

A Method for Producing a Micron-Size Spherical Silica Aerogel

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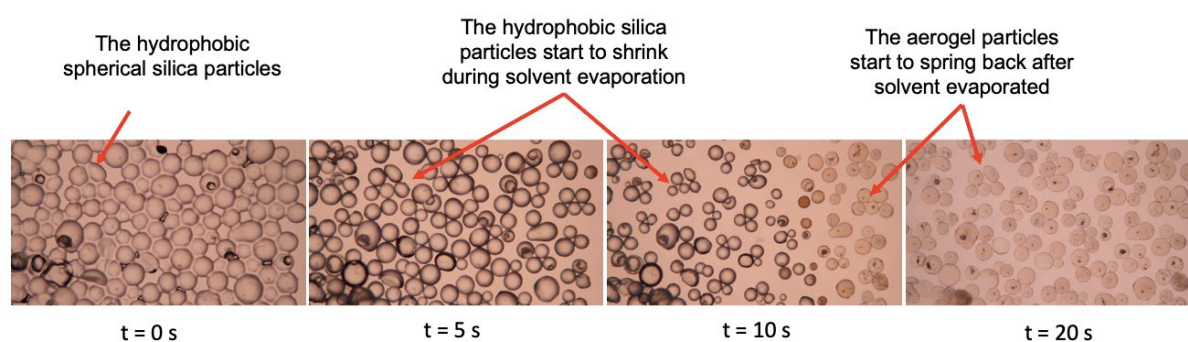
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Abstract

Silica aerogel is the world's best insulating solid material. It is nanoporous silica with a sponge-like structure and has a wide range of industrial applications. Spherical silica aerogel is superior to powdery and granulate silica aerogel regarding uniformity, size control, handling, and purity. However, the existing production of high-quality of the controllable spherical silica aerogel is demanding and not sufficiently cost-effective, so they have yet to be widely implemented in the industry.

The present invention relates to a method of preparing the controllable micron-sized spherical silica aerogel using a low-cost water glass solution as the precursor at ambient conditions. The total processing time for the preparation of the spherical silica aerogel is about 3 hours. The aerogel has a bulk density of $\sim 0.1 \text{ g/cm}^3$, the specific surface area of $\sim 700 \text{ m}^2/\text{g}$, and the thermal conductivity of $\sim 0.020 \text{ W/m.K}$. Different types of drying methods have been explored to dry the aerogel. *Fig 1.* shows the spring-back of the spherical silica aerogel during the drying. The drying of the spherical silica aerogel is fast (*Fig 1*). Our process can also be used to produce silica aerogel powder and oil absorption material. The aerogel product can be used as an additive for the existing building, industrial, and coating products, and provide several advantages include; improved thermal insulation and acoustic insulation, moisture and corrosion resistance, and weight reduction. Examples of applications of our silica aerogel show in *Fig 2-3*.



* The solvent is hexane. The dried on a microscope glass slide at room temperature without heating

Fig 1. The spring-back of the spherical silica aerogel during drying, captured from an optical microscope

