



umicore
Metal Deposition Solutions

**PASSION FOR
PERFECT SURFACES**

**THIN FILM PRODUCT SOLUTIONS
FOR OPTICAL APPLICATIONS**

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ABOUT THIN FILM PRODUCTS AG

We, as Umicore Thin Film Products AG, are specialists for development, manufacturing and supply of high performance evaporation material, sputter targets and accessories for micro-electronic, optoelectronic, optical thin film applications and wear protection. Our customers benefit from our more than seventy years of experience in development, manufacturing and customization of coating materials. With this unique historical background and our operational excellence Umicore Thin Film Products makes the difference when it comes to your coating applications.

Our products enable the implementation and further development of high-technology applications such as EUV/DUV lithography, LIDAR systems, AR/VR glasses and high-power laser systems following our mission : "Materials for a better Life"

OUR UMICORE EXCELLENCE PROMISE TO OUR CUSTOMERS



„CUSTOMER SUCCESS...

OUR PROMISE TO OUR CUSTOMERS

PERSONAL CUSTOMER CARE

- Defined representative
- Local representative
- Local Business Sites

PROFESSIONAL TECHNICAL SUPPORT

- Technical Sales Team
- Technical Competence Center Coating
- Technical Competence Center Analytics

INNOVATIVE COATING PRODUCTS

- Low defect coating materials
- Coating material mixtures
- Precious metal business model

HIGH QUALITY STANDARDS

- QM following IATF characteristics
- ISO 9001 Quality Management System
- ISO 14001 Environmental Management
- ISO 45001 OHS Management System

SUSTAINABLE PRODUCTION SOLUTIONS

- Quality products result in increased yield
- Material recycling model
- Production focused on renewable energy

YOUR BENEFITS

SMOOTH OPERATION

Personal face-to-face contact
Easy & fast communication
Local handling of goods

TOP NOTCH PROCESSES

Guidance & consulting
Material & process support
In-depth troubleshooting

COMPETITIVE ADVANTAGES

Higher production yield and LIDT
Increased environmental stability
Easy transaction incl. weight account

SECURE PRODUCTION AND OPERATION

Stable and reliable supply chain
Continuous quality improvement
Continuous sustainable improvement
Continuous OHS improvement

TOP NOTCH PROCESSES

Reduced handling effort
Reduction of waste
Minimized CO2 footprint

...IS OUR SUCCESS“

OUR COMPETENCE, YOUR SUCCESS

SPUTTER TARGETS

- Cleanroom packaging shop
- Target production shop
- Backplate production shop
- Indium bond shop
- Ultrasonic quality inspection (100%)

EVAPORATION MATERIAL

- Fluorid-production-system
- Tablet production system
- Vacuum sintering furnaces
- Vacuum melting furnaces

