

Aesthetically Enhanced Aerogels for Window Applications

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As excellent thermal and acoustic insulators, translucent silica aerogels have potential applications in building fenestration. Monoliths can be easily manufactured in a hydraulic hot press using a rapid supercritical extraction method [1, 2]. However, it is not possible to make large window-sized aerogel monoliths due to production size limitations with our existing equipment. An alternate approach is to tile smaller monoliths to create a window-sized assembly [3, 4]. However, the resulting assemblies are not aesthetically pleasing due to the contact lines formed between adjacent tiles. The goal of this work was to develop methods to aesthetically enhance silica aerogels to increase the potential range of aerogel designs and architectural objectives in fenestration applications. A palette of thermally stable dyes and salts were used to produce colored transparent aerogels. These included rhodamine and fluorescein dyes as well as copper, cobalt, and nickel salts. The colorants were included in the precursor solution in various concentrations, resulting in doped aerogels of different shades and opacities. Using a new molding technology, the size of the aerogel was scaled up to 10 x 10 x 1.2 cm with smooth, crack-free, flat surfaces. Using a laser cutter with a setting of 3% speed, 90% power, and 1000 Hz frequency, a variety of shapes were laser cut from these monoliths. Designs were also etched onto the surfaces with a setting of 100% speed and 55% power [5]. The shaped colored and etched pieces can be combined in mosaic patterns to form stained-glass-like aerogel-based windows.

References

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