

Optical Interference Coatings, Design and Applications

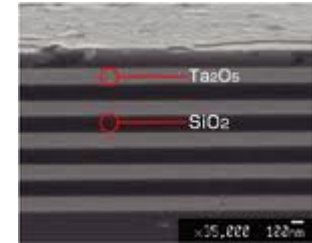


Kevin Mackrodt
Managing Director

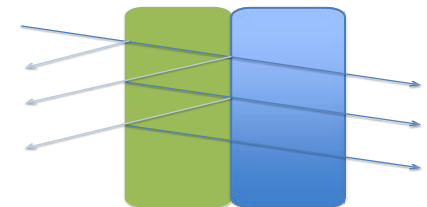


1 Western Wood Way, Langage Science Park, Plympton, Plymouth, Devon, PL7 5BG, UK
T +44 (0)1752 294918
F +44 (0)1752 342467
outthere@artemis-optical.co.uk
www.artemis-optical.co.uk

Optical interference coatings are typically multilayer nano-thickness structures applied to the surfaces of optical components to modify their optical performance.



Using the principle of constructive and destructive interference, transmittance and reflection can be controlled to specified requirements. Absorptance and Non-optical properties such as electrical conductivity and surface hardness can also be influenced by coating material properties.



Topics in this Presentation

- Who are Artemis Optical Coatings Limited
- Coating Design & Precision Deposition Technology
- Applications
- Some New Developments



1 Western Wood Way, Langage Science Park, Plympton, Plymouth, Devon, PL7 5BG, UK
T +44 (0)1752 294918
F +44 (0)1752 342467
outthere@artemis-optical.co.uk
www.artemis-optical.co.uk

WE ARE **OUT THERE...**

WE DESIGN AND MANUFACTURE HIGH PRECISION, TECHNICALLY DIFFERENTIATED OPTICAL THIN FILM COATINGS



1 Western Wood Way, Langage Science Park, Plympton, Plymouth, Devon, PL7 5BG, UK
T +44 (0)1752 341943
F +44 (0)1752 342467
outthere@artemis-optical.co.uk
www.artemis-optical.co.uk

WE ARE OUT THERE...

ARTEMIS OPTICAL LIMITED
2008 to date

QIOPTIQ COATINGS LIMITED
2006

THALES OPTICAL COATINGS LIMITED
2001

AVIMO THIN FILM TECHNOLOGIES LIMITED
1997

OMITEC THIN FILMS LIMITED
1992

OMITEC ELECTRO-OPTICS LIMITED
1968

OPTICAL & ELECTRICAL COATINGS LIMITED
1952



MISSION STATEMENT 2012 TO PRESENT:

IMPROVE

ACCREDITATIONS



Artemis Optical are delighted to have been awarded an SC21 Bronze Award

Demonstrated over a 12 month performance period

>90% on time delivery

>98% customer acceptance

Dedication to a sustainable improvement programme



1 Western Wood Way, Langage Science Park, Plympton, Plymouth, Devon, PL7 5BG, UK
T +44 (0)1752 341943
F +44 (0)1752 342467
outthere@artemis-optical.co.uk
www.artemis-optical.co.uk

WE ARE OUT THERE...

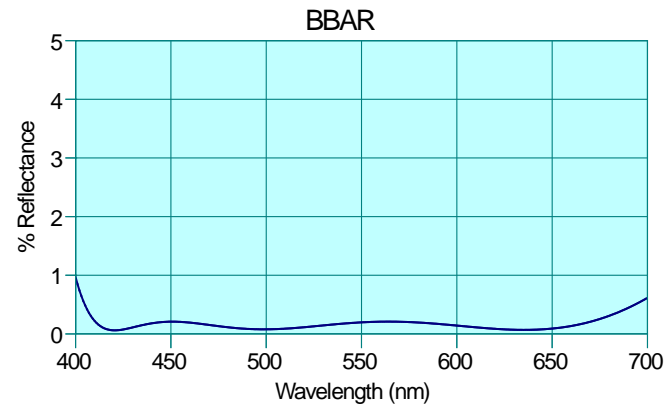
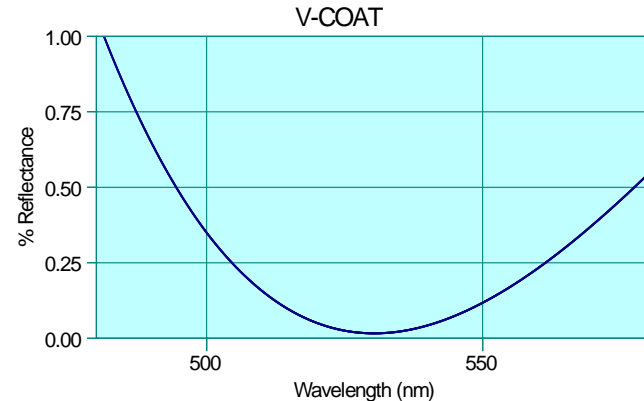
Coating Design and Precision Deposition Technology

