

Product Information

Substance M1 Patinal®

GENERAL INFORMATION

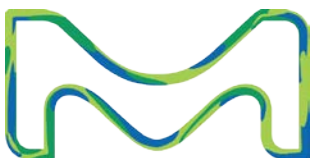
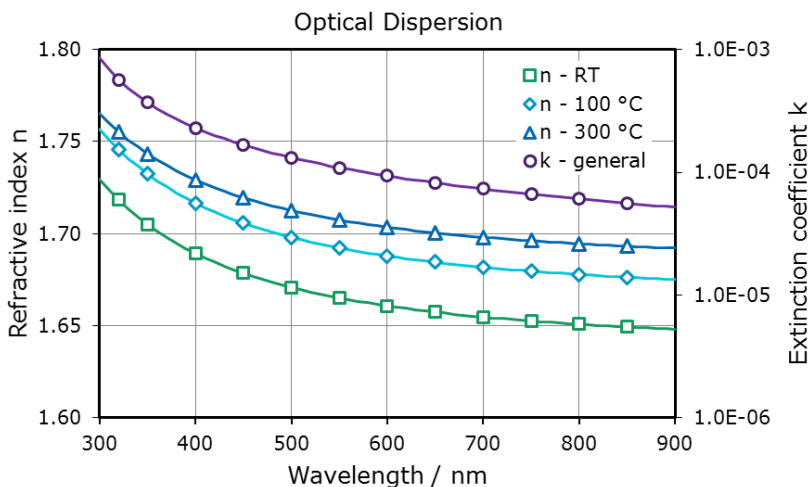
Substance M1 Patinal® (praseodymium aluminium oxide) is a medium refractive index material covering a wide transmission range enabling efficient and high performance optical multilayer designs. It was developed with the aim to provide a melting material for the production of homogenous optical thin films with a medium refractive index.

AREAS OF APPLICATION

- AR coatings on glass (esp. high-index glass) and polymers
- Optical multilayer coatings such as beamsplitters in the UV, VIS and IR spectral range

THIN FILM PROPERTIES

Range of transparency	300 nm – 9 μm
Refractive index at 500 nm	
• conventional $T_s = RT$ °C / no IAD	1.67
• conventional $T_s = 100$ °C / no IAD	1.70
• conventional $T_s = 300$ °C / no IAD	1.71



wavl / nm	300	350	400	500	600	700	900
n - RT	1.729	1.705	1.689	1.671	1.661	1.655	1.648
n - 100 °C	1.757	1.732	1.717	1.698	1.688	1.682	1.675
n - 300 °C	1.765	1.743	1.729	1.713	1.704	1.698	1.692
k - general	8.5E-04	3.7E-04	2.3E-04	1.3E-04	9.4E-05	7.3E-05	5.2E-05

Layers of Substance M1 show weak absorption at about 400 to 500 nm resulting from absorption by praseodymium ions. Usually this absorption is too low to influence the performance of AR coatings e.g. for eye glasses.

NOTES FOR EVAPORATION

Evaporator source	Electron beam evaporator
Liner	Copper
Evaporation temperature	~2100 °C
Deposition rate	0.2 – 0.8 nm/s
Oxygen partial pressure	about 0.8 - $2 \cdot 10^{-4}$ mbar
Substrate temperature	30 – 300 °C
QCR-settings	Density 4.8 g/cm ³ , z-ratio 1.0

Substance M1 Patinal® requires e-beam heating. Attempts to evaporate Substance M1 Patinal® from resistively heated boats were not successful. The material needs no pretreatment before evaporation. We recommend to melt the material below a shutter and to use an oscillating or defocused e-beam to evaporate from a large flat surface area. The material can be evaporated and refilled consecutively without a change in the resulting thin film properties.



PRODUCTS

Product Code	Description	Purity*	Dimensions
1.08333	Substance M1 Granules Patinal®	≥ 99.9 % (3N)	Granules, about 1 – 4mm

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

Appearance

1.08333	Greenish granules
---------	-------------------

SPECIFICATION

Cobalt (Co)	≤ 0.005 %
Copper (Cu)	≤ 0.005 %
Chromium (Cr)	≤ 0.005 %
Iron (Fe)	≤ 0.02 %
Manganese (Mn)	≤ 0.05 %

Sizes

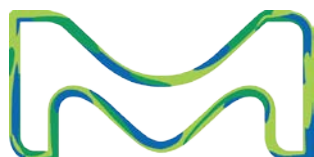
1.08333	Granules 1- 4 mm ≥ 80 %
---------	----------------------------

Application test

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

RoHS information

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



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

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.

