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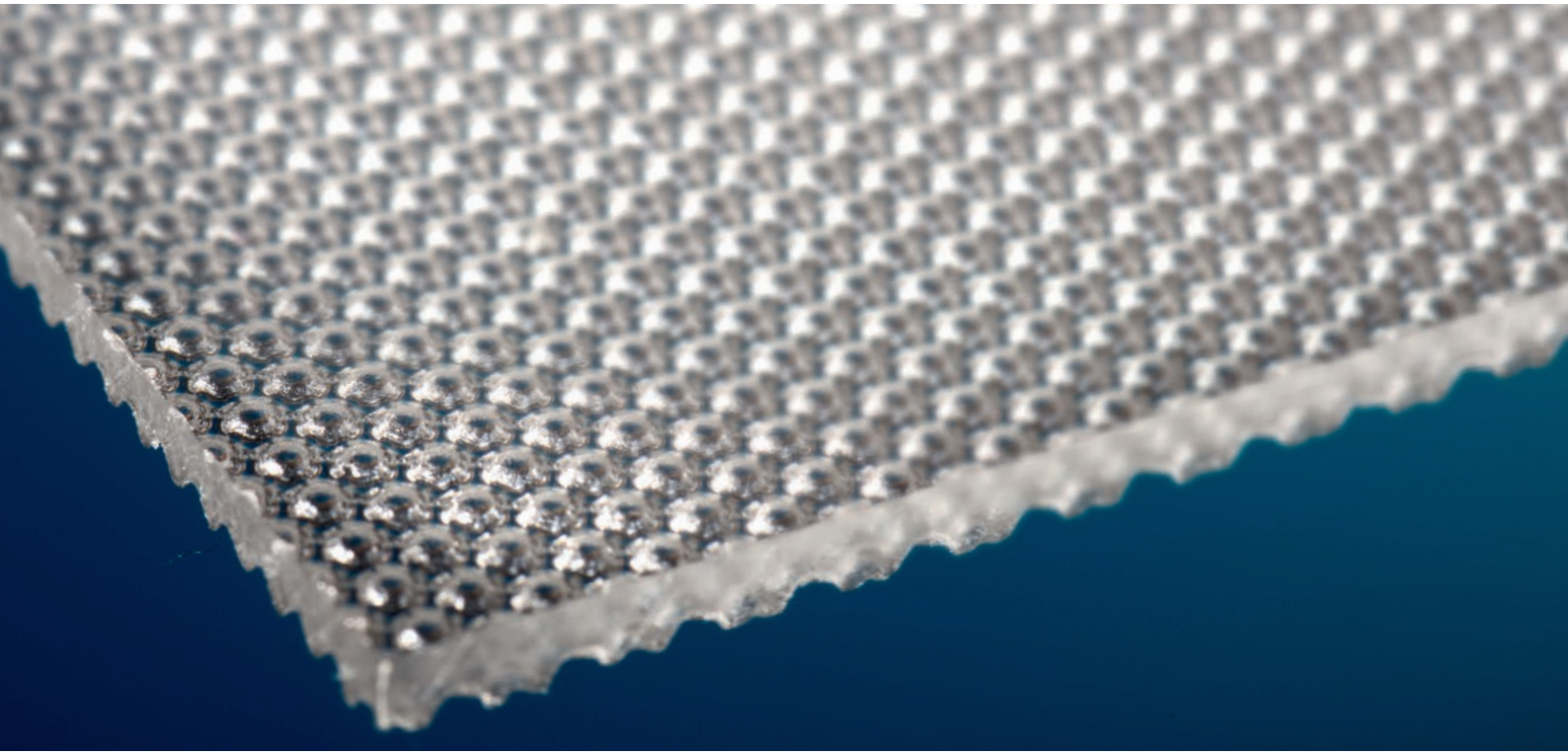


Makrolon® DX Sky

The first transparent Makrolon® refractor (diffuser) with microstructure

makrolon®

Makrolon® DX Sky

The first transparent Makrolon® refractor[1] (diffuser) with microstructure

Prismatic diffusers are commonly made with fairly big structures (e.g. 5 mm). These structures generally work perfectly with bigger light sources that have a larger light emitting surface (e.g. T8 fluorescent lamps). But do not work correctly for smaller light sources like LED structures. Because of this, Exolon Group has developed the Makrolon® DX Sky sheet for LED based luminaires, so that a homogenous light emitting area with fair glare control can now be obtained for those small light emitting sources.