ACCESSORIES

- Boat manufacturing in-house
- Liner manufacturing in-house

YOUR BENEFITS

TAILORMADE PRODUCTS

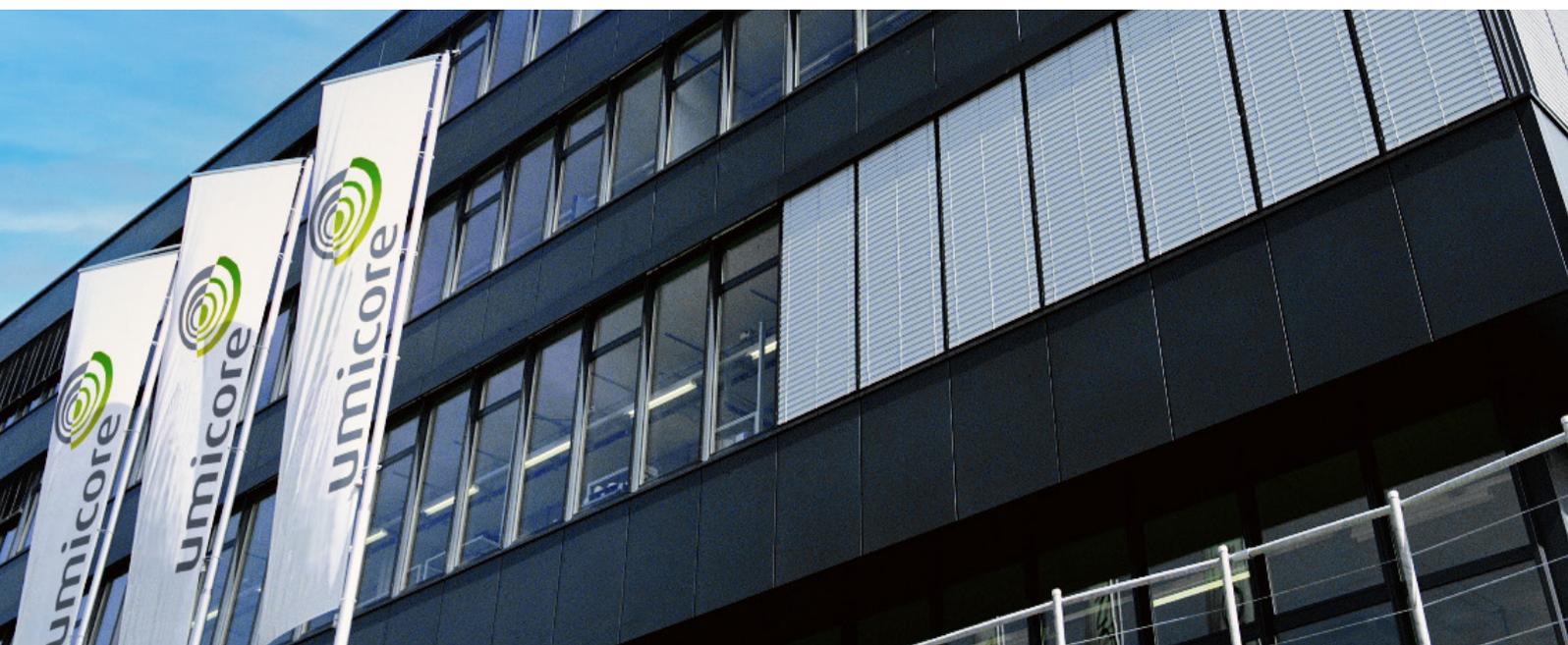
Minimal particle contamination
Optimized microstructure
Perfect sealing and heat transfer
Professional bonding & debonding
Highest process stability of bonding

PERFECT COATING RESULTS

Lowest oxygen content in fluoride products
Reproducibility of tablet characteristics
Preconditioning of coating materials
Pre-melting of (mixed) coating material

RELIABLE PROCESS REPRODUCIBILITY

High quality craftsmanship
Reproducibility of liner characteristics





OPTICS & PHOTONICS

UV-OPTICS PORTFOLIO

- Oxides:** SiO_2 | Al_2O_3 | HfO_2 | ...
- Fluorides:** LaF_3 | GdF_3 | MgF_2 | AlF_3 | ...
- Metals:** Ru | Mo | Au | Ag | Al | Mg | ...
- Element Materials:** Si

(other materials on request)

COATING MATERIALS

	UV			VIS	IR	
	EUV	DUV	NUV		NIR-MWIR	MWIR-FWIR
Precious metals	■	■	■	■	■	
Metals, pure elements	■	■	■	■	■	
Oxides			■	■	■	
TCO				■	■	
Fluorides		■	■		■	
Chalcogenides				■	■	
Nitrides	■				■	
Silicides	■					
Color materials				■		

Coating Technology Legend: ■ Evaporation ■ Magnetron Sputtering ■ Ion Beam Sputtering

UMICORE'S KEY MATERIALS

FOR LOW DEFECT UV-COATING APPLICATIONS



Low oxygen DUV fluorides LaF3, GdF3, MgF2, AlF3, ...

Based on state-of-the-art proprietary fluorination processes, Umicore supplies high-purity, low oxygen & carbon coating materials for low-loss, low-defect coatings used in photolithography & metrology.



