



---

Lighting

# Surfaces for lighting applications

# Your experts for coil coating processes

We have been market leaders in the production of semi-finished products for reflectors in the lighting industry for over 40 years – but it doesn't stop there: our strengths now also include innovative solutions for light control, glare reduction and homogeneous light distribution. We are the only company in the world to offer all processing techniques from a single source, from anodizing and PVD coatings to custom-

developed coating systems. In addition to excellent material properties and a variety of design options, our surface finishes also offer significant economic benefits: using pre-treated strip metal or panel blanks allows significant cost savings in production. Our products are ready for use and are suitable for printing and back-injection moulding with plastic. Your forms and our surfaces will bring the light to where it is needed.



## **Anodizing – The basis for all our surfaces**

Based upon our core competence, we produce anodized aluminium coil. This process has been used successfully in lighting technology for decades. Thanks to the glass-like aluminium oxide layer produced in the anodizing process, all Alanod's qualities are optimally protected.



# Light quality through durability

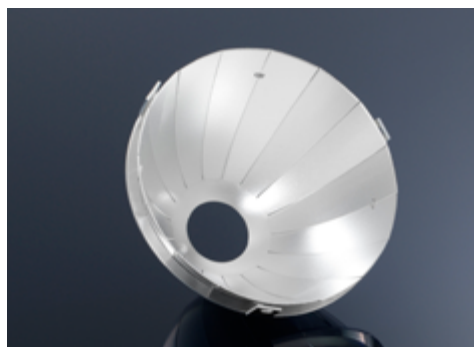
An LED is designed to last 50,000 hours. The reflector material used in an LED lighting system should provide consistently high performance over such a period without reflection loss or color distortion.

This is not the case with plastic materials: vaporized reflector systems and plastic lens systems are prone to degradation, increasingly producing undesirable color effects (chromatic aberration) over time.

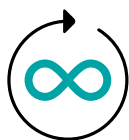
The long-term stability of our reflector surfaces (MIRO® and MIRO-SILVER®) has been tested under the toughest conditions: The surface of the reflector is heated to over 100 °C (200 F) – a thermal load that is never attained in normal operation with LEDs. Even after 50,000 hours, our MIRO® and MIRO-SILVER® surfaces remain unaffected.



High-quality products that start with the choice of materials



## Our tailor-made reflective materials – your benefit



Long-term stability that mirrors LED durability



Neutral color reproduction thanks to excellent color rendering index



Glare limitation thanks to precise light control and reduction of high point luminance

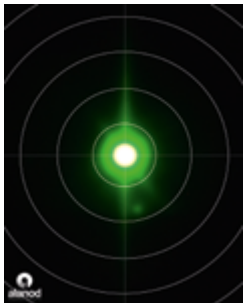


Increased efficiency thanks to maximum total light reflection

# Improve your lighting

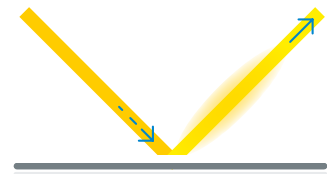
## Light quality through light control

Light control is crucial to ensuring excellent light quality. Regardless of whether an application requires isotropic or anisotropic reflection characteristics, whether a darklight effect is desired or the reflector material needs to have an ergonomic self-luminance, our product range has the ideal surface.

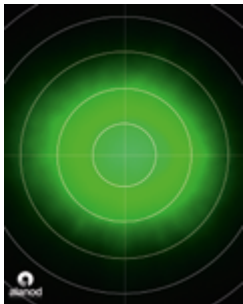


MIRO® 27 reflection characteristics

**Directing light precisely** – examples are for downlights or spotlights in shop lighting, as well as for industrial lighting at great heights (e.g. MIRO® 27)

