Product Information

Tantalum(V) Oxide Patinal®

GENERAL INFORMATION

Tantalum(V) Oxide Patinal® forms hard and environmentally stable films on glass and plastic substrates with low absorption over a broad spectral range from the UV to the SWIR. It shows considerably less absorption than TiO_2 and an adjustable stress level depending on coating conditions. It is therefore especially suitable for laser coatings with an extensively high number of layers.

AREAS OF APPLICATION

- High quality AR and other optical multilayer coatings for UV, VIS and NIR on glass, crystalline substrates and polymers
- Coatings for laser applications with strong requirements on laser damage threshold
- High precision filters with low absorption levels
- Protective and reflection enhancing coatings on metals in combination with e.g. SiO_2

THIN FILM PROPERTIES

Range of transparency	350 – 7000 nm
Refractive index at 500 nm	
Conventional, T_s = 300 °C / no IAD	~ 2.10
IAD, T_s = RT	~ 2.15
Thin film stress	
Conventional, T_s = 300 °C / no IAD	Tensile
IAD, T_s = RT	Compressive

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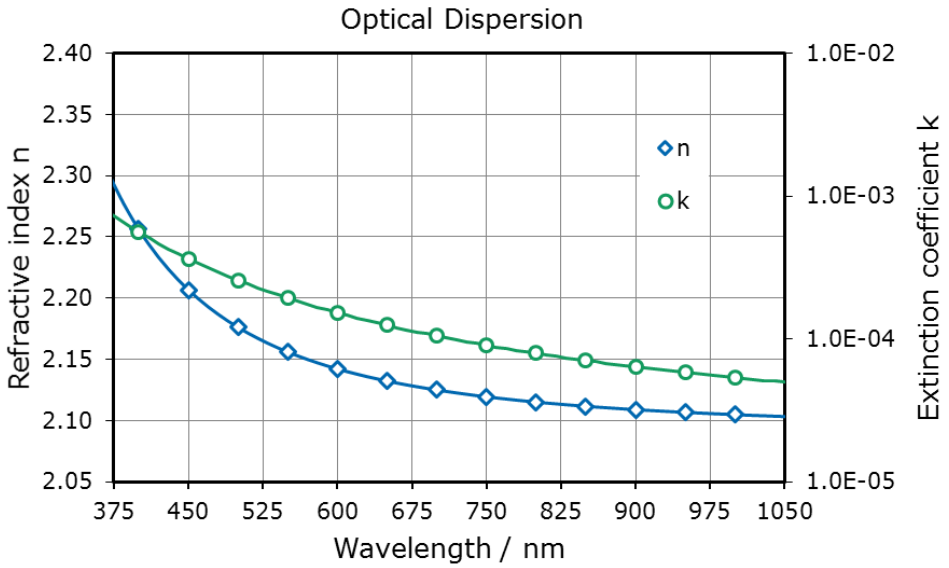
* EMD Performance Materials is a business of Merck KGaA, Darmstadt, Germany



wavl / nm	350	400	500	750	900	1050	1200
n	2.34	2.26	2.17	2.12	2.11	2.10	2.10
k	1.0E-03	5.6E-04	2.6E-04	9.0E-05	6.4E-05	5.5E-05	4.1E-05

The resulting optical properties of the thin film are dependent on process conditions like deposition rate and substrate temperature.

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NOTES FOR EVAPORATION

Evaporator source	Electron beam evaporator
Liner	Copper crucible
Evaporation temperature	2000 – 2200 °C
Deposition rate	0.2 – 0.4 nm/s
Oxygen partial pressure	about $1 \cdot 10^{-4}$ mbar
Substrate temperature	Conventional: 150 – 300 °C IAD: 100 – 200 °C
IAD settings (Leybold APS)	100 – 120 V Bias, 30 – 40 sccm O_2
QCR-settings	Density 8.20 g/cm³, z-ratio 1.0

Usually Ta_2O_5 is premelted under a shutter. The deposition should be carried out reactively with addition of oxygen. During melting and at the beginning of the evaporation of Ta_2O_5, oxygen is released which causes a temporary increase of the chamber pressure.

Under optimized conditions layers without optical absorption in the visible can be produced. However, in some cases, e.g. at higher substrate temperature or after several consecutive evaporations from one crucible without replenishment of material, Ta_2O_5 layers show absorption. At least partial removal of this absorption can be achieved by heat-treatment, e.g. baking the coatings for 1 hour at temperatures >300 °C in air.

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PRODUCTS

Tantalum(V) Oxide Patinal® is available as granules and tablets.

Product Code	Description	Purity*	Dimensions
1.08500	Tantalum(V) Oxide Granules Patinal®	≥ 99.95 % (3N5)	Granules, about 1 – 4 mm
1.08172	Tantalum(V) Oxide Tablets Patinal®	≥ 99.95 % (3N5)	Tablets, about 0.5 g, Ø 6.3 mm x h 3 mm

* The purity values are based on the specified trace metals.

Appearance	
1.08500	white granules
1.08172	white disk

SPECIFICATION

Cobalt (Co)	≤ 0.001 %
Copper (Cu)	≤ 0.001 %
Chromium (Cr)	≤ 0.002 %
Iron (Fe)	≤ 0.005 %
Vanadium (V)	≤ 0.005 %

Sizes	
1.08500	Granules 1- 4 mm ≥ 80 %
1.08172	Tablets h = 2.7 – 3.3 mm Ø = 5.9 – 6.7 mm

RoHS information

The RoHS compliance information is part of the Certificate of Analysis (CoA) for each batch of Patinal® material.

Application test

Each batch has to pass a specific application test assessing its evaporation behaviour.

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Quality assurance

Research, production and sales of our Patinal® evaporation materials take place under a certified DIN EN ISO 9001:2000 quality management system and DIN EN ISO 14001 environmental management system. The quality of the materials is assured by our manufacturing processes, in-process controls and quality tests. Each batch is released only after passing our chemical analysis and application tests designed to confirm the suitability of the material for the evaporation process.

Handling precautions

Product safety information required for safe use is not included in this document. Before handling, read product and safety sheets and container labels for safe use, physical and health hazard information. The material safety data sheet is available online at www.patinal.com, from your EMD representative or distributor, or by calling your global Merck KGaA, Darmstadt, Germany, contact.

Disclaimer

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