Wide range of high-performance, low loss coating materials

Originating from our history and more than 70 years of experience, Umicore provides the full range of wide-bandgap oxides and fluorides for high-performance and low loss DUV & NUV applications.



Hf & HfO2 products for low-loss, high-power laser applications

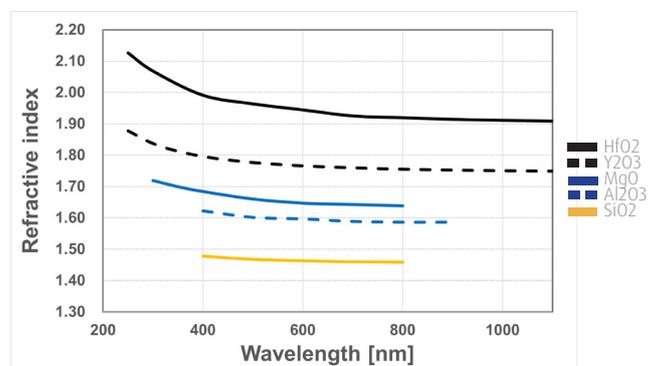
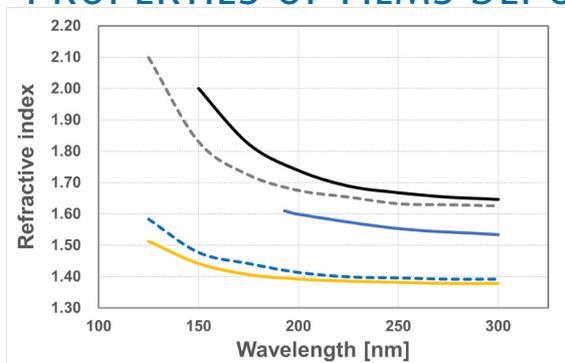
Using well-proven in-house combinations of sintering & melting vacuum technology and based on its long term supply chain for raw materials, Umicore is your reliable supplier for high-purity Hf and HfO2 products for low-loss, high-power laser applications.



Reliable partner for metal & element solutions Ru, Mo, Si, Au, Ag, Al, Mg, ...

Based on our experience in the field of high-purity metals & alloys, Umicore ensures a stable supply of tailored, high quality products for your specific high-reflecting & absorbing application. Combined with our professional and transparent precious metal management we are able to offer an attractive package.

PROPERTIES OF FILMS DEPOSITED FROM UMICORE MATERIALS



Typical values of the refractive index as a function of wavelength for selected Umicore UV materials

APPLICATIONS FOR UV-OPTICS



Microelectronics

- ◇ Photolithography
- ◇ Metrology



Lighting / Illumination

- ◇ LED
- ◇ Curing



High Power Laser

- ◇ Material analysis
- ◇ Materials processing



Life Science & Medical

- ◇ Fluorescence microscopy
- ◇ Flow cytometry
- ◇ DNA & RNA analysis & engineering
- ◇ Food & drug analysis

OPTICS & PHOTONICS

VIS-OPTICS PORTFOLIO

Oxides:	SiO ₂ Al ₂ O ₃ Y ₂ O ₃ HfO ₂ Ta ₂ O ₅ Nb ₂ O ₅ TiO TiO ₂ Ti ₂ O ₃ Ti ₃ O ₅ ... IDA DRALO LATI RENA ...
Fluorides:	MgF ₂ YF ₃ CeF ₃ ...
Metals:	Au Ag AgCu Al ...
Chalcogenides:	ZnS ...

(other materials on request)

COATING MATERIALS

	UV			VIS	IR	
	EUV	DUV	NUV		NIR-MWIR	MWIR-FWIR
Precious metals						
Metals, pure elements						
Oxides						
TCO						
Fluorides						
Chalcogenides						
Nitrides						
Silicides						
Color materials						

Coating Technology Legend: ■ Evaporation ■ Magnetron Sputtering ■ Ion Beam Sputtering

UMICORE'S KEY MATERIALS

FOR LOW DEFECT VIS-COATING APPLICATIONS



Tailormade high-performance Si & SiO₂ grades

To address the current most stringent & upcoming requirements with regards to e.g. low-defect, low-loss & high-power damage resistance, Umicore has developed a number of new Si & SiO₂ solutions for evaporation and sputtering applications using SiO₂ films.