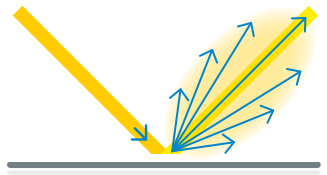


Reflection type optical mirror effect

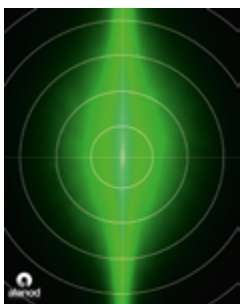


MIRO® 20 reflection characteristics

**Directing light diffusely** – examples are for streetlights and industrial lighting at lower heights. Our materials allow individual LED light points to be dissipated, thus achieving smooth, homogenous light distributions (e.g. MIRO® 20)

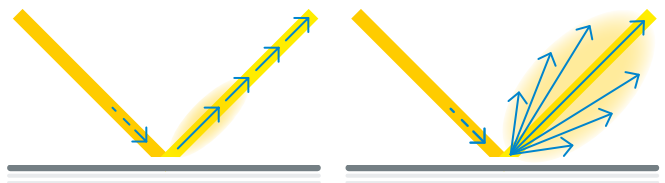


Reflection type controlled diffuse



MIRO® 5 reflection characteristics

**Distributing light linearly through one surface alone** – the point becomes a line. At workstations in offices or industry, linear lights are far superior to circular solutions (e.g. MIRO® 5/5013GP)



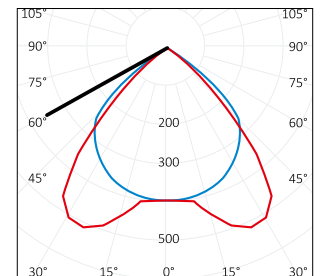
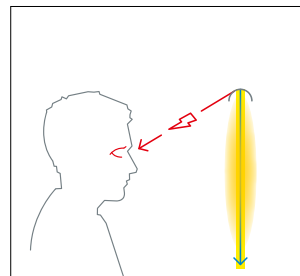
Reflection type directed (left)/diffused (right) depending on structure orientation

## Light quality through glare limitation

The high performance of modern LED technology has once again shifted developers' and users' focus onto the issue of glare. In order to avoid glare, diffuse covers are sometimes fitted to a light source, but this creates disadvantages: optimal ergonomic lighting cannot be ensured in workplaces, color and detail recognition are negatively impacted in shop lighting,

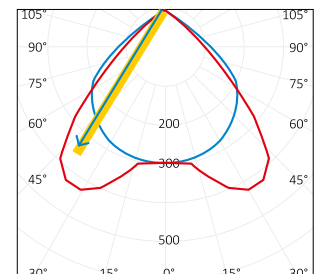
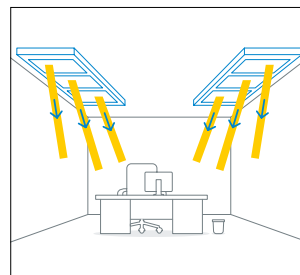
as well as energy wasted and efficiency reduced. Reflector designs using Alano<sup>®</sup> surfaces, can eliminate glare, provide exact reflection to allow precise light distribution and allow the CRI needed by the light source. By directing the light to where it is actually needed, the efficiency of the fixtures is increased and energy is saved.

Precise light control can ensure that the focus is not **drawn towards the high point luminance** of a powerful LED, then preventing direct glare.



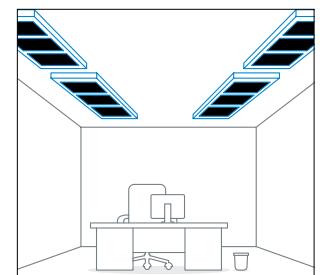
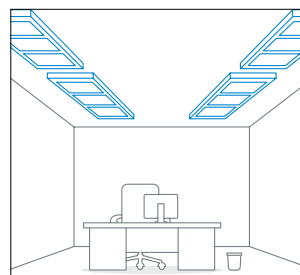
cd / klm  
● C0 – C180  
● C90 – C270  
 $\eta = 91\%$

Correct light control through the reflector gives light **a precise intensity distribution curve**. A specialist planner can then arrange a lighting system to ensure an optimized CRF (contrast rendering factor) for the illumination of workplaces.



cd / klm  
● C0 – C180  
● C90 – C270  
 $\eta = 91\%$

A lighting concept with adapted self-luminance will **blend in harmoniously with the surroundings** and help avoid glare caused by excessive high differences in luminance.

