide and Chalcogenide Glass, Sapphire
- Dimension: Diameter up to 230mm
- Durability:
  - ARC: MIL-C-48497, MIL-675C
  - DLC: MIL-C-48497A, TS-1888 (Windshield Wiper)
- Custom coating designs are available upon request

APPLICATIONS

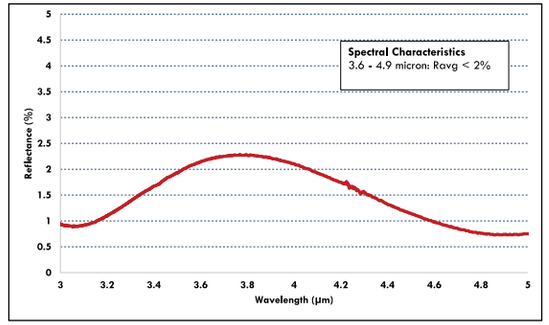
- Thermal imaging
- Pyrometers

Night Vision Optics

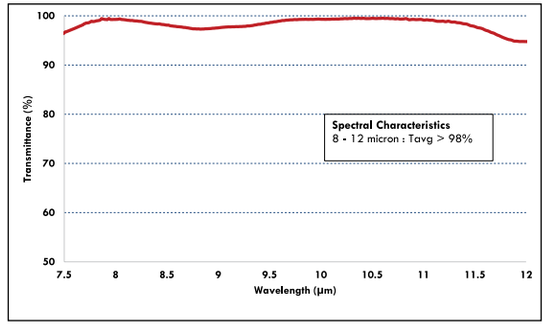
Spectral Graphs



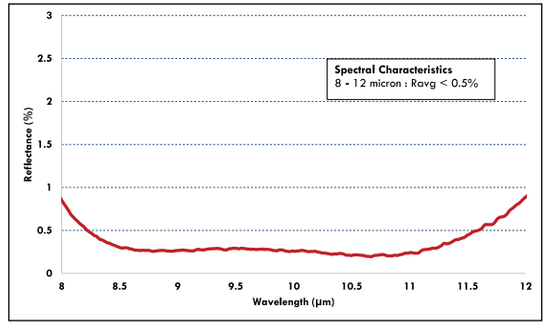
Transmittance: HEAR On Silicon In MWIR Region



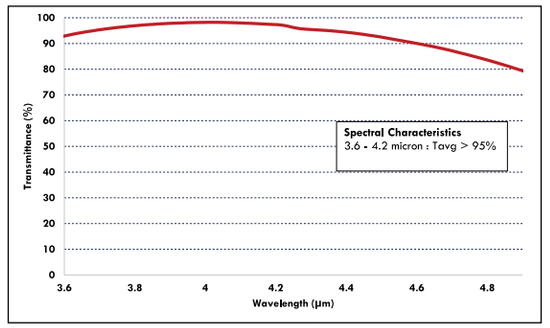
Reflectance: HEAR On Silicon In MWIR Region



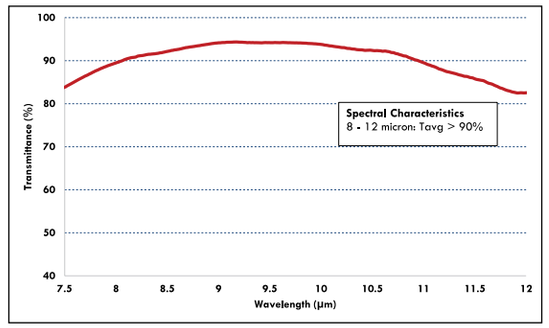
Transmittance: HEAR On Ge In LWIR Region



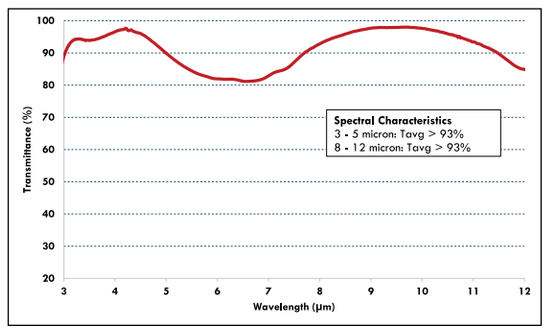
Reflectance: HEAR On Ge In LWIR Region



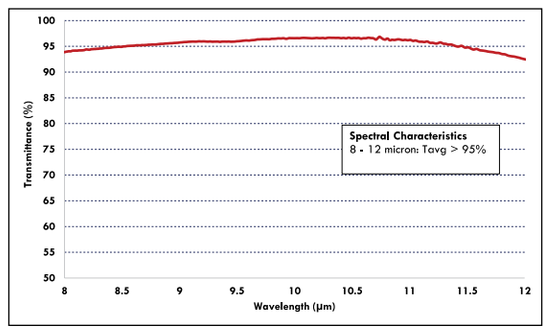
Transmittance: HEAR On Sapphire In MWIR Region



Transmittance: DLC + HEAR On Ge In LWIR Region



Transmittance: Dual Band ARC On Ge In MWIR & LWIR Region



Transmittance: HEAR On Chalcogenide Glass

8. PERISCOPE AND PRISMS

Periscope consists of ITO coated heater plate that is laminated with a prism through an autoclave process for sealing and encapsulation.