Tantalum & Hafnium oxides

For superior coating performance Ta₂O₅ and HfO₂ derived products have been tuned to lowest absorption, scatter & defect generation & highest LIDT. This was achieved by improved purity & density, material mixture & stoichiometry as well as product geometry.



Hf, Ta, Nb, Si, ... targets for various sputter platforms

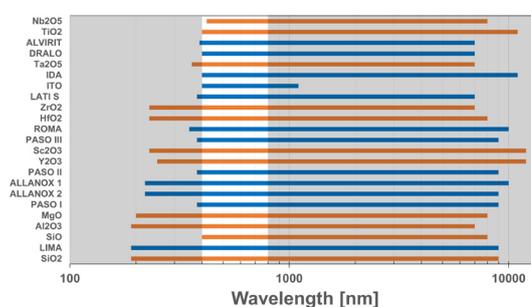
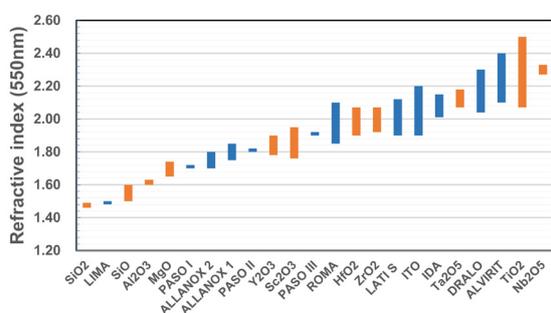
Due to our long history of servicing the optics & optoelectronics industry, coating companies benefit from a wide portfolio of targets & related solutions for the most common sputter technologies and geometries e.g. MSP, HELIOS, SPECTOR, NAVIGATOR.



Mixed oxide materials for special applications

For wide-angle & polarization depending requirements as well as for coating on plastics and other sensitive components, Umicore provides a wide range of tailored oxide compositions with optimal density, stoichiometry & geometry. This enables highly stable deposition processes leading to congruent, low-defect, homogenous coating results.

PROPERTIES OF FILMS DEPOSITED FROM UMICORE MATERIALS



Typical ranges of refractive index at 550 nm and of the transmittance for common Umicore materials

■ Pure oxides
■ Mixed oxides

APPLICATIONS FOR VIS-OPTICS



Imaging & Sensing

- ◇ Camera
- ◇ Microscopy
- ◇ Sighting
- ◇ Endoscopy
- ◇ Cinema projection



Office

- ◇ Scanning
- ◇ Printing



Industrial & Analytical

- ◇ Position measurement and alignment
- ◇ Machine vision
- ◇ Photospectrometry



Security

- ◇ Anticounterfeiting
- ◇ Surveillance and monitoring



Lighting / Illumination

- ◇ Lamp, LED & headlight reflectors
- ◇ Medical lighting



OPTICS & PHOTONICS

IR-OPTICS PORTFOLIO

Oxides:	SiO ₂ Al ₂ O ₃ Y ₂ O ₃ SiO HfO ₂ Ta ₂ O ₅ ...
Fluorides:	CeF ₃ YbF ₃ YF ₃ ...
Chalcogenides:	ZnSe ZnS
Metals:	Ge Ag Au Al ...
Element materials:	Si
Mixtures:	IR-F625 IR-F900 Y-Ca-fluoride MIRA ...

(other materials on request)

COATING MATERIALS

	UV			VIS	IR	
	EUV	DUV	NUV		NIR-MWIR	MWIR-FWIR
Precious metals						
Metals, pure elements						
Oxides						
TCO						
Fluorides						
Chalcogenides						
Nitrides						
Silicides						
Color materials						

Coating Technology Legend: ■ Evaporation ■ Magnetron Sputtering ■ Ion Beam Sputtering

UMICORE'S KEY MATERIALS

FOR LOW DEFECT IR-COATING APPLICATIONS



LWIR and multispectral pure & mixed fluorides

YbF₃, YF₃, CeF₃ & proprietary mixtures like IR-F625 and IR-F900 from a refined in-house production process match highest requirements with respect to stable & reproducible evaporation processes. Furthermore, Umicore offers tailored material alternatives for ThF₄ based applications.

