



## **Novel translucent solution for outstanding natural light diffusion, thermal insulation and acoustic properties**



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Amorphous silica is a poor heat conductor, and the low solids content offers little for solid phase conductivity. The pore sizes are smaller than the mean free path of air and thus prevent gas phase conductivity. When used to insulate a cavity in a translucent roof or wall panel it also prevents convection currents.

Its translucent nature allows light to be transmitted. The porous structure also slows down the speed of sound in the air, thus reducing noise.

## ■ What is Nanogel® aerogel?

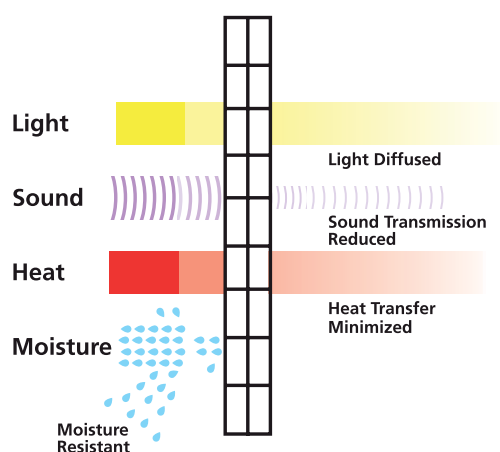
Nanogel is Cabot Corporation's trade name for its family of hydrophobic silica aerogel products. Translucent aerogel particles allow light to pass, while serving as a highly effective thermal insulation.

## ■ The advantages of Nanogel aerogel

Nanogel is a unique material. Some products may perform similarly in ONE area of performance, but Nanogel has ALL of the following characteristics:

- Very high thermal insulation: 0.018 W/m.K
- Excellent light diffusion and reduction of solar transmission
- Very good light transmission (up to 80% per cm)
- Low weight: 60-80 kg/m<sup>3</sup>
- Improved acoustic insulation
- Aesthetically appealing
- Architectural freedom
- Elimination of glare
- No downdraught
- Hydrophobic: superior resistance to condensation; will not support growth of fungus inside the glazing systems
- UV resistant (no discolouration)
- Performance will not deteriorate over time

## ■ How does Nanogel aerogel work?



Characteristics of Nanogel translucent aerogel

Particle size range	0.5 to 4.0 mm
Pore diameter	20 nm
Porosity	> 90%
Bulk density	60 to 80 kg/m <sup>3</sup>
Surface chemistry	hydrophobic
Thermal conductivity	0.018 W/m.K at 25°C
Speed of sound	100 m/sec compared to 340 m/sec in air
Light transmission	80% per cm of aerogel

## ■ The performance of Nanogel aerogel

Nanogel Aerogel Performance Properties*			
Thickness (mm)	Light Transmission (%)	Direct Solar Transmission (%)	U-Value (W/m <sup>2</sup> .K)
10	80	80	1.38
15	70	70	1.00
20	62	62	0.78
25	55	55	0.64
30	49	49	0.54
40	39	39	0.42
50	31	31	0.34
70	19	19	0.25

\* Performance of Nanogel aerogel only. There will be further reductions in SHGC values and improvements in U-values depending on the system selected.

## ■ The benefits of natural light

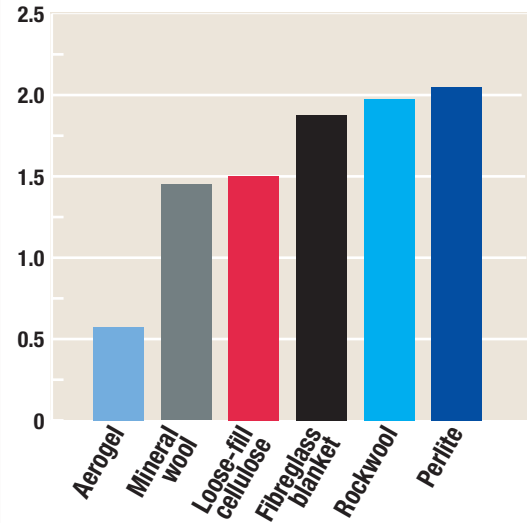
Increasing natural light in buildings has long been a goal in architectural design. Studies have shown that people thrive in natural lighting; they are healthier, happier and more productive. Also, increased daylighting designs are proven to have positive effects such as:

- Increased productivity
- Increased learning rates (20 - 26%)
- Decreased absenteeism
- Happier work or educational environment
- Higher morale and company loyalty
- Better visual quality and comfort
- Longer visits by customers to shopping centres





