

Silica aerogel pillars for vacuum glazing

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To provide a novel approach to evacuated window systems, highly transparent supports are required to keep the two glass panes of the window at distance (2 to 3 cm). One option for these supports are silica aerogels. The requirement profile for the supports are:

- optical transparency (visible spectrum): > 0.50 at a thickness of 2 cm (image quality, not translucency)
- mechanical stiffness: can withstand 1 MPa (1 bar) external uniaxial load at compressive strain < 5%
- thermal conductivity (ambient conditions): < 0.035 W/(m·K)

The synthesis of the aerogels was performed with TEOS as precursor by applying a 2-step process and subsequent supercritical drying with CO₂. By variation of synthesis parameters, a silica aerogel with a Young's modulus of 24.6 MPa, a visual transmission of 0.67 and a thermal conductivity of 0.0206 W/(m·K) was developed. These silica aerogels do not crack up to an external load of 1 MPa, at which they show a compressive strain less than 5% thus fulfilling the previously defined requirement profile. These silica aerogels were used in vacuum glazing where the window panes are only partially supported by the aerogel pillars (< 50%). Simulations predict U_g-values down to 0.5 Wm⁻²K⁻¹ for the window element, which is comparable or even lower than for current triple glazing [1].



Figure 1: *Prototype of vacuum glazing with transparent silica aerogel pillars.*

[1] B. Büttner et al., *Evacuated Glazing with Silica Aerogel Spacers*, EuroSun 2018 / ISES Conference Proceedings, (2018), doi:10.18086/eurosun2018.06.17