

## Substance H2 Patinal®

### GENERAL INFORMATION

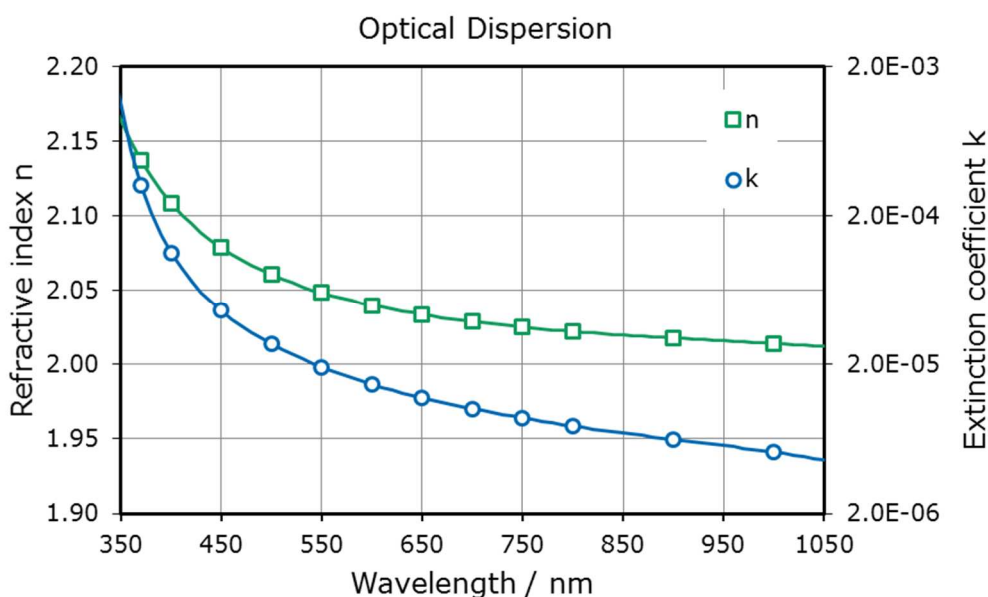
Substance H2 Patinal® is a titanium praseodymium oxide mixture for high refractive index thin films. Compared to  $ZrO_2$  the material melts and is therefore easier to evaporate and forms very homogeneous layers without a refractive index gradient.

### AREAS OF APPLICATION

- Antireflection coatings in the VIS and NIR spectral range
- Coatings on glass and crystalline substrates

### THIN FILM PROPERTIES

Range of Transparency	400 nm – 5 $\mu$ m
Refractive index at 500 nm	
<ul style="list-style-type: none"> <li>• conventional <math>T_s = 300</math> °C / no IAD</li> </ul>	2.1
Absorption edge	400 nm



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wavl / nm	350	400	450	500	550	700	900
n	2.27	2.17	2.13	2.10	2.08	2.05	2.03
k	9.0E-03	1.6E-03	7.7E-04	4.9E-04	3.6E-04	2.0E-04	1.3E-04

Layers of Substance H2 show some weak absorption bands between 400 to 500 nm. These bands are a result of the 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 crucible
Evaporation temperature	2200 – 2400 °C
Deposition rate	0.2 – 1.0 nm/s
Oxygen partial pressure	about $2 \cdot 10^{-4}$ mbar
Substrate temperature	250 - 300 °C
QCR-settings	Density 6.2 g/cm <sup>3</sup> , z-ratio 1.0

Substance H2 Patinal® can be evaporated by electron beam deposition directly from a water-cooled copper crucible. For optimum flatness of the melt a circular sweep pattern at low frequency (~3-6 Hz) is recommended with a softly defocussed electron beam. A beam overlap in the center of the liner should be avoided (ring shaped pattern). Other sweep techniques depend on the available equipment.

Substance H2 melts at a temperature below the evaporation temperature and therefore forms a flat melted surface. A homogeneous thickness distribution can thus be achieved easily. It is recommended to fill the material into the crucible and pre-melt in vacuum below a shutter. If necessary, fresh material can be refilled and pre-melting can be repeated. After the deposition process, the melting residue can be used for further processes after refilling of fresh material.



## PRODUCTS

Product Code	Description	Purity*	Dimensions
1.16413	Substance H2 Granules Patinal®	≥ 99.95 % (3N5)	Granules, about 1 – 4 mm

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

### Appearance

1.16413	Dark grey granules
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## SPECIFICATION

Cobalt (Co)	≤ 0.001 %	Sizes	
Copper (Cu)	≤ 0.005 %	1.16413	Granules 1 - 4 mm ≥ 80 %
Chromium (Cr)	≤ 0.005 %		
Iron (Fe)	≤ 0.005 %	Application test	
Vanadium (V)	≤ 0.01 %	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 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

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