Attachment 1 - Article

Translucent aerogel solar walls as a façade material of the future: an environmental impact and energy-efficiency assessment

Catharina Hansen, Bjørn Petter Jelle, Jon Aaleskjær, Mohamed Hamdy, Rolf André Bohne

The global construction and property sector is constantly growing and will continue to do so because of the population growth. Today the sector stands for about 40% of global greenhouse gas emissions, and it is therefore crucial to find more sustainable and energy efficient solutions if we want to reduce the emissions.
A number of innovative thermal insulation technologies have been developed throughout the years as the energy demand continues to grow. For the new insulations to be sustainable, there has to be a balance between performance, thickness, costs, and climate impacts.

A solution to this may be the thermal insulation material called aerogel. It is not exactly a new material, but due to its high costs, implementing the material in the building industry has proven to be rather challenging. Today however, due to new technological developments that are driving the costs down, the use of aerogel in insulation materials has increased.

Aerogel may be used in several different types of applications, which includes mainly opaque, translucent or transparent products.

Following a new initiative from one student, Catharina Hansen at NTNU with guidance from AFRY Consult AS and professors at NTNU, the use of translucent aerogel solar walls have been examined for a building in Fredrikstad in Norway. The article was submitted to *Building and Environment*, June 2022.

The article investigates if the energy consumption may be reduced, as a consequence of implementing aerogel solar walls to the building in Fredrikstad, Norway. This was performed by doing an energy simulations using the building energy simulation software IDA ICE. Results showed that the aerogel solar walls reduced the cooling load with 38% just by changing regular windows with the solar walls. Heating showed a reduction on 7%. Artificial lighting on the other hand, was not affected.

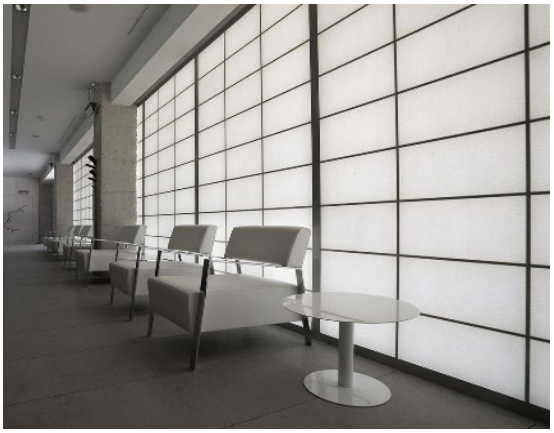

Figure 1. *Translucent aerogel solar walls. Source: Kalwall, 2022*

Furthermore, the article looks at the environmental aspects of the solar walls through performing a life cycle assessment to determine their total environmental impact from production and transportation to the building site. The results showed higher emissions than from regular windows, depending on the location of production (that determines the transport distance and energy), material composition, and lastly but most importantly, the recycling degree of methanol (as the recipe included a lot of methanol).

Overall, the translucent aerogel solar walls showed promising results. Through further advancement and innovation in production, aerogel solar walls may be able to realize its potential as a “façade material of the future”.