A periscope makes use of two triangular prisms to change the direction of light by 90°. The reflective portion of the prism consists of a silver coating that is deposited directly on the prism.

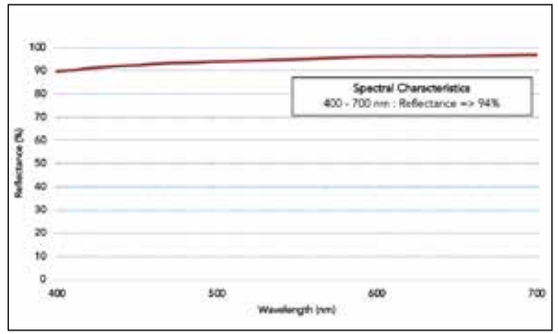
Our reflective coatings are finished with protective paint to prevent it from atmospheric degradation. The entire assembly is bullet-proof and chemically inert. Prisms can also be supplied on request.

PRODUCT FEATURES

- Substrate: Glass and PMMA
- Dimension: Lengths up to 300 mm
- Periscopicity: 225 max
- Total field of view, Horizontal up to 110° and Vertical up to: 30°
- Laser Safety protection is available
- Durability: Temperatures: -40 °C to +60 °C, Relative humidity of 95%
- Custom periscope can be designed and produced upon request

APPLICATIONS

- Periscopes in submarines for defense
- Periscopes in battle tanks for defense



Reflectance: Silver Coating

Periscope Prisms

Periscope

9. TRANSPARENT HEATERS

Transparent heaters are substrates coated with transparent and electrically conductive ITO coatings. Controlling the sheet resistance of the film and the resistance of the heating element allows us to control the attainable temperature of the heater. The shape or pattern of the resistor circuit can be fine-tuned for optimum performance.

Bus bars are provided at the edge of the heater for integration with an external power source. ITO coatings can be applied on glass, plastics such as acrylic and polycarbonate and flexible substrates such as PET and Kapton which are widely used in flat panel displays, scientific research and LCD / OLED manufacturing processes.

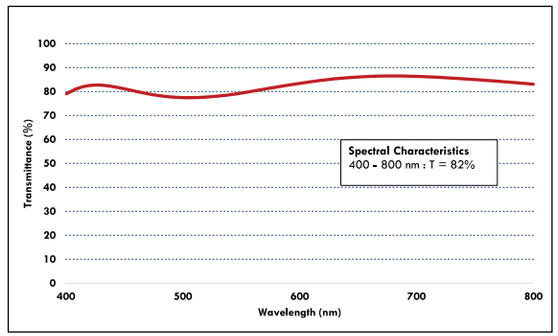
Additionally, ITO coatings can be index-matched (IMITO) along with an anti-reflective coating to reduce reflectance at various interfaces. ITO glasses are laminated and autoclaved for higher strengths.

PRODUCT FEATURES

- Substrate: BK 7, Borofloat, Polycarbonate, Acrylic
- Dimension: Lengths up to 300 mm
- Durability:
- - Autoclaved heaters: -40 °C to +60 °C, Relative humidity of 95%
  - ITO Coatings on glass and plastic: MIL- STD-810F
  Shapes, profiles and resistance can tailored to customer requirements

APPLICATIONS

- Defogging windows
- Electronic devices
- LCD panels
- Cockpit displays
- Automobile windshields and headlights
- Slides for microscopes
- Camera security systems



Transmittance: ITO Coating On BK-7

Transparent Heaters

10. THIN FILM METALLIZED CIRCUITS

Our thin film metallization process is carried out through magnetron sputtering.
The deposited metal layers show superior adhesion, structural and electrical properties in comparison to non-vacuum methods.