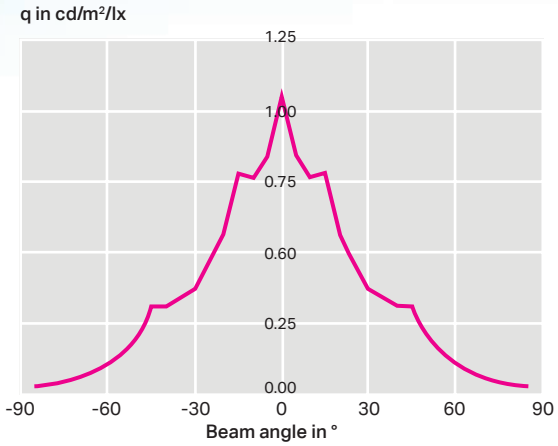
The colourless transparent diffuser sheet Makrolon® DX Sky is designed to distribute the light uniformly with a light intensity distribution curve best suited for most common lighting applications.

The best way to diffuse light is through a micro lens array, or a so called microstructure. This pre-determined geometric shape arranged in a hexagonal grid results in optimized control over the light distribution and an optically better product than one would achieve with a frosted surface or a simple surface pattern. The resultant scattering profile is almost 22° with straight edges and almost no light losses except for Fresnel losses.

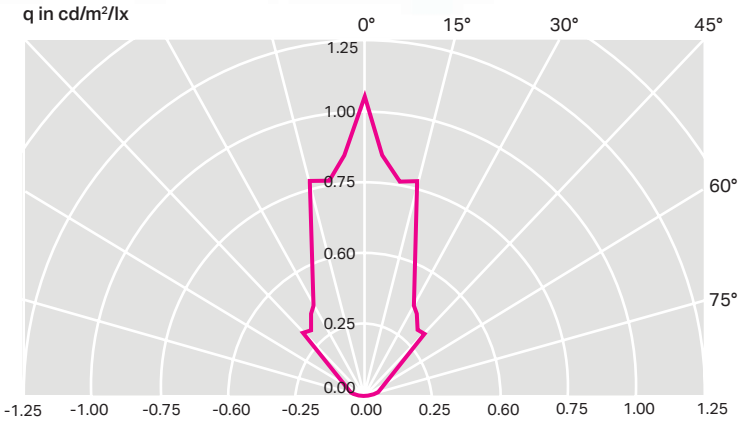
	LED		Sample +	
	LED (1)	LED (2)	LED (1)	LED (2)
Chromaicity coordination				
x	0.439	0.322	0.438	0.322
y	0.401	0.346	0.400	0.345
u	0.253	0.198	0.253	0.198
v	0.347	0.319	0.347	0.319
Correlated colour temperature T_c/K	2940	5940	2950	5980
Special colour rendering indices R_i				
1)	97	69	97	69
2)	97	73	97	73
3)	99	77	99	77
4)	98	73	97	73
5)	96	71	96	71
6)	94	66	94	66
7)	97	78	97	78
8)	98	61	98	61
9)	97	-27	97	-26
10)	94	38	94	38
11)	95	72	95	73
12)	91	49	91	49
13)	96	68	96	69
14)	99	87	99	87
General colour rendering index R_a	97	71	97	71

The results show that the influence of the Makrolon® DX Sky on the colour and colour rendering properties in both LEDs with and without sample is hardly noticeable.

