LUMIRA AEROGEL

an ideal filler material for skylights and facades



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The interior of the industrial bakery of Inter Europol SA. Aluco Skylight roof with aerogel provide a large amount of diffused daylight.

Lumira® Aerogel

Aerogel is the lightest solid material in the world - 95% air in volume

At Aluco System, we successfully use Lumira aerogel in our skylights and facades. Filling polycarbonate panels with aerogel filler results in excellent thermal insulation and light diffusion. It is an excellent material in solutions oriented towards minimal heat transfer.



Properties of aerogel

Lumira® aerogel is a silicate belonging to the group of silica aerogels. Aerogel is an amorphous form of silica of nanoporous structure. About 95% by volume is made of air, making aerogel the lightest solid material in the world. Due to the low solids content and the very small pore size (approx. 20 nanometers), Lumira® prevents heat transfer very effectively. Amorphous silica is inherently safe for all construction applications. The material is chemically Aerogel effectively prevents heat transfer

stable and resistant to UV radiation, nontoxic, classified as non-flammable and does not produce smoke. It is permanently hydrophobic, i.e. waterproof, translucent, resistant to moisture and it is not susceptible to the development of mold and fungus. Due to the inert silica material (= with weak reaction ability), the aerogel can even be used and recycled longer than the service life of the system in question. Lumira® aerogel is an excellent material wherever physical daylight is required without the risk of sacrificing building insulation.

Lumira® aerogel filled multi-chamber polycarbonate panels as a filler for skylights are used in ventilation systems, smoke and heat extraction and facade systems. This unique combination of properties results in significant weight savings without the need to use a large amount of heat and sound insulation. Therefore, Lumira® is perfect for new and renovated buildings. Lumira® aerogel is certified for use in polycarbonate panels by French Avis Technique by CSTB (6706-1699).





Low thermal conductivity

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Figure 1 shows the performance of the Lumira® aerogel. In the conventional range, free atoms are able to transfer heat almost unhindered through the material in the form of kinetic energy (Fig. 1 left). By reducing the size of the gaps (Fig. 1 right), Lumira® reduces the mobility of the atoms to such an extent that heat is almost completely non-conductive through the material. The result is a thermal conductivity value of no more than 0.018 W / (m2 K). Compared: Concrete = 2.1 W / (m2 K), POROTON = 0.08-0.45 W / (m2 K), aerated concrete = 0.08-0.25 W / (m2 K).

Polycarbonate multi-chamber panels filled with Lumira® aerogel achieve a U value of up to 0.54 W / (m2K) (with 40 mm click panels). Hence, the roof and facade elements allow better use of natural light with minimal heat loss, which creates a huge potential for architectural freedom. Building standards are easy to achieve and even better results are achieved without having to sacrifice natural light (UK: part L; France: RT2005; Spain: CTE, Germany: Passive House Standards).



As the photos from the thermal imaging camera show (Fig. 2), polycarbonate multi-chamber panels filled with Lumira® aerogel have much better insulating properties compared to traditional materials. Reddish, much warmer



areas are single glazing elements in the full Lumira® skylight system.

Plate thickness	Light conducting U-value in W / m2 K (for multi-chamber polycarbonate panels)	U-value in W/m²K
10mm	65	2,39
+Lumira	65	1,93
16mm	59	1,82
+Lumira	57	1,31
25mm	40	1,50
+Lumira	32	0,89
40mm	59	1,20
+Lumira	20	0,54

U-values for individual panels

The corresponding U-values apply to applications as vertical facade elements. When installed horizontally, the overall U-value deteriorates. The U value of the Lumira® aerogel used to fill polycarbonate multi-wall panels was taken from horizontally mounted elements, i.e. in the most unfavorable installation position.

Perfect light conduction and diffusion

Natural daylight provides a pleasant atmosphere that has a positive effect on the mind, well-being and, consequently, also on motivation and commitment. Lumira® aerogel is characterized by an excellent light transmittance of up to 90% per 1 cm of thickness. When introduced into polycarbonate multi-wall panels, Lumira® aerogel increases the incidence of light by up to 30% compared to the use of opal polycarbonate multi-wall panels.

For many users, a particularly important aspect is the enormous light scattering property. Daylight, which penetrates through the Lumira® aerogel filling the panels, is uniformly diffused throughout the building. Thus glare and direct sunlight are avoided, improving the lighting conditions and increasing the comfort of the room. This effect is clearly visible in the two photos below, which illustrate the production hall, before and after the application of Lumira® aerogel in the skylights. Working in all parts of the hall has become much more enjoyable and efficient.

Additional advantages of aerogel

 Increased noise protection: Due to the very porous structure and the small percentage of solids in the aerogel, the oscillation is negligible. Inside the aerogel, sound travels much slower than outside (100 m/s, compared to 340 m/s in air). The effect becomes clearly audible especially at low frequencies (40 - 500 Hz), typical for airborne or street noise. The



16 mm multi-wall panel filled with Lumira® aerogel increases the sound reduction value by 3 dB compared to a panel without the filler. This value was assessed at the Müller-BBM laboratory in Munich.

 Reduction of solar convection: Sun shade louvres become redundant due to the significantly reduced heat input during the summer. There are savings in investment and maintenance costs, and the design of the building or the appearance of the facade does not need to be changed.

 Chemically and UV stable: even after many years of use, the Lumira[®] aerogel shows no changes in its chemical and physical properties.

 Permanently hydrophobic: Lumira® aerogel is permanently resistant to moisture. Therefore, it is not susceptible to the development of mold or fungus. This feature is especially beneficial for the food industry.

 Non-flammable and smokeless: classification of Bs 1.0 according to EN 13501-1

• Low weight: 70 - 100 kg / m3: when Lumira® aerogel is used in multi-wall panels, the wind load on the panels does not have to be statically calculated due to the low weight of Lumira® aerogel. Environmentally friendly and ecological: less energy is needed for heating, air conditioning and lighting. Significant savings are made in building maintenance costs and carbon dioxide emissions are reduced.



Warsaw swimming pool

Lumira aerogel is hydrophobic. It has permanent resistance to moisture, so it is not susceptible to the development of mold or fungus. This feature is particularly advantageous in facilities with high humidity, such as swimming pools and in the food industry.





FCA POLAND

The photos show one of the production halls of FCA POLAND.

Aluco SL skylights with LUMIRA aerogel filler were used in the facility. The interior of the building is intensely and uniformly illuminated by natural daylight.



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