Metallization schemes that we offer:

TiW/Au or TaN/TiW/Au	TiW: 200 - 500 Å Au: 5 - 7 µm TaN: 10 - 250 Ω/□ if resistor layer is required
TiW/Au/NiV/Au	TiW: 200 - 500 Å Au: 3 - 3.5 µm NiV: 0.5 - 1 µm Au: 2 - 2.5 µm
Cr/Cu/Au	Cr: 200 - 800 Å Cu: 4 - 5 µm Au: 1.8 - 2 µm
Cr/Cu/Ni/Au	Cr: 200 - 800 Å Cu: 4 - 5 µm Ni: 0.1 - 0.5 µm Au: 1.8 - 2 µm
NiCr/Cu	NiCr: 200 Ω/□ Cu: 5 - 7 µm
NiCr/Ni/Au	NiCr: 200 Ω/□ Ni: 0.1 - 0.5 µm Au: 3 µm
TiW/Au or Cr/Au	Au: 0.5 - 7 µm TiW: 200 - 500 Å Cr: 200 - 800 Å

The metallization schemes start with a bonding layer of titanium-tungsten or chromium and a conductive layer of gold or copper on a ceramic substrate. For resistor applications we use tantalum-nitride (TaN) or nickel-chromium (NiCr) layers and for solderable applications nickel or copper is added to the metallization scheme. All the metal layers are deposited in a single cycle without breaking the vacuum process.

The sheet resistance of TaN, NiCr and SiCr layers can be tuned from few ohms per square to several kiloohms per square depending on the application.

Subsequent to the metallization, the substrates are patterned in an in-house photolithography facility. We use positive photo resist to produce mask plates, For patterning, the substrates are first coated with a negative photoresist through spin coating and baked.

The patterns are generated using a mask aligner and UV exposure system.

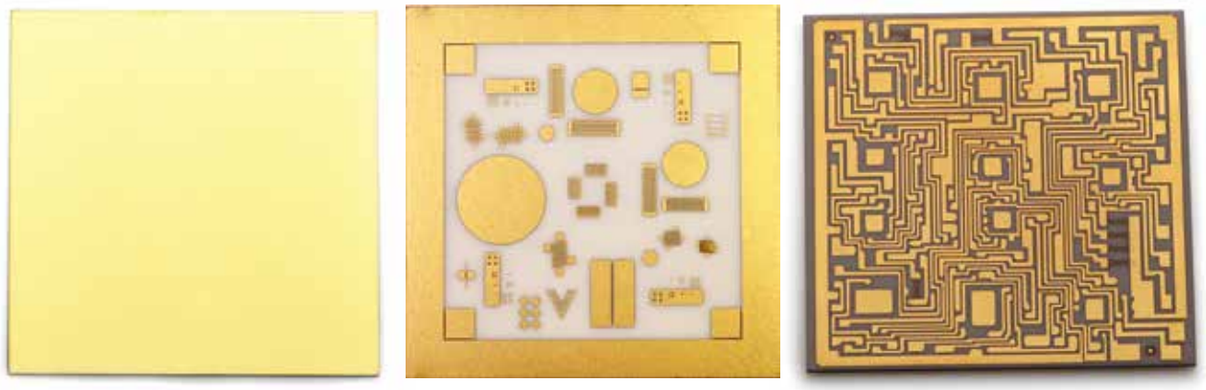
The photoresist is then developed to realize the required pattern. With our in-house direct laser writing facility, we can achieve resolutions of 1 micron on photomasks and our lithography facility is capable of producing patterns with 10 micron linewidths.

PRODUCT FEATURES

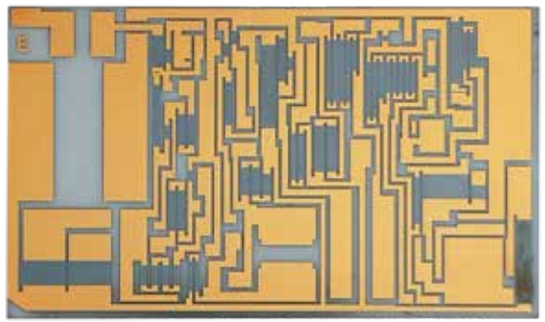
- Substrate: Alumina, Zirconia
- Dimension: Up to 2*2 inches
- Durability: Qualified for Space applications
- Custom patterns and metallization schemes can be developed and produced on request

APPLICATIONS

- RF/Microwave integrated circuits
- Hybrid micro circuits
- SAW devices
- RADAR
- Thin film resistors
- Reticles



Hybrid Micro Circuits



Thin Film Resistors

11. MIRROR COATINGS AND METAL OPTICS

We offer a comprehensive range of protective as well as enhanced metallic mirror coatings on both aluminum and glass substrates. They can be tailored to meet your requirements.

In recent years, laser scanning has been used to identify the accurate distance between targets from combat vehicles. Laser beams are fired towards the target and the intensity/time of flight of the reflected beams are measured.

Laser scanners are silver coated mirrors, which rotate at certain angles to position the laser beams onto the target. It should possess lightweight and stiffness.

The critical requirements are lightweight, stiffness, strength and higher reflectivity in the required wavelength. A clock records the time of firing and receiving pulse. With the time data, the distance is calculated, and the target can be fired.