- Brief overview of coating design types
- Considerations when Designing Coatings
- Precision Deposition Technology

Brief overview of coating design types

Anti-Reflection Coatings

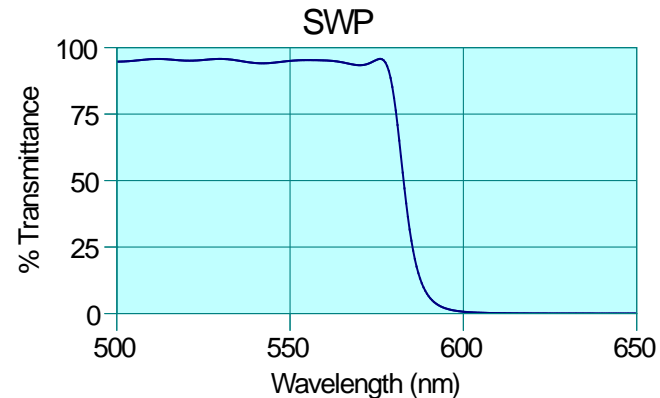
- V-Coat
- Broadband (BBAR)
- Multi-band



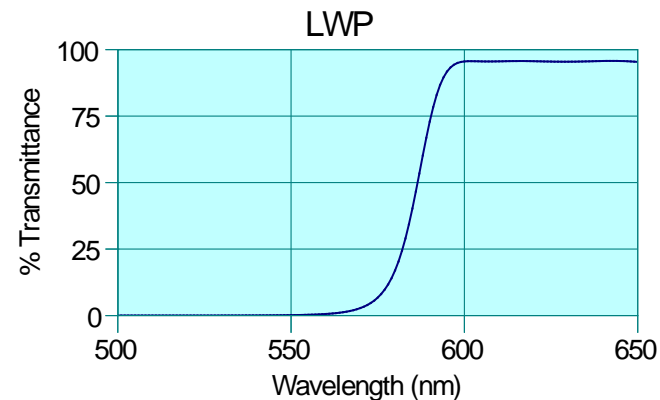
Brief overview of coating design types

Edge Coatings

- Short wave pass filter (SWP)



- Long wave pass filter (LWP)

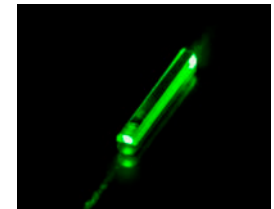
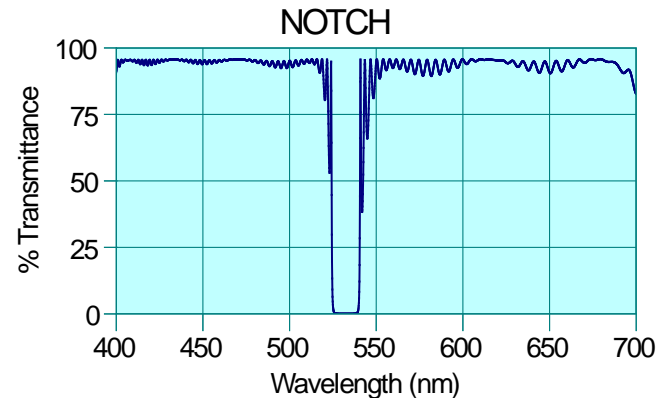
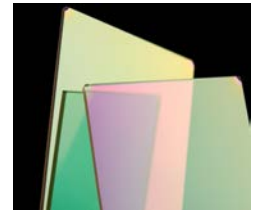
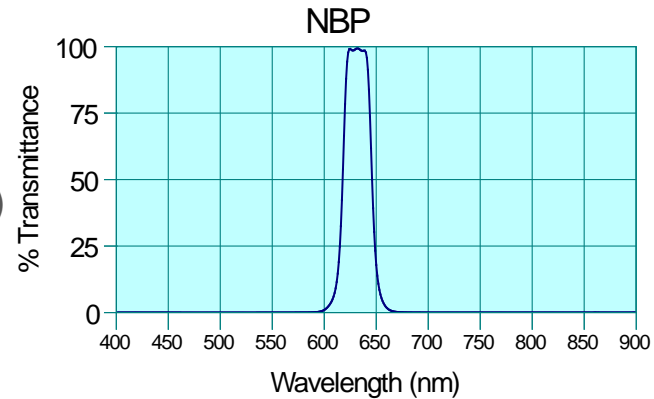