Distribution of Luminance

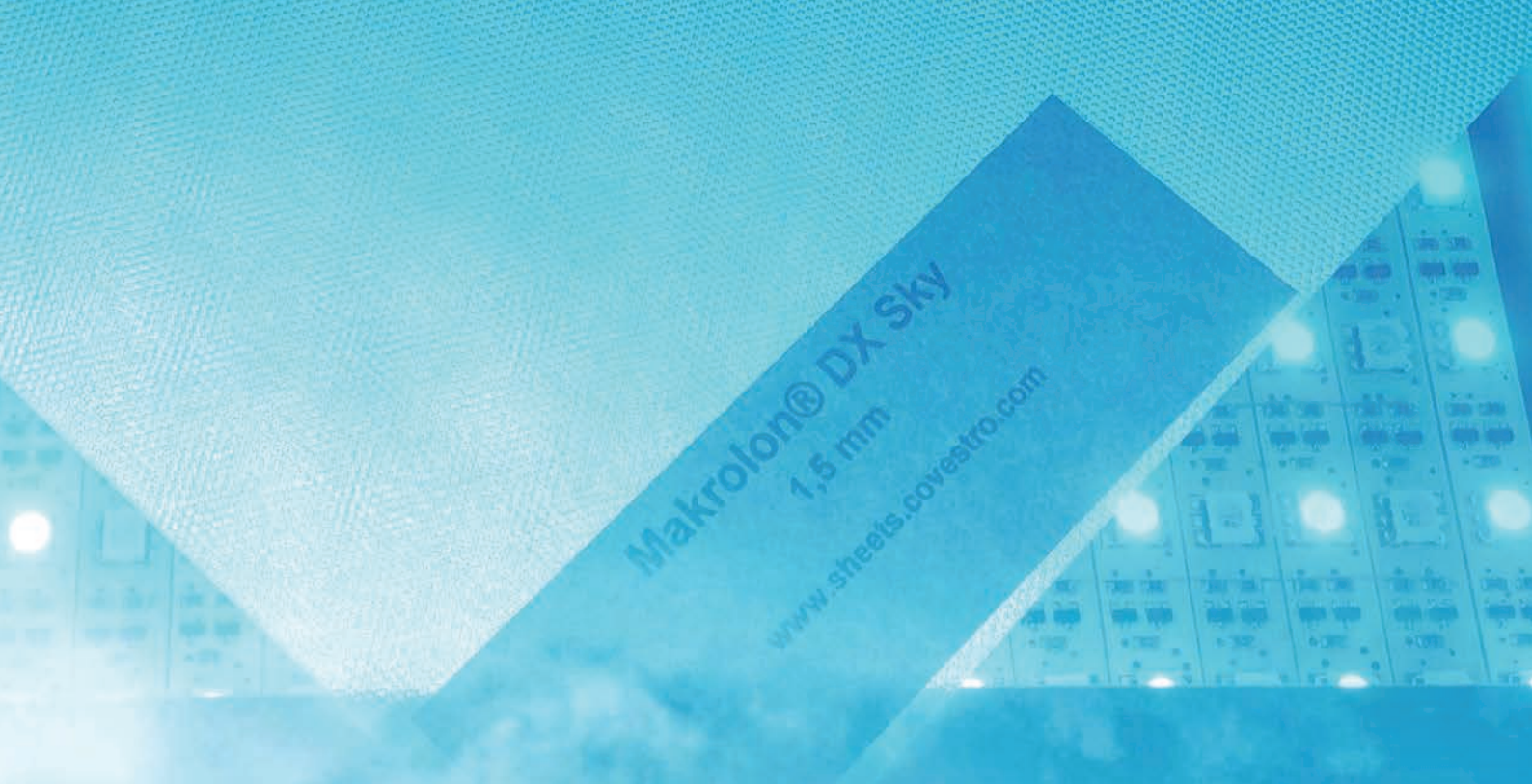


Coefficient q in cartesian coordinates



Coefficient q in spherical coordinates

[1] Refractors are transparent optical parts with special 3D geometrical structures which are used to control light.