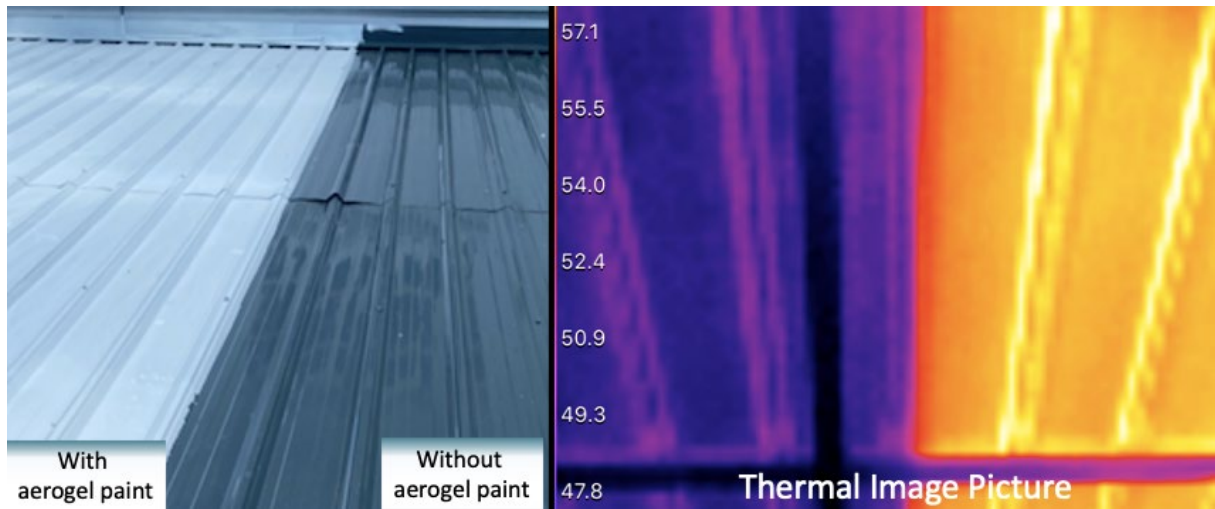


Fig 2. Effect of the aerogel insulation paint coated on a metal sheet roof

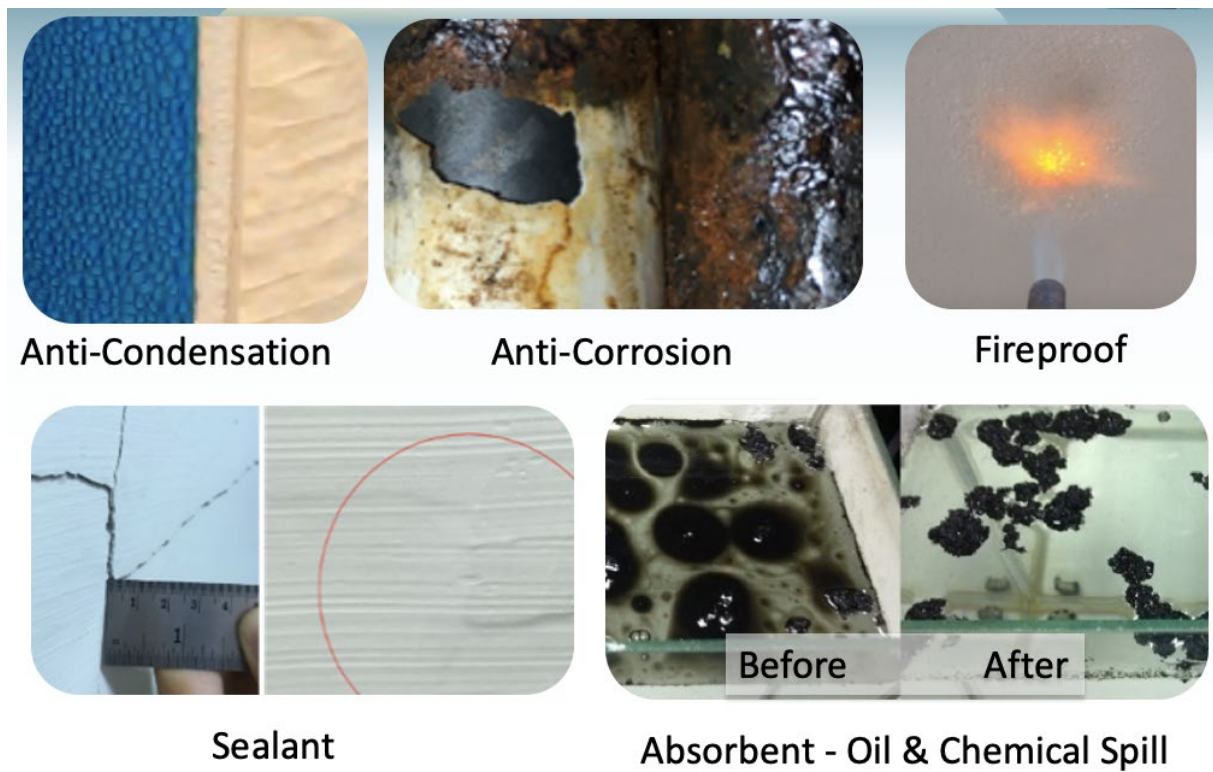


Fig 3. Others applications of aerogel

Acknowledgments

This work has been financially supported by Mahidol University and Thilium Co., Ltd.

"Work carried out in the frame of the COST-Action "Advanced Engineering of aerogels for Environment and Life Sciences" (AEROGELS, ref. CA18125) funded by the European Commission."