Brief overview of coating design types

Wavelength Selective Coatings

- Band pass filter
- Narrow band pass filter (NBP)

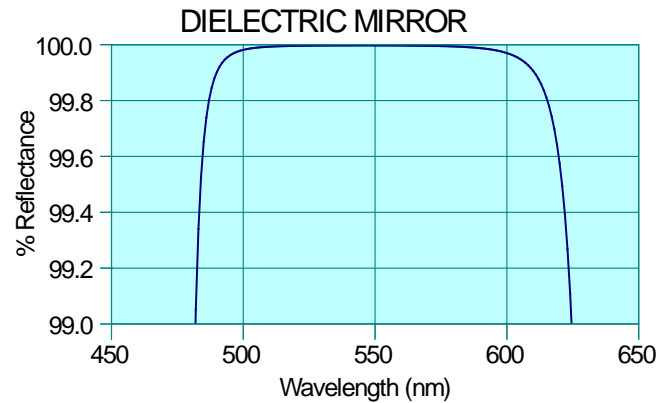
- Band stop or Notch filter



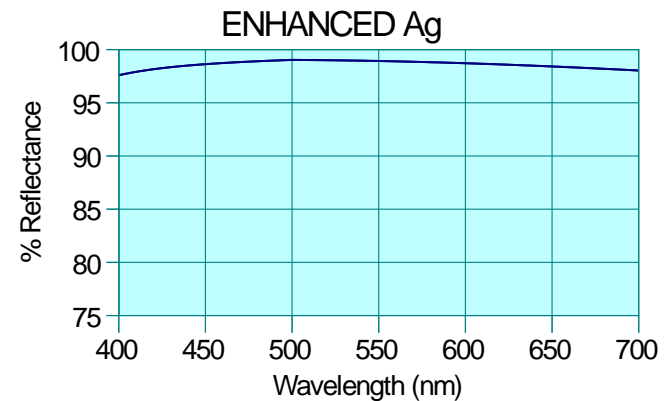
Brief overview of coating design types

Reflective Coatings

- Dielectric Mirror



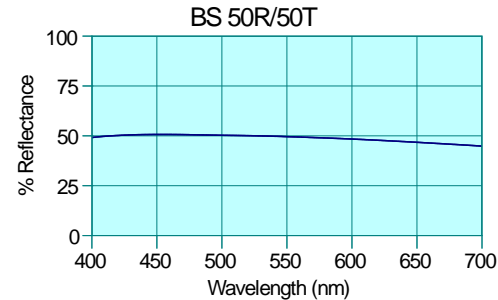
- Enhanced & Protected Metallic Mirror



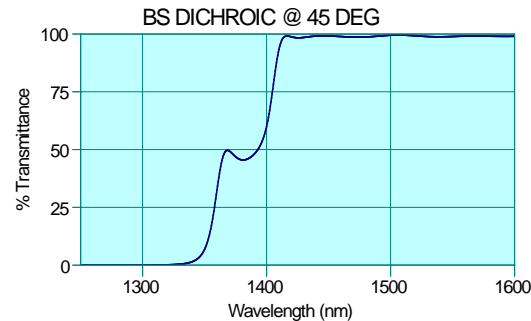