Advantage over diffusers made with scattering additives:

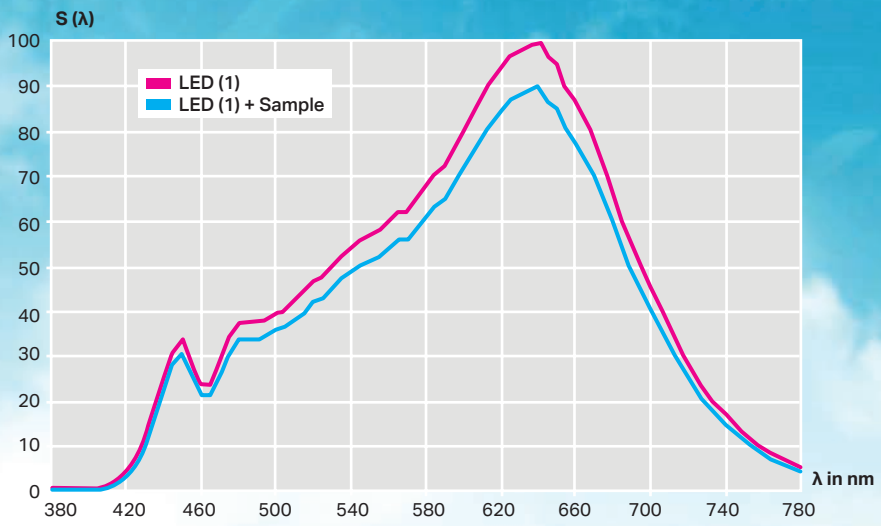
The opto-mechanical structure avoids the need to add scattering additives to the sheet to diffuse the light, which results in a higher light transmission of 90%. The addition of scattering additives introduces photometric losses and the resulting diffusion is not as controllable.

Advantage over frosted surfaces:

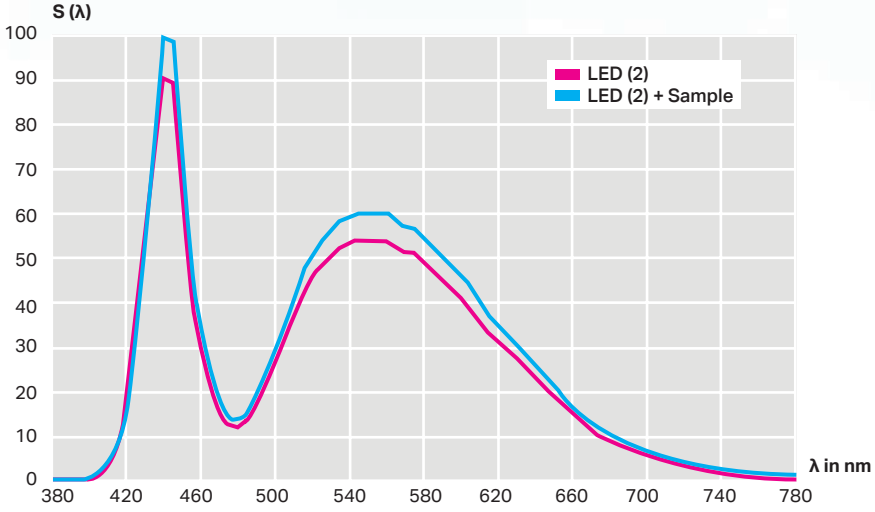
- The use of frosted surfaces for scattering the light limits the scattering profile to just 7° in transmission.
- Intensity distribution edges contain a significant amount of light, which result in light losses.
- Also due to the manufacturing process, no pre-determined surface is possible and the scattering profile is randomised and uncertain.

Optical data:

- Luminous transmittance τ_A for standard illuminant A: 0.90
- Luminous transmittance τ_{D65} for standard illuminant D65 (average daylight): 0.90
- Half-value angle γ: 21.5°
- Diffusion factor σ: 0.36
- Volumetric absorption (mm^{-1}): 0.0083
- Abbé number: 30



Light distribution for two types of LEDs with and without Makrolon® DX Sky sample.



The graphs clearly indicate that Makrolon® DX Sky causes limited light loss over the whole visible light spectrum

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