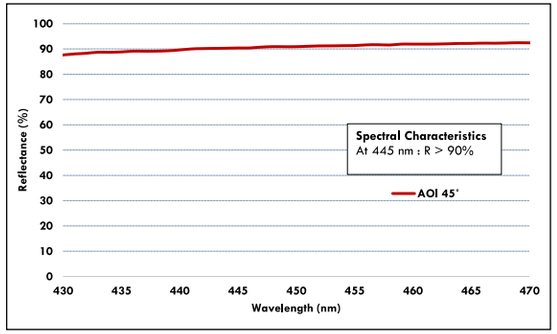
Our coatings improve reflectance, reduce light losses, and enhance resistance to environmental factors, making them crucial in high-precision optical systems, high-power laser applications, and advanced imaging technologies.

FEATURES

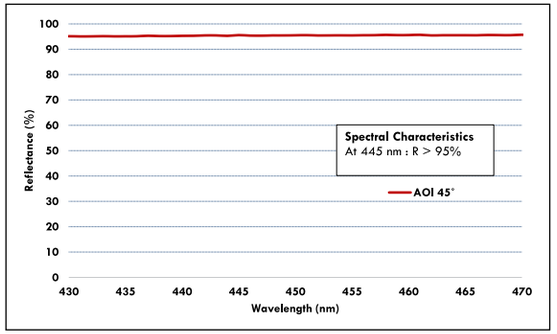
- Substrate: Aluminium, Glass, Glass and Metal Sealed
- Forms: Flat, Aspherical, Off-Axis, Parabola, Hyperbola, Cylindrical
- Dimension: Diameter up to 200 mm
- Flatness: λ/4
- Durability: MIL-C-48497A
- Custom coating designs are available upon request

APPLICATIONS

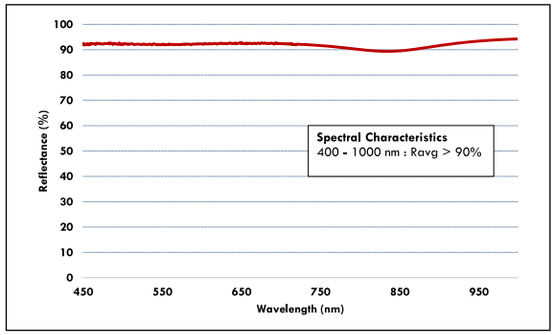
- High power laser systems to focus laser beam
- Defense and security in imaging and detection system
- Spectroscopy for high precision focusing of light
- Telescopic mirrors
- Thermal imaging unit of fire control systems in military tanks.



Reflectance: Silver Coating On Glass

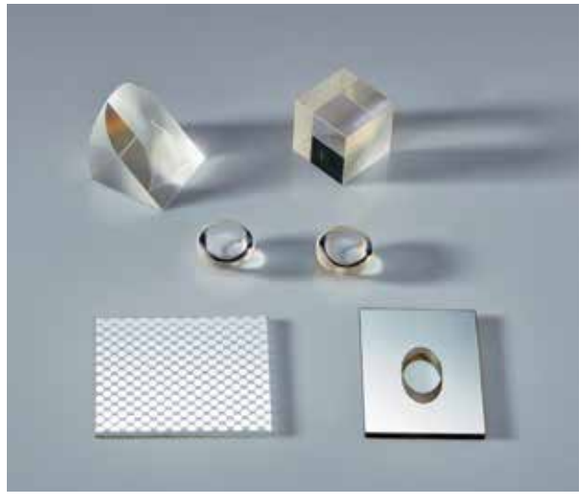


Reflectance: Enhanced Aluminium Coating On Aluminium



Broad Band Reflectance: Enhanced Aluminium Coating On Glass

Aluminium Mandrel (Parabola and Hyperbola)



Metal Coated Mirrors

Off-Axis Metal Mirror

12. AR COATED ZINC SULPHIDE

Zinc Sulphide is used for missile seekers and windows due to its broadband optical transparency.

Zinc Sulphide (ZnS) domes are used as impact sensors on seeker missiles. When the missile makes contact with the target, the impact sensor sets off the warhead.

We have in-house facilities to fabricate ZnS. Substrates can be coated with high durability anti-reflection coatings suitable for the LWIR and MWIR regions with transmittance of more than 92%.

Our coatings on domes and windows are corrosion resistant, have excellent adhesion and if needed coated with a gold band to ensure a resistance of less than 12Ω.

