

## Product Information

# Yttrium Oxide Patinal®

### GENERAL INFORMATION

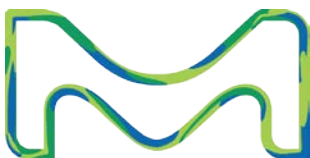
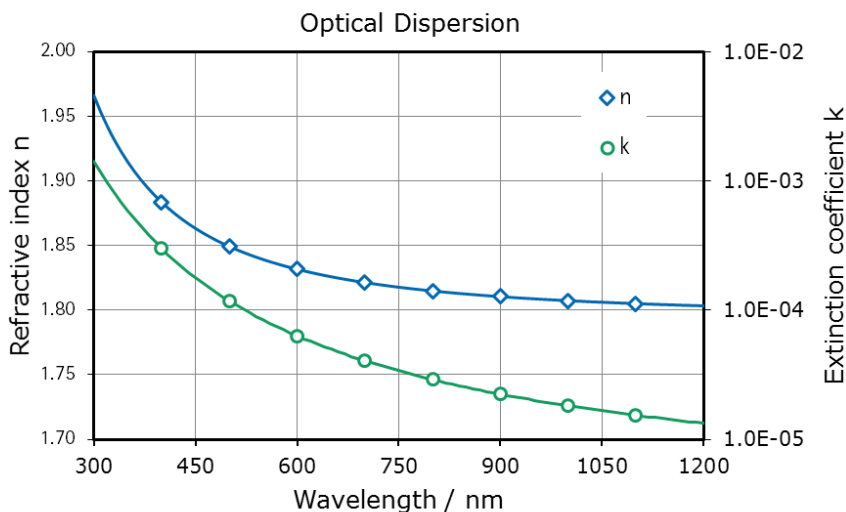
Yttrium oxide forms hard and durable layers with a medium refractive index and low absorption over a wide wavelength band from the UV to the IR. It is especially well suited as a protective coating for aluminium, silver or gold mirrors. It acts as an excellent adhesion promoter for oxidic, metallic and fluoridic coatings, especially for applications in the IR.

### AREAS OF APPLICATION

- AR and multilayer coatings in the UV, VIS and IR range
- Protective coatings for metal mirrors
- Adhesion Promoter

### THIN FILM PROPERTIES

Range of transparency	240 nm – 12 µm
Refractive index	
• at 500 nm	~ 1.82 - 1.85
• at 9 µm	~ 1.69
Thin film stress	Tensile



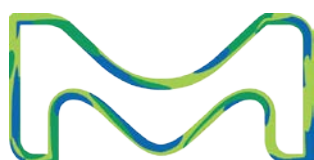
wavl / nm	300	400	500	650	900	1200
n	1.96	1.88	1.85	1.83	1.81	1.80
k	1.4E-03	3.0E-04	1.2E-04	5.1E-04	2.5E-05	1.5E-05

The optical, electrical and mechanical properties of vapor deposited films are dependent on deposition rate, substrate temperature and oxygen partial pressure.

## NOTES FOR EVAPORATION

Evaporator source	Electron beam evaporator Resistance heated evaporator
Liner / boat	Copper crucible Tungsten boat
Evaporation temperature	2300 – 2500 °C
Deposition rate	0.6 – 2.0 nm/s
Oxygen partial pressure	1- 2·10 <sup>-4</sup> mbar
Substrate temperature	conventional 250 to 300 °C
QCR-settings	Density 5.01 g/cm <sup>3</sup> , z-ratio 1.0

Coatings with a high packing density and virtually no water absorption bands can be deposited at high substrate temperatures or by using IAD. Yttrium oxide has a tendency to form slightly inhomogeneous layers with increasing film thickness, this can be counter acted by using an ion source.



## PRODUCTS

Yttrium Oxide Patinal® is available as granules.

Product Code	Description	Purity*	Dimensions
1.16440	Yttrium Oxide Granules Patinal®	≥ 99.95 % (3N5)	Granules, about 1-2.5 mm

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

### Appearance

1.16440	Colorless granules
---------	--------------------

## SPECIFICATION

Cobalt (Co)	≤ 0.001 %
-------------	-----------

Copper (Cu)	≤ 0.001 %
-------------	-----------

Chromium (Cr)	≤ 0.005%
---------------	----------

Iron (Fe)	≤ 0.005 %
-----------	-----------

Vanadium (V)	≤ 0.005 %
--------------	-----------

### Sizes

1.16440	granules 1- 2.5 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](http://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.