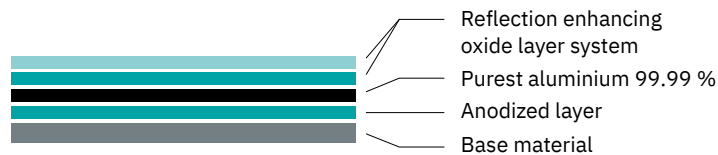


# Surfaces for superior results

## MIRO®

MIRO®, the material quality most commonly used in conjunction with all light sources including LEDs, combines a high total light reflection of 94 to 95 % with excellent long-term stability. For nearly three decades, MIRO® has been synonymous with efficient lighting systems, and is THE material of choice.

### MIRO® layer structure

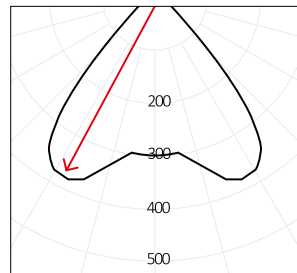


### Neutral color reproduction

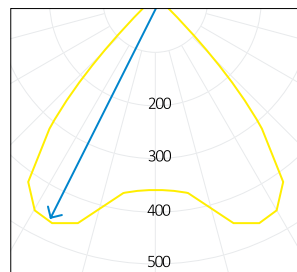
The excellent color reproduction of our MIRO® and MIRO-SILVER® qualities guarantees a neutral color experience without the chromatic aberration seen in lens systems.

### Efficiency

MIRO® increases efficiency by at least 20 %, even in a standard, wide-angle reflector concept.



**Lor ( $\eta$ ) 69 %**  
Standard anodized –  
conventional material



**Lor ( $\eta$ ) 83 % | +20 %\***  
MIRO® – optimized reflection

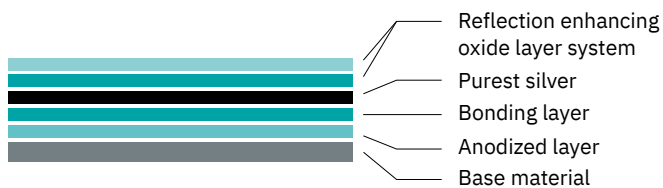
\* Compared to anodized  
aluminium

## MIRO-SILVER®

With a total light reflection of more than 98 %, MIRO-SILVER® is the frontrunner when it comes to energy-efficient lighting solutions.

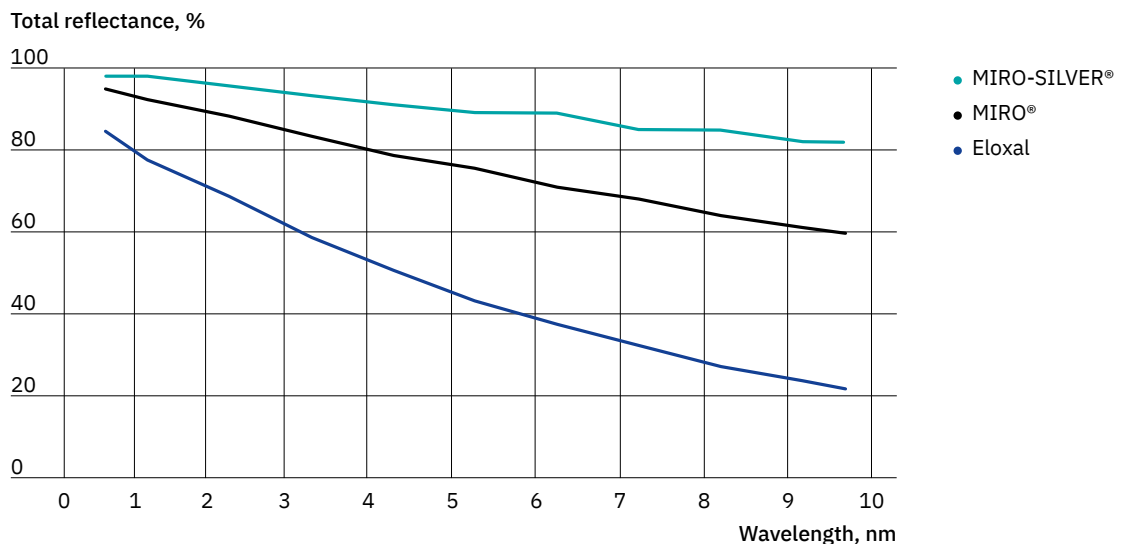
MIRO-SILVER® quality further improves what is already possible with MIRO®.