PRODUCT FEATURES

- Substrate: Zinc Sulphide
- Dimension: Diameter up to 230 mm
- Durability: MIL-C-675, TS-1888 wiper test (40 grams load)
- Custom profiles can be generated upon request

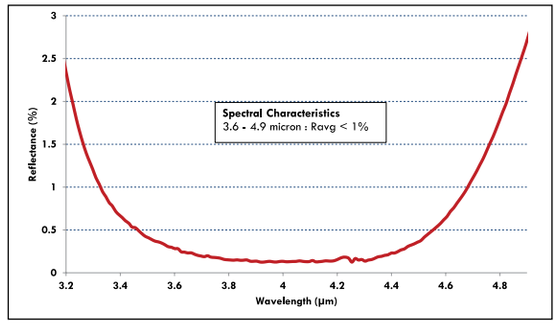
APPLICATIONS

- Seeker missiles for defense
- Front window in thermal imaging system

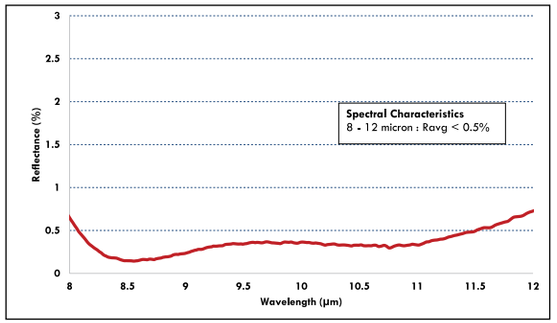
AR Coated Zinc Sulphide Domes

AR Coated Zinc Sulphide Windows

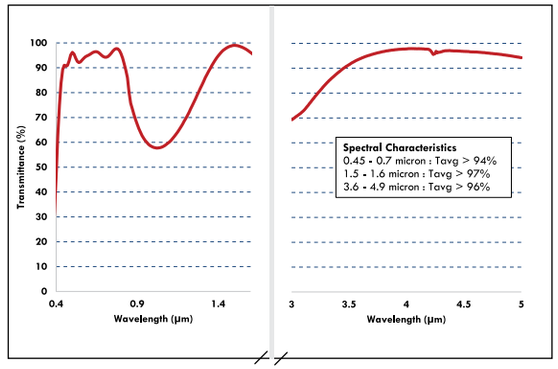
Spectral Graphs



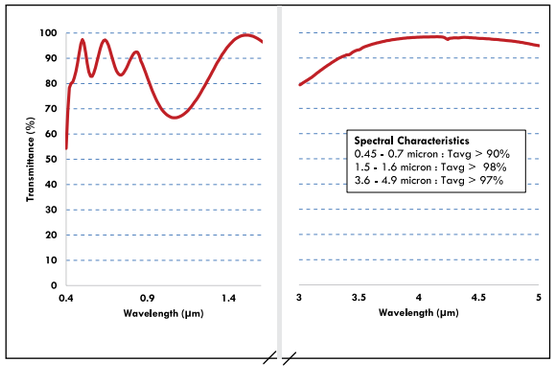
Reflectance: HEAR On ZnS In MWIR Region



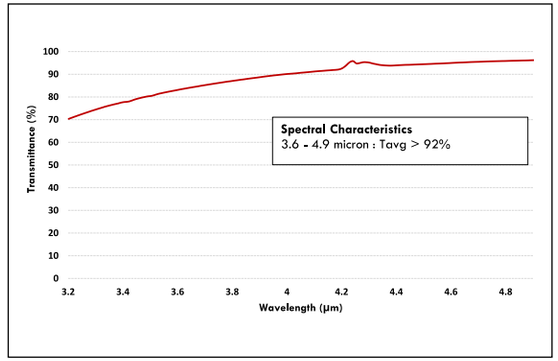
Reflectance: HEAR On ZnS In LWIR Region



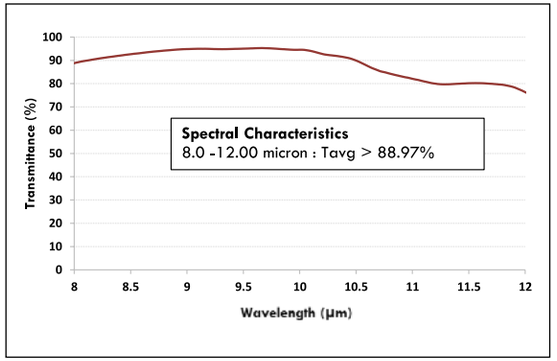
Transmittance: Triple Band HDAR On ZnS



Transmittance: Triple Band, Extremely Durable Anti-reflection coating (EDAR) on ZnS



Transmittance: HEAR On ZnS In MWIR Region



Transmittance: HEAR On ZnS In LWIR Region.

13. EMI SHIELDING COATINGS

EMI shielding coatings are used to eliminate interference of stray electromagnetic rays that can damage sensitive devices and components. Both metallic and transparent coatings can be used for EMI shielding. Commonly used metallic coatings include aluminium, copper and nickel.

We specialize in offering EMI shielding coatings on metallized plastic enclosures with complex geometries and can also custom make the coatings based on the required frequency and shielding effectiveness.

We also offer transparent EMI shielding coatings on glass and plastic substrates by depositing transparent conducting oxides such as ITO or AZO films that have high transmission in the visible range. Shielding effectiveness of our metallic EMI shielding coating is better than 80 dB for frequencies up to 1 GHz.

