

Energy Efficient Windows

Development of versatile transparent aerogel panes

Virginia Commonwealth University researchers have developed a versatile high-performance aerogel-based window design. Currently, insulated double-pane windows are the dominant energy efficient window type on the market. While they are superior thermal insulators when compared to single-pane windows, which account for about 30% of windows in the Northeast and Midwest U.S., the double-pane windows have been slow in replacing single-pane windows. This is because double-pane windows are more expensive, less durable, and their frames are often too wide for the existing single-pane settings. Not only could our aerogel-based windows provide a desirable and effective replacement for single-pane windows, they could also provide enhanced thermal insulation over double pane windows.

Benefits

- » Enhanced durability
- » High optical transparency
- » Low thermal conductivity
- » Moldable into custom shapes & sizes
- » Protects from UVA & UVB light
- » Lower production cost

Applications

- » Insulated window panes
- » Lightbulbs
- » Incubators
- » Acoustic dampening

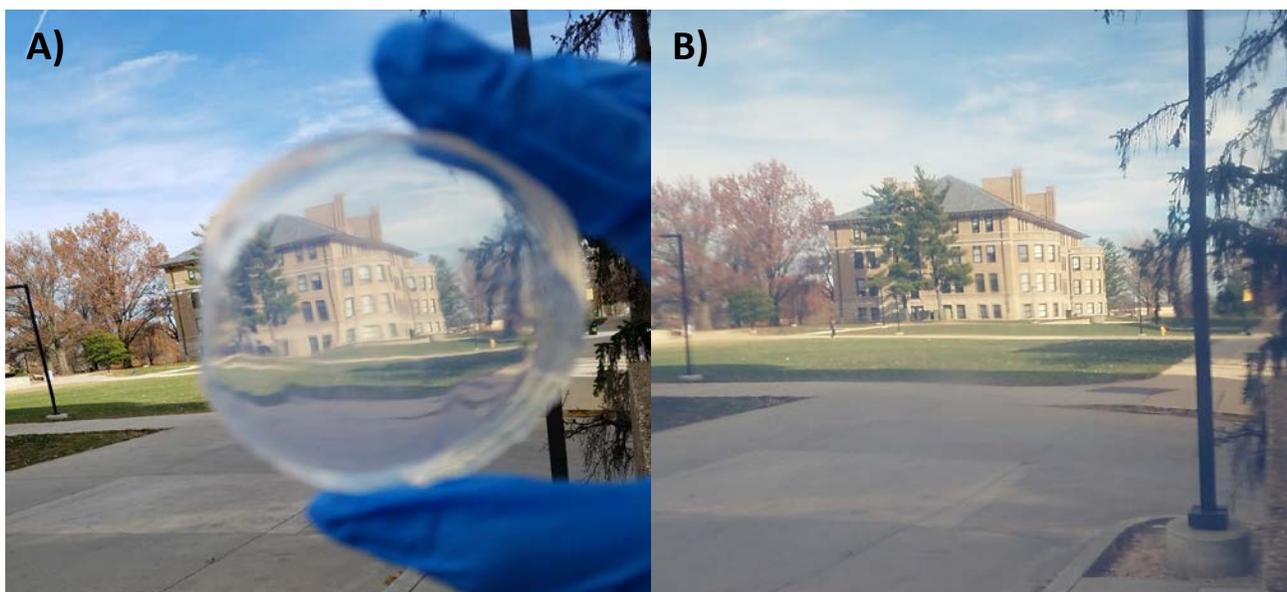


Figure 1. A) Cross-linked aerogel sample showing high optical transparency; B) Observed view through an aerogel window



The technology

While aerogels and nano-foams are typically produced with expensive supercritical drying processes, the presented novel aerogels are fabricated using the freeze drying method. Our custom processing allows for the fabrication of custom-shaped aerogels, reduces the costs of production by roughly 50%, and significantly reduces production hazards. Aerogels produced using this method have several enhanced properties compared to traditional aerogel materials. While traditional aerogels are typically brittle in nature, the newly-developed aerogels are more durable due to the crosslinking of polymer chains. Additionally, while traditional aerogels are fairly opaque, the new aerogels have a high degree of transparency. The enhanced characteristics make them a desirable alternative for thermal insulating window panes and also allow for aerogels to be considered for a wide range of building and industrial applications.

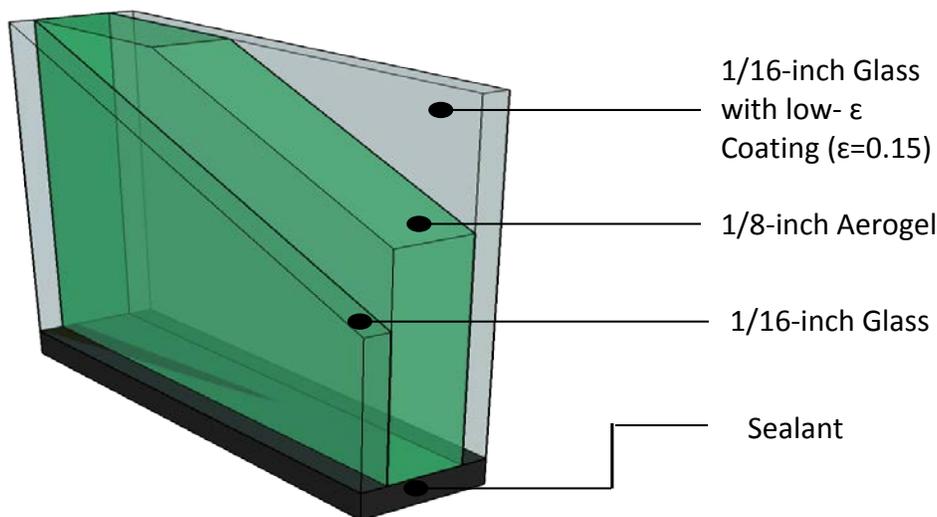


Figure 2. Example of how aerogel material could be incorporated into a double pane window

Additional information

Patent status:

Patent Issued: U.S. rights available.

16/095,158

License status:

This technology is available for licensing to industry for further development and commercialization

Category:

Engineering and Physical Science

VCU Tech #:

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