### MIRO-SILVER® layer structure



### Reflective properties

Some lighting solutions require multiple reflections, and this is where the strengths of MIRO-SILVER® lie: compared to the already highly reflective MIRO®, MIRO-SILVER® achieves an increase of 14 % after five reflections and an increase of 27 % after ten reflections. Thus, with narrow-angle spotlights such as those in shop lighting, the efficiency of the reflector design can be significantly increased.



## MIRO® White 98

MIRO® White is a highly reflective, matte white polymer material that acts as a functional layer guaranteeing uniform, diffuse reflection characteristics in all directions. Our MIRO® White surfaces are particularly suitable for use as reflectors and light housings in the field of indirect lighting, with the aim of optimizing uniform illumination. They offer total light reflection of 98 %.

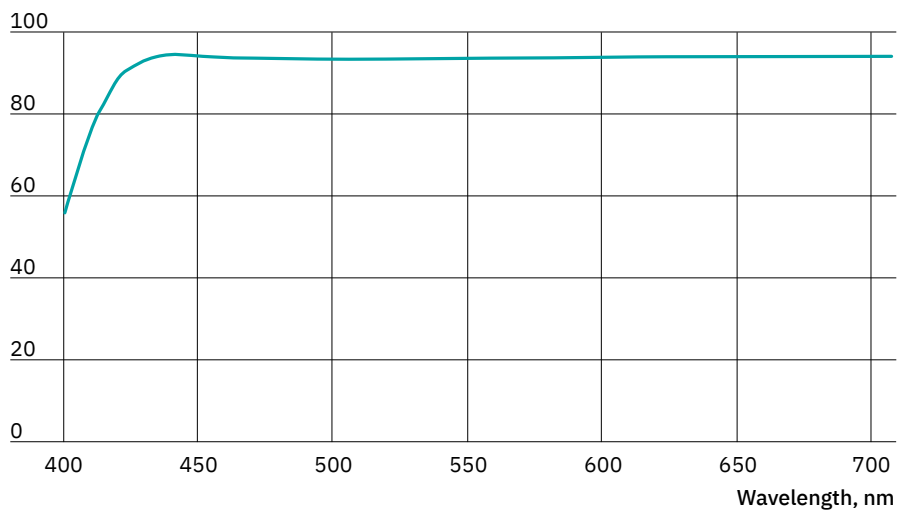
### MIRO® White 98 layer structure



MIRO® White 98 is a highly diffuse reflective metal composite with a matte finish that boasts an impressive total light reflection of 98 %.

- UV-stable
- Continuous thermal stability up to 100 °C
- Stable in a humid environment
- Antistatic
- Abrasion-resistant
- Chemically resistant to most common cleaning solutions; not compatible with bleaches or alkalis.

Total reflectance, %



● MIRO® White 98



# Our solutions for extraordinary lighting concepts

## High-quality look

Our aluminium qualities stand out not only with their excellent reflective properties, but also with the high-quality appearance of their metallic surface. This gives modern light and reflector designs unique quality and value.