Shielding effectiveness of our ITO coatings are in the range of 50 to 60 dB. Index-matched ITO (IMITO) coatings can also be developed for enhanced transmission.

PRODUCT FEATURES

- Substrate: Glass, Plastic
- Dimension: Lengths up to 1000 mm
- Durability: MIL-STD-810F
- Custom requirements for resistance and coating thickness upon request

APPLICATIONS

- Smoke and fire sensors for industrial purposes
- Communication equipment and display devices for defense
- Ultrasound sensors for medical equipment
- Cockpit windshield for Aerospace

EMI Shielding Coating

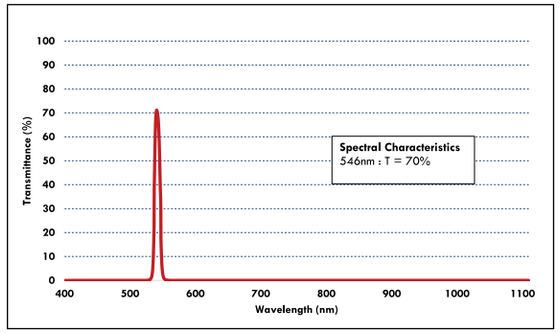
14. OPTICAL FILTERS

An optical filter is a device which selectively transmits light of a specific wavelength. We offer a broad range of optical coatings that span the UV, visible and IR spectrum.

We produce fluorescence filters, narrow band interference filters, flame photometry filters, neutral density filters, short pass filters, long pass filters, band pass filters, notch filters, edge filters and coloured glasses.

The filters are coated with dielectric coatings and can be tailored to transmission and optical density requirements. HHVAT's optical filters offer superior hardness and durability.

Our filter coatings can be deposited on a single substrate or multiple substrates and laminated with optical cement to form a single element.



Transmittance: Optical Filter Coating on Glass

PRODUCT FEATURES

- Substrates: BK7, Borofloat, UV Fused Silica, Quartz
- Filters are available in standard wavelengths of 340 nm, 405 nm, 450 nm, 492 nm, 505 nm, 546 nm, 578nm, 630 nm and 700 nm
- Dimension: Diameter up to 25mm
- Durability: MIL-STD-810E
- Custom wavelengths can be developed and produced on request

APPLICATIONS

- Determination of Sodium and Potassium levels in body fluids
- Determination of Calcium in milk, beer, fruit juice and biological fluids
- Determination of potassium in soil, fertilizers and plant-derived resins
- Fluorescence microscopy
- Biomedical instrumentation
- Lasers

Optical Filters

CERTIFICATIONS

We are an ISO certified company. HHVAT is also qualified by the Space Applications Centre for its metallization process. Our laser optics are certified by international testing agencies for laser damage.

ISO Certificates

TÜVNORD

Certificate

Management system as per

ISO 9001:2015

The Certification Body TÜV NORD CERT GmbH, hereby confirms as a result of the audit, assessment and certification decision according to ISO/IEC 17021-1:2015, that the organization

HHV ADVANCED TECHNOLOGIES PRIVATE LIMITED
No.31, 32, 33, 34 & 37, Sy.No.63. KIADB Industrial Area,
Dabaspet, Nelamangala Taluk, Bengaluru Rural,
Bengaluru – 562 111,
Karnataka,
India

operates a management system in accordance with the requirements of ISO 9001 : 2015 and will be assessed for conformity within the 3 year term of validity of the certificate.

Scope

Design, Development, Manufacture and Service of Equipments for Thin Film Deposition and Photovoltaics.
Manufacture and Supply of Optics and Thin Film Coated Products.
Manufacture of Vacuum Pumps and Related Components.

Certificate Registration No. **44 100 21393259** Valid from **10.07.2024**
Audit Report No. **2.5-10370/2021** Valid until **09.07.2027**
Initial certification **10.07.2021**

Mumbai, **08.07.2024**
Certification Body at TÜV NORD CERT GmbH

Visit our database to verify the validity of this certificate.

TÜV NORD CERT GmbH
Am TÜV 1, 45307,
Essen
www.tuev-nord-cert.com
TÜV ®

TUV INDIA PVT. LTD.
801, Raheja Plaza 1, L.B.S Marg,
Ghatkopar (W) Mumbai – 400 086,
India
www.tuv-nord.com/in
TÜV® TÜVNORDGROUP

TÜVNORD

Certificate

Management system as per

ISO 14001:2015

The Certification Body TÜV NORD CERT GmbH, hereby confirms as a result of the audit, assessment and certification decision according to ISO/IEC 17021-1:2015, that the organization

HHV ADVANCED TECHNOLOGIES PVT. LTD.
No. 31, 32, 33, 34 & 37, Sy. No.63. KIADB Industrial Area,
Dabaspet, Nelamangala Taluk,
Bengaluru Rural – 562 111,
Karnataka,
India

operates a management system in accordance with the requirements of ISO 14001 : 2015 and will be assessed for conformity within the 3 year term of validity of the certificate.