Brief overview of coating design types

Beamsplitter Coatings

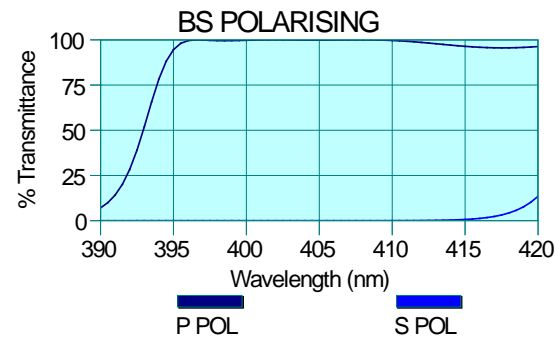
- Broadband beamsplitter



- Dichroic beamsplitter



- Polarisation beamsplitter



Brief overview of coating design types

Designs with non-optical properties

- Transparent Conductive
 - Indium Tin Oxide (ITO)

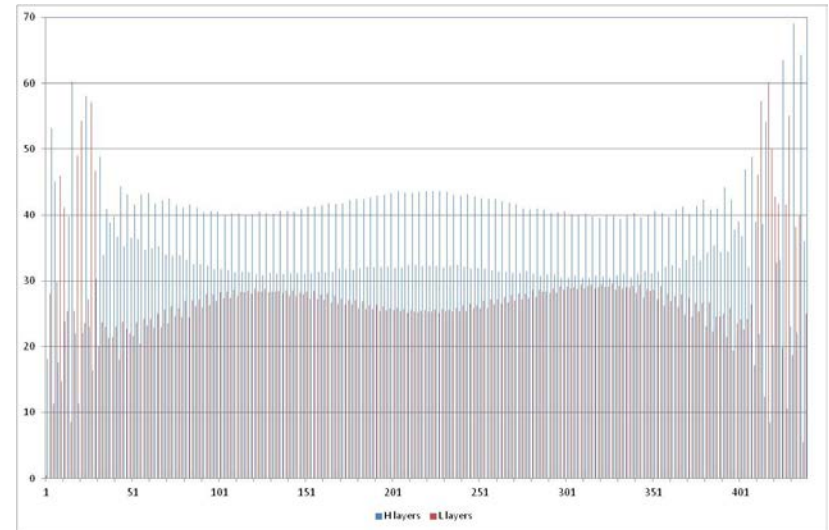
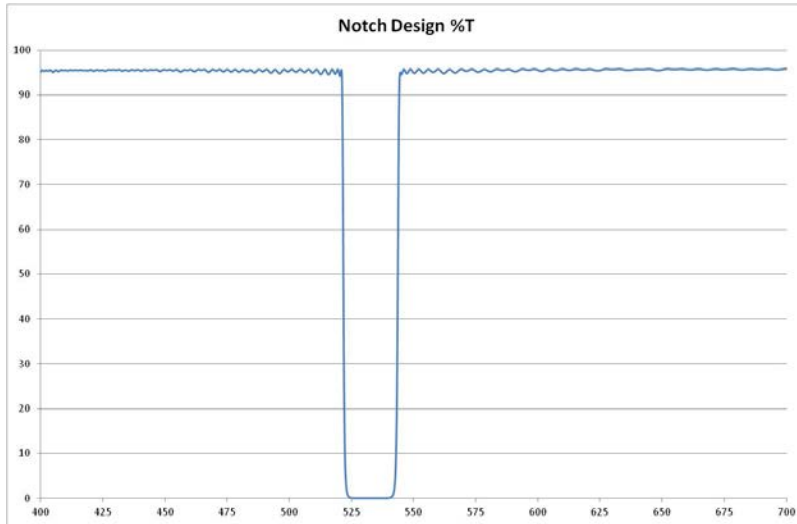
- Ultra Durable Infrared Transmitting
 - Diamond Like Carbon (DLC)