## ■ Potential applications

- Industrial roof-lights
- Offices, shopping malls and hotels
- Schools and museums
- Conservatories and private housing
- Sports and leisure centres, swimming pools
- Façade glazing and curtain walls
- Special projects such as train stations, airports, etc

Comparison of U-Values of 25 mm Thick Insulation Materials (W/m<sup>2</sup>.K)



## ■ Comparison of the performance of Nanogel aerogel in different systems

Fibre reinforced panels (in Kalwall: 70 mm)	Fibre reinforced panels (in Scobatherm: 50 mm)
<p>Thermal insulation: U-Value: 0.28 W/m<sup>2</sup>.K Improvement: 350% (compared to a standard panel)</p> <p>Light transmission: 21%</p> <p>Acoustic insulation: 35 dB</p> <p>Solar heat gain coefficient (SHGC): 0.10</p> 	<p>Thermal insulation: U-Value: 0.48 W/m<sup>2</sup>.K Improvement: 350% (compared to a standard panel)</p> <p>Light transmission: 25%</p> <p>Acoustic insulation: 32 dB</p> <p>Solar heat gain coefficient (SHGC): 0.25</p> 
Polycarbonate (25 mm)	U-channel glass (25 mm)
<p>Thermal insulation: U-Value: 0.89 W/m<sup>2</sup>.K Improvement: 80% (compared to a standard panel)</p> <p>Light transmission: 55%</p> <p>Acoustic insulation: 23 dB</p> <p>Solar heat gain coefficient (SHGC): 0.53</p> 	<p>Thermal insulation: U-Value: 1.10 W/m<sup>2</sup>.K Improvement: 75% (compared to a standard panel)</p> <p>Light transmission: 30%</p> <p>Acoustic insulation: 46 dB</p> <p>Solar heat gain coefficient (SHGC): 0.42</p> 