## Simple processing

Special lighting concepts require special reflector materials. Surfaces for lighting technology are more and more frequently being formed three-dimensionally using techniques such as pressing, deep drawing or hydroforming. These methods can also be combined with the segmentation of reflectors. We offer suitable qualities for these applications.

Here is an example of the adapted strength properties of a quality with almost identical lighting properties:

## Mechanical properties

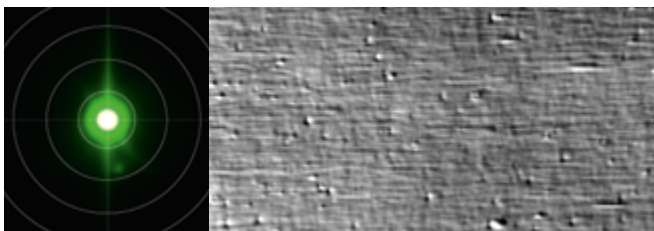
Strength properties	Basic quality (hard)	3D forming quality (soft)
Yield strength Rp 0.2 [Mpa]	130 – 165	30 – 60
Tensile strength Rm [Mpa]	140 – 175	60 – 90
Strain A50 [%]	≥ 2	≥ 30



# Explore tailor-made reflectivity

## Surface reflection characteristics

The following illustrates the reflection characteristics of our surfaces for a light incidence below 45°, supplemented by topographic images of the surfaces. These representations allow an initial estimation of the reflective properties of our surfaces. Precise optical values can be found in the table on the next page.



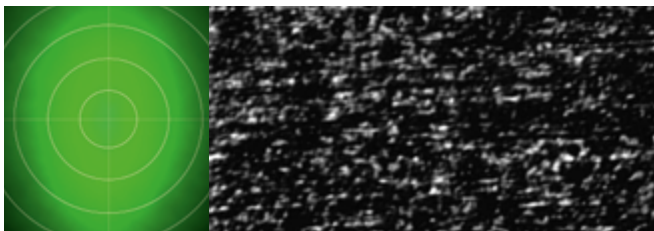
### MIRO® 27 | 4270 GP

- High-gloss surface with low diffuse reflection < 6 %, minimal preferential direction
- Optical mirror effect
- High brightness



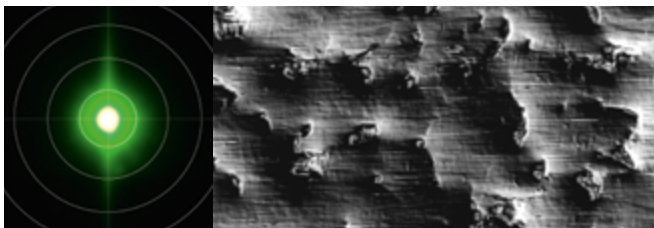
### MIRO® 20 | 2000 GP

- Scattergloss surface with purely diffuse reflection, almost without preferential direction
- Increasing brightness at lower incident angles



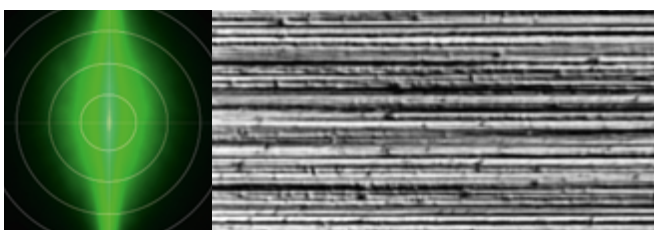
### MIRO® 12 HD | 1200 GP HD

- Particularly isotropic, highly diffuse reflection surface due to special surface treatment
- Perfect light mixing
- Ideal for LED applications due to dissipation of light spots – glare reduction



### MIRO® 8 | 5120 GP

- Reflectormat surface, highly diffuse reflection  $\rho_{\text{d}} = 60 - 67 \%$



### MIRO® 5 | 5013 GP

- Mill finish surface with strong preferential direction, almost purely diffuse reflection
- White appearance due to the magnesium content of the substrate