Designing Optical Interference Coatings

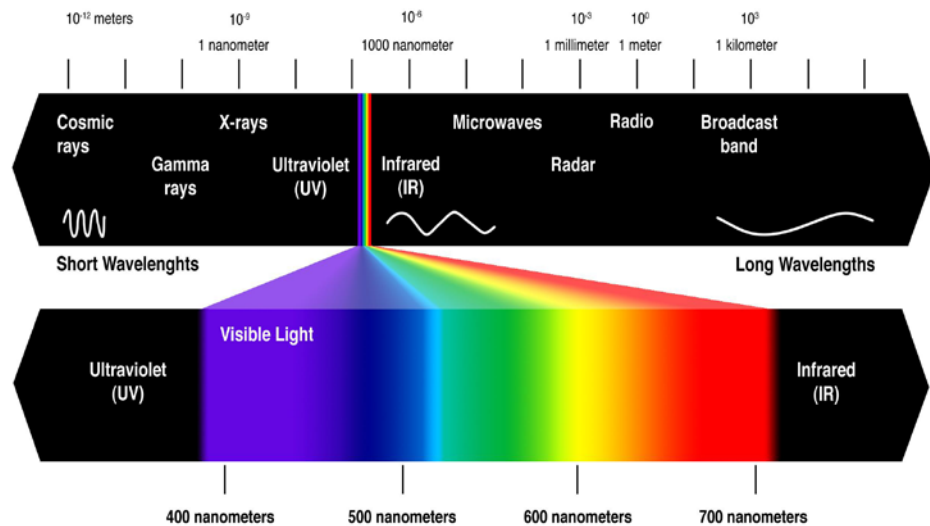
- All high performance optical systems have coated components
- Coating performance is driven by developments in optics and photonics which also drives deposition technology
- To keep pace with progress Coating Engineers use specialized software and advanced modelling tools to produce more complex multi element designs which achieve the highest performance requirements of today's systems.

Designing Optical Interference Coatings



Considerations when Designing Coatings

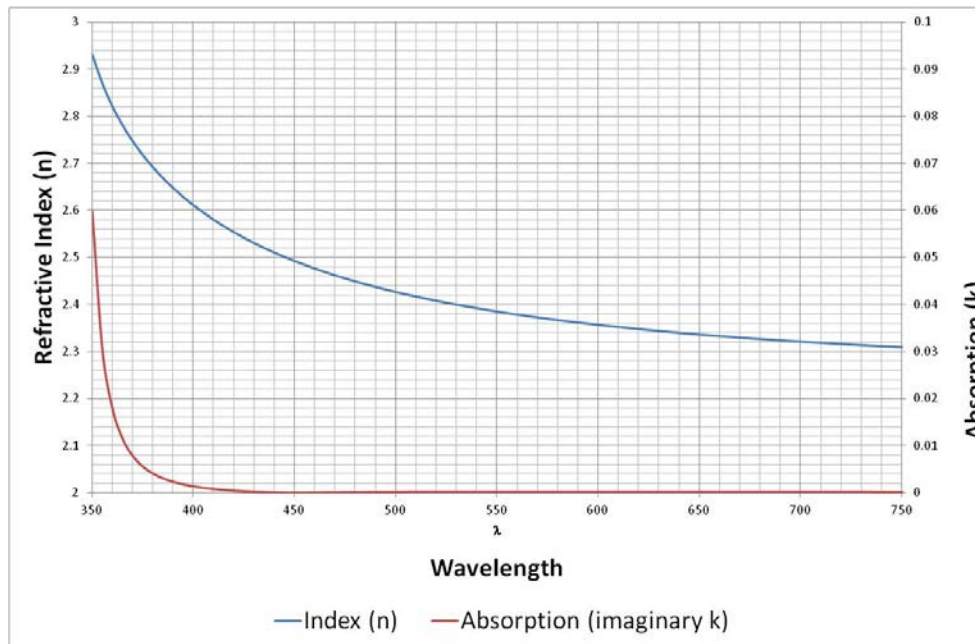
- Low stress – good coating adhesion and high optical flatness specifications
- Environmentally durable coatings – sensitive materials (plastics)
- High power uses – High Laser Induced Damage Threshold
- Ultra fast coatings – Femto second laser pulses
- Cost sensitivity
- Operating Wavelengths