Scope

Design, Development, Manufacture and Service of Equipments for Thin Film Deposition and Photovoltaics.
Manufacture and Dispatch of Optics and Thin Film Coated Products.
Manufacture of Vacuum Pumps and Related Components.

Certificate Registration No. **44 104 21393384** Valid from **07.11.2024**
Audit Report No. **2.5-10640/2021** Valid until **04.10.2027**
Initial certification **05.10.2021**

Mumbai, **07.11.2024**
Certification Body at TÜV NORD CERT GmbH

Visit our database to verify the validity of this certificate.

TÜV NORD CERT GmbH
Am TÜV 1, 45307,
Essen
www.tuev-nord-cert.com
TÜV ®

TÜVNORDGROUP

TÜVNORD

Certificate

Management system as per

ISO 45001:2018

The Certification Body TÜV NORD CERT GmbH, hereby confirms as a result of the audit, assessment and certification decision according to ISO/IEC 17021-1:2015, that the organization

HHV ADVANCED TECHNOLOGIES PVT. LTD.
No. 31, 32, 33, 34 & 37, Sy. No.63. KIADB Industrial Area,
Dabaspet, Nelamangala Taluk,
Bengaluru Rural – 562 111,
Karnataka,
India

operates a management system in accordance with the requirements of ISO 45001 : 2018 and will be assessed for conformity within the 3 year term of validity of the certificate.

Scope

Design, Development, Manufacture and Service of Equipments for Thin Film Deposition and Photovoltaics.
Manufacture and Dispatch of Optics and Thin Film Coated Products.
Manufacture of Vacuum Pumps and Related Components.

Certificate Registration No. **44 126 21393384** Valid from **07.11.2024**
Audit Report No. **2.5-10640/2021** Valid until **04.10.2027**
Initial certification **05.10.2021**

Mumbai, **07.11.2024**
Certification Body at TÜV NORD CERT GmbH

Visit our database to verify the validity of this certificate.

TÜV NORD CERT GmbH
Am TÜV 1, 45307,
Essen
www.tuev-nord-cert.com
TÜV ®

TÜVNORDGROUP

Ref.: PMQD-E/EQAG/SRA/2024/69 Date:13/03/2024

To: **Shri Naveen C S**
Assistant Manager
HMC-TFOD, HHV Bangalore

From: **Gyan Singh**
Sci. /Engr - SF
PMQD-E/EQAG/SRA

Through:
R. K. Begde,
Head, PMQD-E/EQAG/SRA

Sub: Extension of Qualification Validity for 2 & 3-layer Metallization on alumina substrate and MIC lithography (2 & 3-Layer metallized substrates) facilities from M/s HHV, Bangalore

This is with reference to the VoQ request from M/s. HHV re-validity of **Metallization & lithography facilities.** Qualification/ maintenance requirements were met by the vendor and the same has been reviewed and summarised as under.

1. The process was continuously used without break for metallization on alumina substrates & no major non-compliance observed in the last 2 years supplied FM batches
2. VoQ samples witnessed for MIC Lithography (2 & 3-layer metallization) and found acceptable. As those samples were prepared by **Shri Vinod Kumar MS, Shri Mansur Ali MH and inspected by Shri Kishan C S,** they shall also be deemed certified for Microlithography Process for Fabrication and Inspection of FM hardware, respectively.
3. Metallization & Lithography facility found meeting the QA requirements *vide* internal audit carried out by vendor on January, 2024 as well as audited by SAC/QA on February, 2024

Based on the above, Qualification Validity for Metallization & MIC Lithography facility/ facilities using 2-layer (Cr+Au) & 3-layer (Cr+Cu+Au) metallization from **M/s. HHV is extended up to March, 2025. Subject to continuous FM hardware delivery and periodic audits.**

Regards,
Gyan Singh
PMQD-E/EQAG/SRA

Space Qualification for Metallization
(2 and 3 Layers)

Government of India
Department of Space

U.R. RAO Satellite Centre
Post Box No. 1795, Old Airport Road,
Vimanapura Post, Bengaluru - 560 017, India
Telephone :
Fax :

ISRO-IPAB-CT-02 29-Jan-2023

Certificate of Qualification

U. R. Rao Satellite Centre (URSC) has qualified photolithography process & etching of 4-layer thin film metallized substrates Cr-Cu-Ni-Au & TiW-Cu-Ni-Au upto size 3" x 3" from HHV Advanced Technologies Pvt Ltd.

This certificate is issued after successful completion of process qualification.

