

Product Information

Substance WR1 Patinal®

GENERAL INFORMATION

Substance WR1 Patinal® was developed for the deposition of hydrophobic layers by evaporation in vacuum. Topcoats made of Substance WR1 Patinal® on AR coated glass or plastic lenses exhibit a very low wettability by water and therefore a lowered tendency to be contaminated by grease and finger prints.

The product Substance WR1 Patinal® comes ready to use, consisting of carrier tablets made of an oxide mixture doped with a perfluorinated silane. WR1 Patinal® is available in three tablet sizes with different silane doping levels.

AREAS OF APPLICATION

- Hydrophobic & oleophobic topcoat for ophthalmic lenses and AR coated glasses

THIN FILM PROPERTIES

Contact angle

- | | |
|-------------------|--------|
| • with water | ~ 112° |
| • with hexadecane | ~ 67° |

After abrasion

- | | |
|-----------------------------------|--------|
| • with cotton cloth @ 4000 cycles | > 100° |
|-----------------------------------|--------|

Free surface energy

Total: 19.8 mN/m
 Dispers: 19.3 mN/m
 Polar: 0.5 mN/m

The typical water contact angle of Substance WR1 Patinal® should be larger than 110°.

The refractive index is about 1.4 in the visible spectral range. The change in AR-functionality can be considerable if the AR-coating design has not been compensated for this additional layer. We advise to compensate (reduce) the original top layer of the AR stack by the same thickness as the deposited WR1 layer in order to keep the spectral performance unchanged.

No major deterioration occurs by wiping with cloth or after boiling in salt solution (5% of sodium chloride in water) for 10 minutes. Furthermore, no delamination occurs after tape testing.



NOTES FOR EVAPORATION

Evaporator source	Resistance heated thermal evaporator Electron beam evaporator (indirect)
Tablet holder	For resistive heating: Box type Ta or W boat (see fig. 2) For indirect e-beam heating: Mo or Ta liner with perforated cover (see fig. 3)
Evaporation temperature	350 – 750 °C recommended 450 °C
Chamber pressure	< 4·10 ⁻⁵ mbar
Substrate temperature	from RT up to < 300 °C recommended < 150 °C
QCR-settings	Density 1.5 g/cm ³ , z-ratio 1.0
Thickness (QCR)	15 – 25 nm (depending on tooling factor)

In general, we recommend the more moderate resistive source heating over e-beam heating. If e-beam heating is unavoidable, the e-beam ought not to be focused directly onto the tablet.



Fig. 1: Substance WR1 Patinal®



Fig. 2: Box type boat



Fig. 3: Liner with perforated cover

After opening the shutter, the boat current should be set to a low and constant value. Onset of evaporation usually occurs after approximately 60 - 90 sec. The evaporated Substance WR1 Patinal® will form a thin fluorinated siloxane layer on the substrate. The thickness of the film is self limited at a physical layer thickness of about 7 – 8 nm. Excess material can be wiped off. For optimum spectral stability the spectral measurement of the coating should be performed after wiping off surplus material. Maximum durability is achieved for approximately 20 nm thickness quartz crystal reading at 1.5 g/cm³ density setting.

Durable films with good adhesion can be deposited onto oxide films, especially onto silicon dioxide or Substance L5 Patinal® films (top layer of an AR coating) on mineral glass or plastic lenses.



The WR1 layer undergoes a ripening process post deposition at ambient conditions.
 Post treatment in warm and humid environment for a few hours reduces the ripening time.

- e.g. condition 1: 25°C, 40% RH, 24 hours
 condition 2: 40°C, 80% RH, 8 hours
 condition 3: 60°C, 80% RH, 2 hours

PRODUCTS

Product Code	Description	Active Substance
1.15195.0103	Substance WR1 Tablets 0.03 Patinal®	0.03 g per tablet
1.07669.0103	Substance WR1 Tablets 0.06 Patinal®	0.06 g per tablet
1.07683.0103	Substance WR1 Tablets 0.13 Patinal®	0.13 g per tablet

Storage conditions

No indication for a limitation of shelf life has been observed when stored under cool and dry conditions in original sealed package. Nevertheless, the maximum storage time should not exceed 5 years because of the organic nature of the hydrophobic ingredient.

SPECIFICATION

RoHS information	Sizes
The RoHS compliance information is part of the Certificate of Analysis (CoA) for each batch of Patinal® material.	1.15195 Active substance ≥ 0.03 g/tab. h = 4.5 – 5.5 mm Ø = 6.5 – 7.5 mm
Contact Angle ≥ 110°	1.07669 Active substance ≥ 0.06 g/tab. h = 4.7 – 5.5 mm Ø = 10.8 – 11.6 mm
Application test Each batch has to pass a specific application test assessing its evaporation behavior.	1.07683 Active substance ≥ 0.13 g/tab. h = 9.5 – 10.5 mm Ø = 10.5 – 11.5 mm



Quality assurance

Research, production and sales of our Patinal® evaporation materials take place under a certified DIN EN ISO 9001 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

Products are warranted to meet the specifications set forth on their label/packaging and/or certificate of analysis at the time of shipment or for the expressly stated duration. EMD MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE REGARDING OUR PRODUCTS OR ANY INFORMATION PROVIDED IN CONNECTION THEREWITH. Customer is responsible for and must independently determine suitability of EMD's products for customer's products, intended use and processes, including the non-infringement of any third parties' intellectual property rights. EMD shall not in any event be liable for incidental, consequential, indirect, exemplary or special damages of any kind resulting from any use or failure of the products: All sales are subject to EMD's complete Terms and Conditions of Sale. Prices are subject to change without notice. EMD reserves the right to discontinue products without prior notice.

EMD, EMD Performance Materials, the vibrant M, Patinal are trademarks of Merck KGaA, Darmstadt, Germany.

