



Light pipes: Almeco PVD coated Aluminium vs. reflecting films

Technical information
concerning environmental resistance and related topics

PVD Coating

PVD aluminium material is highly reflective aluminium with a total reflectance up to 98% or even more. The PVD layer system contains metallic and non-metallic layers; The mirror functionality will be performed by pure silver; further layers protect this silver, enhances the reflectance and also „passivate“ the entire layer system against the environmental treatments. No organic components like plastics will be used in our layer system.

1. Optical Properties: *State of the art and more*

The total reflectance and the color values of the VSP298 material are continuously monitored during coating by VIS/NIR Zeiss spectrometers.

Property	Standard	Value
Total reflectance [%]	DIN 5036-3	≥98 *)**)
Total reflectance [%]	ASTM 1651	≥98 *)**)

*) standard deviation SD < 0.4 for standard guaranteed value 98%,

***) we can specify >98%, e.g.98,6% with standard deviation SD < 0.6

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Specular reflectance (ISO 7668)

Measurements are made with handheld reflectometer / glossmeter.

Total reflectance (DIN 5036-3)

Measurements are made using a 50cm integrating sphere (Ulbricht Globe).

Total reflectance at 30° (ASTM E 1651)

Measurements are made with the Technidyne TR2 integrating sphere.

Due to the reliable and carefully monitored coating process, Almeco can specify for the *certain* wavelengths (e.g., one in blue, one in green and one in red spectral region), the spectral reflectance value higher than 98,4%

2. Optical properties: *Advantages in color*

Color measurements are performed regularly according to internal Almeco standard, using a set of inline spectrometers. The PVD product is almost color neutral, corresponding to values of a^* , b^* close to zero (both a^* and b^* between -3 and +2, CIE Lab color system).

We can state also, that, due to the absence of organic compounds we didn't achieve material color ageing at any relevant conditions: no yellowing occurs.

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3. Optical properties: *Advantages in the blue spectral region*

In the opposite of some plastic reflective products the PVD coated aluminium has large spectral reflectance in the (deep) blue spectral region (under 400 nm, s. graph). Due to this fact we expect kind of “natural” color by use in the light pipes.

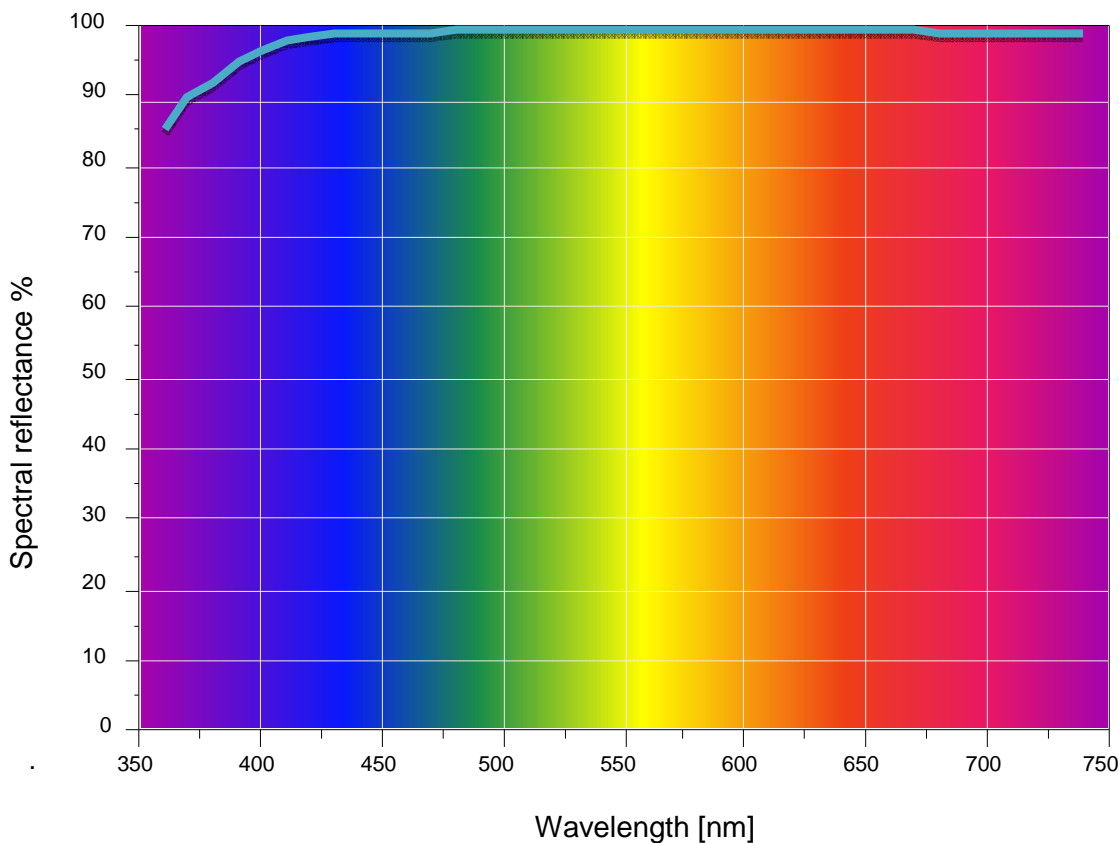


Figure 1. Reflection spectrum of the VSP298 material.

This spectral property will not change by ageing at any relevant conditions.

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2. Environmental stability of the coating: *Excellent stability*

The stability of VSP298 has been extensively tested under different experimental conditions. They have included heat storage, high humidity storage, different arts of chemical attack (gaseous and liquids).

Property	Standard	Value
Total reflectance [%]	ISO 6270-1 (humidity.resistance)	no change *)
Total reflectance [%]	different chem attack (SO ₂ / H ₂ S / mixgas ...) **)	no change *)

*) within standard dev. of the instrument (KonicaMinolta Spectrophotometer)

***) details available on request

We have to underline the excellent heat resistance of our material, which withstands also elevated temperatures for the long time, which resistance exceeds by far what could be achieved for usual commercial available plastics.

The technical data are available on request.

3. UV stability of the coating: *Outstanding properties*

As mentioned, the ageing is no problem for the PVD layer system at all relevant conditions; one of the important ageing factor in practice is the incoming (sun-)UV radiation.

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Property	Standard	Value
Total reflectance [%]	ISO 11341 (UV resistance: Xe lamp)	no change*)
Total reflectance [%]	internal: long storage at sunlight	no change*)

*) within standard dev. of the instrument (KonicaMinolta Spectrophotometer)

We have shown that our PVD material has an excellent ageing performance by this ageing factor, almost no ageing was achieved in standard test with QSun equipment as well as with our custom tests.

3. Handling / Assembling / Cleaning:

The robust choice

You can handle with our aluminium based material as usual, as you do it with any metal sheets or coils; you do not need special machines to laminate them; usual metal workers skills should be enough to handle with.

Normally the sheets will be delivered with protective film on the reflectance side, please remove them as the last step of assembling as it usually will be done in the lighting industry. Some storage demands arise more due to the fact of using this protective coil, than from the demands of the aluminium material itself. Please contact our departments for further storage and cleaning informations.

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Conclusion

Focused on the excellent optical performance, which remains quite stable, - thanks the outstanding ageing properties of our material, merged with relative ease handling, we can underline these advantages especially in the field of light pipes.

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