Precision Deposition Technology

- Predictable Coating Material Properties

- Refractive Index, Absorption coefficient, Stress coefficient, Durability



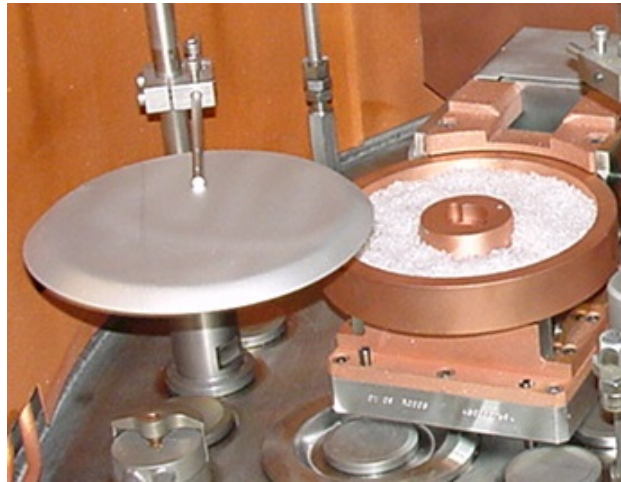
Precision Deposition Technology

- Predictable Coating Material Properties

- Large range of coating materials dependant on requirement

- Visible wavelengths; SiO₂, TiO₂, Al₂O₃, Ta₂O₅, HfO₂, MgF₂

- Infrared wavelengths; ZnS, Ge, Si, SiO, YbF, YF₃



Precision Deposition Technology

- Good Process Capability and Stability
- Physical Vapour Deposition (EBG and Thermal) – PVD
- Ion Assisted Deposition – IAD
- Plasma Ion Assist Deposition (APS) – PIAD
- Ion Beam Sputtering – IBS
- Plasma Enhanced Chemical Vapour Deposition – PECVD
- Precision Optical Reactive Magnetron Sputtering



Applications

- Laser eye safety filters

- Ophthalmic Surgery



- AFV Sighting systems



General requirements

- High optical densities
- Colour neutrality
- High Photopic Transmission
- Minimal image distortion
- Performance Reliability
- Complete Traceability

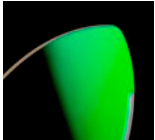
Applications

- Avionic displays

- Head up displays

- Multi element configuration

- Wavelength and Amplitude graded coatings



- Helmet mounted displays

- Complex multi layer designs on plastics

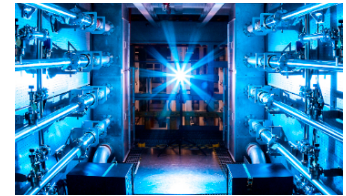
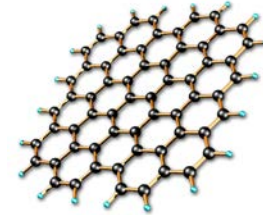
- Conformal uniform coating

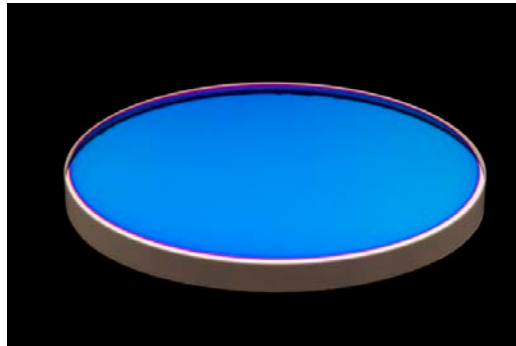
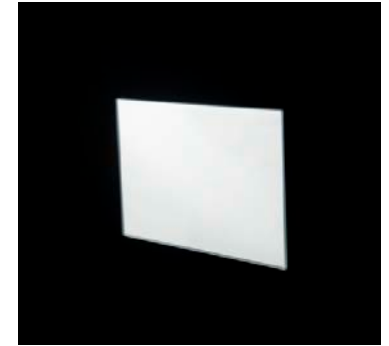
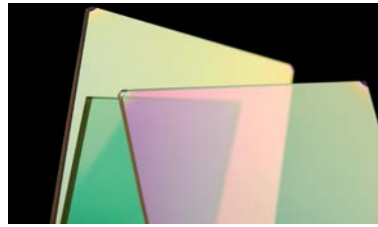
- Minimal image distortion, low stress coatings



Some New Developments

- Anti Reflection Structures– plasma etched organic materials
- Graphene – single atomic layer of graphite, high conductivity, high %T
- Gravitational wave detection (LIGO) – lower thermal noise required from coating materials
- Very High Power Laser coatings – Laser Mega Joule project for fusion power
- Photovoltaic Solar Cells – Challenges, high volume production and increased energy conversion efficiency





Please call us
for further
details