Optical values of our product qualities

Alanod quality	Total light reflection [%] DIN 5036-3 ASTM-E16511	Diffuse reflection [%] ISO 7668	Brightness 60° along ISO 7668	Brightness 60° across ISO 7668	Maintained reflectance class DIN EN 16268
MIRO-SILVER® 27	≥ 98	≤ 6	≥ 96	≥ 95	A+
MIRO® 27	≥ 95	≤ 6	≥ 85	≥ 85	A
318 G2 (Anodized)	≥ 87	≤ 8	≥ 78	≥ 74	C
MIRO-SILVER® 8	≥ 97	60–75	85–87	85–87	A+
MIRO® 8	≥ 94	60–67	76–82	75–82	A
1520 G3 (Anodized)	≥ 86	70–75	69–70	65–67	C
MIRO-SILVER® 5	≥ 97	≥ 95	80–90	25–41	A+
MIRO® 5	≥ 94	≥ 93	72–84	23–40	A
1100G (Anodized)	≥ 84	80–84	43–60	12–20	C
MIRO-SILVER® 20	≥ 97	≥ 97	25–35	21–30	A+
MIRO® 20	≥ 94	≥ 94	21–34	20–23	A
2000G (Anodized)	≥ 87	≥ 87	20–26	13–16	C
MIRO-SILVER® 12HD	≥ 96	≥ 96	8–10	7–8	A+
MIRO® 12HD	≥ 93	≥ 93	6–8	6–7	A
1200 (Anodized)	≥ 76	≥ 76	<10	<10	D
MIRO® White 98	≥ 98	≥ 98	<1	<1	A+

Maintained reflectance class DIN EN 16268	Total reflection [%]
A+	97.0–100.0
A	93.0–96.9
B	88.0–92.9
C	82.0–87.9
D	76.0–81.9
E	70.0–75.9
F	64.0–69.9
G	58.0–63.9
H	50.0–57.9

## Care for the Environment

Conserving natural resources has been part of our corporate philosophy ever since our company was founded in 1975. Today, Alanod is a climate-neutral, sustainably run company. Due to the excellent recycling properties of aluminium, our materials use up to 90 % recycled aluminium. This consumes up to 95 % less energy compared to primary aluminium production.

Our cutting-edge post-combustion technology enables production of all of our materials without the need for excessive energy input. All our electricity needs are met using “100 % green” energy sources.

## Made in Germany

Our high-tech materials are all manufactured at our sites in Germany.

## System Development

Our broad-based team of experts develops individual solutions for our customers in close cooperation with international research institutions and long-standing industrial partners. Talk to us so that we can work together to fulfill your wishes.



**ALANOD GmbH & Co. KG**  
Egerstr. 12, 58256 Ennepetal  
Germany  
+49 2333 986 - 500  
info@alanod.de

**Alanod-Westlake Metal Ind. Inc.**  
36696 Sugar Ridge Road, North Ridgeville  
Ohio 44039, USA  
+1 440 327 8184  
sales@alanod-westlake.com

**ALANOD Metal Surface  
Treatment (Shanghai) Co, Ltd.**  
88 Keyuan Road, Zhangjiang  
Hi-Tech Park / German Center  
201203 Pudong New Area  
Shanghai, China  
+86 13774207787  
mo.weizhong@alanod.de

**Alanod-Xxentria Technology Materials**  
No. 168, Lane 256, Yilin Road  
Rende Dist., 717, Tainan City, Taiwan  
+886-6-2496885  
info@alanod-xxentria.com

**ALANOD Metal Surface  
Treatment (India) Private Ltd.**  
MIDC Knowledge Park, 2nd Floor, Tower 5  
World Trade Centre, 1, Opp. EON Free Zone  
Kharadi, Pune, Maharashtra 411014  
India  
+91 9552102922  
bhupendra.kelam@alanod.de

[alanod.com](https://alanod.com)