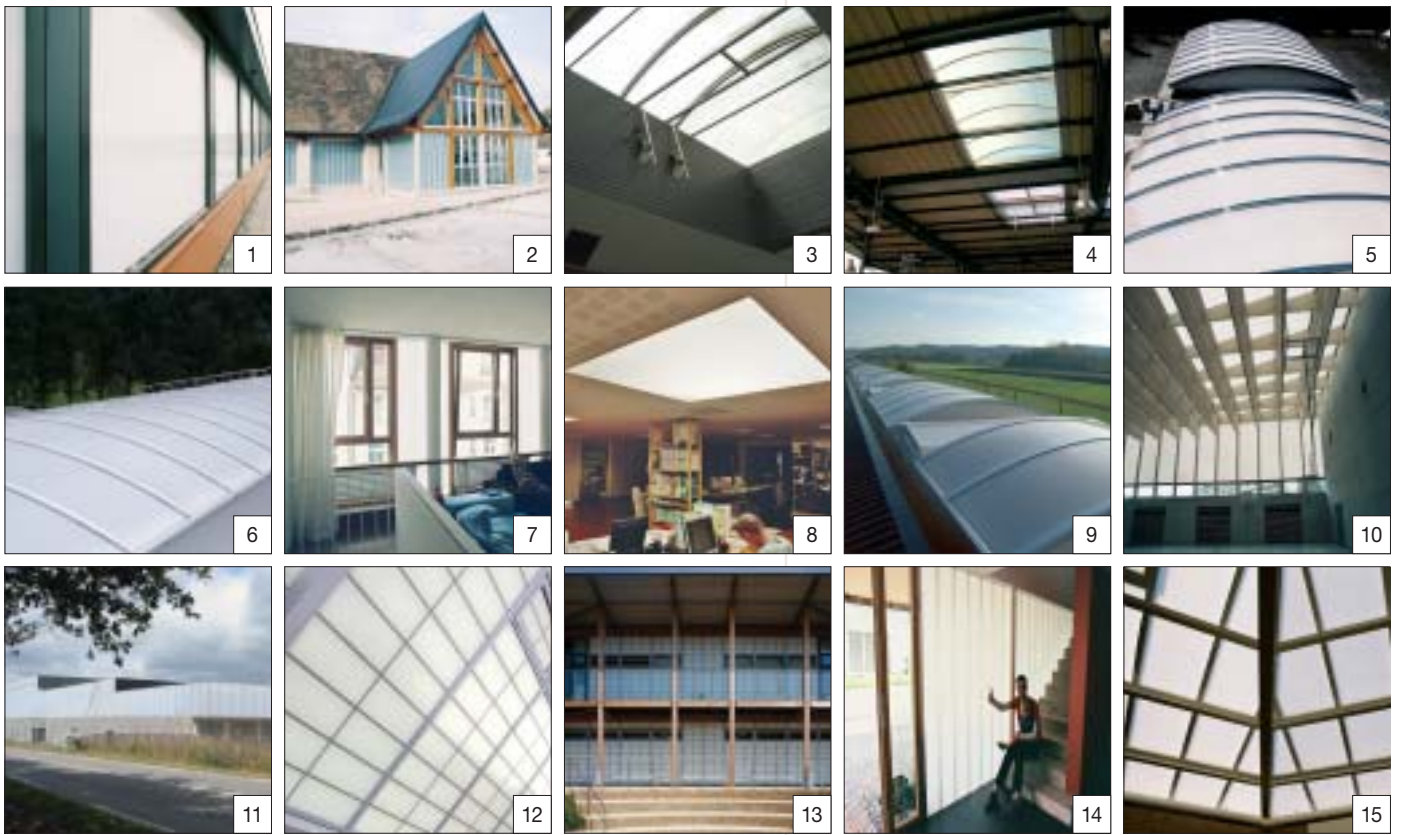
## ■ Other benefits of Nanogel aerogel

- Ability to meet stringent building codes (such as “Part L” in the UK and “Règlement Thermique 2005” in France) for thermal insulation and light transmission without trade-offs
- Reduced energy consumption and heat ventilation/air conditioning (HVAC) costs
- No investment required in louvres thanks to the excellent light diffusion properties

## ■ Example of economic benefits of Nanogel aerogel

Application: sports hall in Western France	
<p>1450 m<sup>2</sup> of façade 25 mm polycarbonate multiwall sheets U-value: 0.89 W/m<sup>2</sup>.K</p>	
<p><b>Nanogel filled PC sheets and profiles:</b> PC sheets: € 110/m<sup>2</sup> Nanogel: € 80/m<sup>2</sup> Total cost: € 190/m<sup>2</sup></p> <p><b>Energy savings:</b> € 3.000/year on lighting € 2.000/year on heating</p>	
<p><b>Double glazing</b> Glass: € 300/m<sup>2</sup> Louvres: € 140/m<sup>2</sup> Total cost: € 440/m<sup>2</sup></p>	<p><b>PC without Nanogel</b> PC sheets: € 110/m<sup>2</sup> Louvres: € 140/m<sup>2</sup> Total cost: € 250/m<sup>2</sup></p>
<p><b>Savings</b> € 250/m<sup>2</sup> direct savings + € 5.000/yr on energy</p>	<p><b>Savings</b> € 63/m<sup>2</sup> direct savings + € 5.000/yr on energy</p>

## ■ Some existing installations



## ■ Awards and membership

Cabot has received the following Awards for Nanogel:

- Innovation Award 2004  
(Royal Institute of British Architects – RIBA)
- DAB Product Award – Bau 2005  
(Deutsches Architektenblatt)
- Top 10 Green Building Products – 2006  
(Sustainable Industries Journal)

Cabot is a member of the “Trade Association of Translucent Insulating Panels” (Germany).

## ■ Warranty

Cabot provides a limited warranty that Nanogel translucent aerogel particles will not display yellowing, loss of light transmission or changes in thermal properties due to weathering, within ten years of date of sale.

1. *Gymnasium, Barendrecht, the Netherlands*
2. *Media Center, Briis-sous-Forges, France*
3. *Carrefour shopping mall, Mont de Marsan, France*
4. *EDIS fire school, Fleury-Mérogis, France*
5. *Givenchy perfumes, Beauvais, France*
6. *HaRo Anlagentechnik, Rüthen, Germany*
7. *Apartment building, Schwabing-Munich, Germany*
8. *Office renovation, Paris, France*
9. *Ruf Maschinenbau, Zaisertshofen, Germany*
10. *Buchwiesen School, Zürich, Switzerland*
11. *Souchais sports complex, Carquefou, France*
12. *Office building, Hemsworth, United Kingdom*
13. *High Crest School extension, High Wycombe, United Kingdom*
14. *Private house, Tollinger, Austria*
15. *Meadow Wood School, Bushey, United Kingdom*

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creating what matters