

## Product Information

# Silicon Dioxide Patinal®

### GENERAL INFORMATION

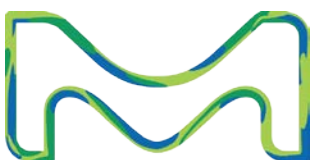
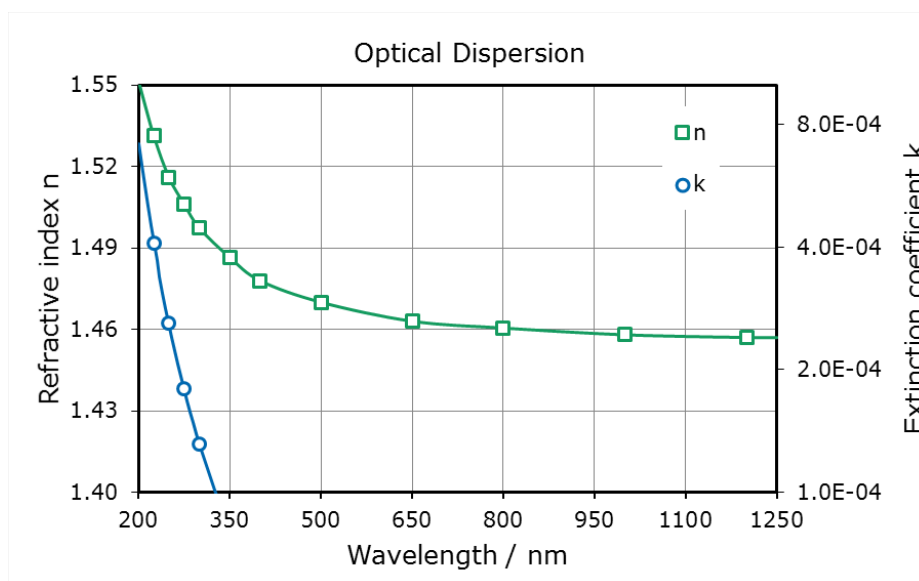
Silicon dioxide is the most common low refractive index material for multilayer coatings in combination with e.g. titanium oxide, hafnium oxide, tantalum pentoxide, or Substances H1, H2, or H4 Patinal®.

### AREAS OF APPLICATION

- Antireflection (AR) coatings for low temperature deposition on plastic substrates
- Laser coatings, e.g. with hafnium oxide, scandium oxide or aluminium oxide for UV applications
- Protective coating on Al-coatings

### THIN FILM PROPERTIES

Range of Transparency	190 – 2000 nm
Refractive index at 500 nm	1.46
Thin film stress	compressive



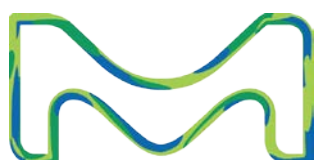
wavl / nm	200	250	350	500	650	800	1000	1250
n	1.551	1.531	1.487	1.470	1.463	1.461	1.458	1.457
k	7.1-04	2.6E-04	< 1E-4	< 1E-4	< 1E-4	< 1E-4	< 1E-4	< 1E-4

The resulting optical properties of the thin film are dependent on process conditions like deposition rate and substrate temperature. SiO<sub>2</sub> thin films exhibit an amorphous structure. High packing densities can be achieved by using IAD or a high substrate temperature.

## NOTES FOR EVAPORATION

Evaporator source	Electron beam evaporator
Crucible / Boat	Copper crucible
Evaporation temperature	1800 – 2200 °C
Deposition rate	0.4 – 1.2 nm/s
Oxygen partial pressure	none to $\sim 5 \cdot 10^{-5}$ mbar
IAD settings (Leybold APS)	130 – 150 V Bias
Substrate temperature	conventional RT to 350 °C IAD @ RT
QCR-settings	Density 2.648 g/cm <sup>3</sup> , z-ratio 1.0

The evaporation characteristics and the properties of the coating depend on the focusing of the electron beam. In order to obtain good and reproducible results, the energy of the beam must be distributed as evenly as possible over the surface of the granules.



## PRODUCTS

Product Code	Description	Purity*	Dimensions
1.07688	Silicon Dioxide Granules Patinal®	≥ 99.99 % (4N)	Granules, about 1-3 mm
1.07537	Silicon Dioxide Granules Patinal®	≥ 99.99 % (4N)	Granules, about 1-4 mm
1.15337	Silicon Dioxide Granules Patinal®	≥ 99.99 % (4N)	Granules, about 2.5-4 mm

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

### Appearance

1.07688	Colorless glass-like granules
1.07537	Colorless glass-like granules
1.15337	Colorless glass-like granules

## SPECIFICATION

Cobalt (Co)	≤ 0.0005 %	Sizes	
Copper (Cu)	≤ 0.0005 %	1.07688	Granules 1-2.5 mm ≥ 80 %
Chromium (Cr)	≤ 0.002 %	1.07537	Granules 1-4 mm ≥ 80 %
Iron (Fe)	≤ 0.005 %	1.15337	Granules 2.5-4 mm ≥ 80 %
Vanadium (V)	≤ 0.0005 %		

### 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.



## 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

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