Ge, Si, ZnS and ZnSe

Umicore provides H- and M-index materials with excellent purity for high-performance IR applications. Umicore ZnS grades cover the core of the IR spectral band as well as an extended range down to the visible spectrum. Along with ZnSe they address high-power laser coatings as well.

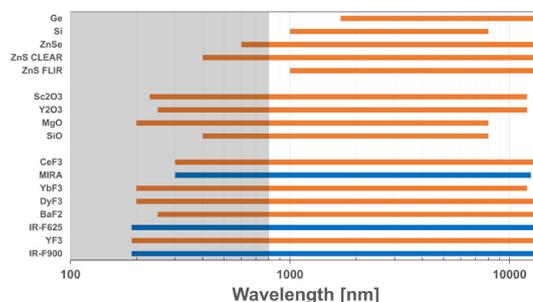
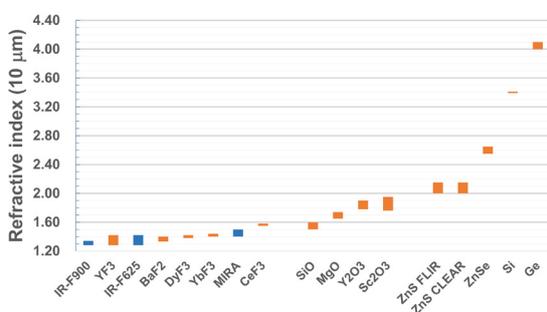
High-quality metal & oxide sputter targets

Based on our manufacturing & application competencies Umicore provides a wide range of targets for applications ranging from the LWIR to the NUV spectral range. In combination with our inhouse target bondshop, small series up to high throughput coating production scenarios can be addressed.

Wide range of high-quality metal & oxide evaporation materials

High-purity metals & alloys as well as substoichiometric and oxygen-saturated material solutions are available for premium evaporation applications. In addition, Umicore offers precious metal products including recycling & other services.

PROPERTIES OF FILMS DEPOSITED FROM UMICORE MATERIALS



Typical ranges of refractive index at 10'000 nm and transmittance for selected Umicore LWIR materials

■ Pure materials
■ Mixed materials

APPLICATIONS FOR IR-OPTICS



Optical communication

- ◇ Thin film type of DWDM, CWDM, GF filters
- ◇ Waveguide type of telecom NIR multiplexers
- ◇ Satellite communication



Geo-Mapping & 3D-Sensing

- ◇ Multispectral imaging
- ◇ LIDAR for PDA, AR/MR



Material processing & gas sensing

- ◇ Solid state and CO₂ lasers for material processing
- ◇ Analysis for solid material and gases



Defense & Security

- ◇ Directed energy, ranging and tracking
- ◇ Reflected or thermal IR cameras and thermography devices



Life Science & Medical

- ◇ Surgery and Diagnostics

UMICORE THIN FILM PRODUCTS AG

NETWORK FOR GLOBAL SUPPLY



Find more information here:
www.tfp.umicore.com

Umicore Thin Film Products production sites:

Umicore Thin Film Products AG
Headquarter
Alte Landstrasse 8
9496 Balzers
Principality of Liechtenstein
Tel +423 388 7300
Fax +423 388 7450
sales.materials@umicore.com

Umicore Optical Materials
USA Inc.
2976 S. 614 Road
Quapaw, OK 74363
USA
Tel +1 918 673 1650
Fax +1 918 673 2121
sales.materials.us@umicore.com

Umicore Thin Film Products
Taiwan Co., Ltd.
No. 22, Aly. 4, Ln. 711 Bo'ai St.,
Zhubei City,
Hsinchu County 302
Taiwan ROC
Tel +886 3553 2999
Fax +8863553 2525
sales.materials_hc@umicore.com