Reference Documents:

Id no	Document Name	Ref no
1.	Process Identification Documents (PID)	
a.	Pattern generation of 4-layer TiW-Cu-Ni-Au metallized thin film substrates	PID/HHVAT/ URSC / TiW -C-Ni/01 01-24.01.2024
b.	Pattern generation of 4-layer Cr-Cu-Ni-Au metallized thin film substrates	PID/HHVAT/URSC/Cr-Ni-Cu / 01 Dt. 24.01.2024
2.	Qualification of Photolithography Process on four layer Thin film metallized substrates from M/s HHV	PAD/HHV/PQ-01 Dt.25.01.2024

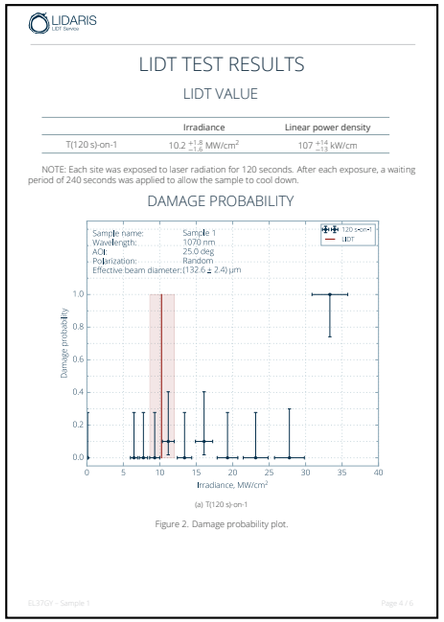
Validity: This certificate is valid till 31st October 2026.

Jagannath Das
Deputy Director, SMQA

Ramakrishnan K
Associate Director (R&D), URSC

To:
M/s HHV Advanced Technologies Pvt Ltd, Bengaluru

Space Qualification for Lithography
(For 4 Layers)



LIDARIS
LIDT Service

LIDT TEST RESULTS

LIDT VALUE

	Irradiance	Linear power density
T(120 s)-on-1	10.2 $^{+1.8}_{-1.6}$ MW/cm^2	107 $^{+14}_{-13}$ kW/cm

NOTE: Each site was exposed to laser radiation for 120 seconds. After each exposure, a waiting period of 240 seconds was applied to allow the sample to cool down.

DAMAGE PROBABILITY

Sample name: Sample 1
Wavelength: 1070 nm
AOI: 25.0 deg
Polarization: Random
Effective beam diameter: (132.6 ± 2.4) µm

(a) T(120 s)-on-1

Figure 2. Damage probability plot.

EL37GY – Sample 1 Page 4 / 6

Laser Induced Damage Certificate
CW Laser

LASER DAMAGE CERTIFICATION

PASS

946.1 MW/cm^2 or **20.0** J/cm^2

Customer:	Hind High Vacuum Co.	**Certificate No.:**	171646 #1
Purchase Order No:	PTFD/2016160721	**Issued:**	4/14/2017
Substrate Material:	UV FS	**Coating Type:**	Ion assisted E-beam
Part No:	HR Mirror	**Lot Number:**	N/A
	1		Arrow Side
Special Requirements:	Per PO		
Wavelength (nm):	1064	**Spot Diam. (mm):**	0.507
Rep. Freq. (Hz):	20	**Incidence Ang. (deg.):**	Normal
Pulse Width (ns):	20	**Polarization State:**	Linear
Axial Modes:	Multiple	**Transverse Modes:**	TEMoo
No. Sites:	10	**No. Shots/Site:**	>200
Preparation:	N2 Dustoff		
Damage Definition:	Permanent Surface Change		
Inspection Method:	Nomarski/Darkfield 150x		
Fail Criterion:	Fail if damage at any site		

Notes:

"Quantel USA certifies that the Laser Damage Resistance of this sample was tested as shown herein. Fluence measurement precision was plus or minus 10% traceable to NIST. The pulse width may be Rise T scaled as required. Specific calibration data are maintained in this office and are available on request. We certify that this test report conforms to all applicable provisions of the purchase order."

Gary Shaffer

Laser Damage Certificate
Pulsed Laser

NOTES

NOTES

ADVANCED
Technologies

Thin Film Equipment | Precision Optics

CONTACT US FOR YOUR THIN FILMS AND OPTICS NEEDS TODAY

INDIA
Site No. 31 - 34 & 37, KIADB Industrial Area,
Phase 1, Dabaspet, Nelamangala Taluk,
Bengaluru Rural District – 562111,Karnataka, India
Phone: +91-80-66703700, Fax: +91-80-66703800
Email: infotfod@hhvadvancedtech.com | Website: www.hhvadvancedtech.com

INTERNATIONAL
Unit 14, Lloyds Court, Manor Royal, Crawley,
West Sussex, RH10 9QX, United Kingdom.
Phone : +44 (0) 1293 611898 | Fax : +44 (0) 1293 512277
Email: info@hhvltd.com | Website: www.hhvltd.com

TFOD_Catalogue_07@2025 Copyright, All rights are reserved.