

TECH OFFER

Silica Aerogel Based Insulation Paint and Plaster for Building and Construction



KEY INFORMATION

TECHNOLOGY CATEGORY:

Sustainability - Sustainable Living

Green Building - Heating, Ventilation & Air-conditioning

Chemicals - Coatings & Paints

TECHNOLOGY READINESS LEVEL (TRL): **TRL6**

COUNTRY: **SINGAPORE**

ID NUMBER: **TO175169**

OVERVIEW

As global temperatures rise, governments are setting eco-friendly building standards to address concerns about energy consumption and carbon emissions. Improving energy efficiency in buildings, especially in hot climates where cooling demands increase energy use, has become a major challenge. This has driven the need for sustainable and energy-efficient building materials.

Aerogels are among the most promising insulation materials due to their large specific surface area (500-1200 m²/g), high porosity (80-99.8%), and ultra-low density (around 0.003 g/cm³). They are amorphous, chemically inert, non-flammable, and exhibit extremely low thermal conductivity (0.01-0.03 W/(m·K)). Silica aerogel (SA) is particularly notable for having the lowest thermal conductivity, making it ideal for building insulation.

The technology owner has developed an advanced insulation coating that incorporating in-house fabricated silica aerogel (SA)

powders to enhance both thermal and acoustic insulation in buildings. This technology also works with silica aerogel powders purchased externally. Incorporating 20 vol% SA into paint and plaster formulations can reduce surface temperatures by up to 12°C and chamber temperatures by up to 3.3°C, helping to lower air conditioning use and save energy. The coating also improves acoustic insulation, offering a dual benefit. By meeting the growing demand for greener building solutions, this technology offers a competitive edge in reducing energy consumption and improving overall comfort and building performance.

The technology owner is seeking industrial partners for test-bedding and is also open to licensing opportunities for commercialization, especially with construction companies, building material manufacturers, and developers focused on sustainable and energy-efficient construction.

TECHNOLOGY FEATURES & SPECIFICATIONS

This technology leverages the exceptional properties of silica aerogel (SA) to represent a significant advancement over current state-of-the-art building insulation materials, making it ideal for sustainable construction. Key features include:

- Silica aerogel has the lowest thermal conductivity of any solid insulation, outperforming even still air
- SA has an amorphous structure made of over 90% air, making it the world's lightest solid material and breathable, enabling fresh air circulation
- Incorporating SA into building materials significantly reduces k-value, achieving high efficiency with thinner coatings or plasters while maintaining excellent energy efficiency
- Adding SA to plaster enhances its thermal insulation properties in high-temperature environments (45°C), with a temperature reduction of up to 3.3°C
- Concrete cubes coated with 5 mm thick SA plaster show superior noise insulation, achieving a noise reduction of up to 19.6 dB
- Enhances both thermal and acoustic insulation, contributing to energy-efficient and comfortable working and living spaces

POTENTIAL APPLICATIONS

This technology is highly suited for the construction and building materials industry, with a focus on enhancing energy efficiency and sustainability in both new buildings and retrofitting projects. Its primary application is to improve thermal and acoustic insulation in residential, commercial, and industrial buildings. By incorporating silica aerogel into paints and plasters, it significantly reduces the need for heating and cooling, lowering energy consumption - particularly valuable for green building initiatives and sustainability certifications.

The technology also improves soundproofing, making it ideal for noise-sensitive environments like hospitals, schools, and office spaces. Additionally, its high-temperature resistance makes it suitable for industrial insulation applications including furnaces and pipelines.

Potential solutions that can be co-developed from this technology include but are not limited to:

- Thermal insulation paints
- Insulating plasters
- Prefabricated insulating panels
- Lightweight insulating concrete blocks

MARKET TRENDS & OPPORTUNITIES

In 2022, the global market for building insulation materials, including thermal insulation, was valued at approximately USD 26 billion and is expected to exceed USD 37 billion by 2027, with a compound annual growth rate (CAGR) of around 7%. The growing demand for advanced insulating materials like silica aerogel is driven by stringent energy efficiency regulations, increasing awareness of environmental sustainability, and the rising trend of green building certifications.

UNIQUE VALUE PROPOSITION

- **Exceptional Thermal Insulation:** Leverages silica aerogel's extremely low thermal conductivity, enabling thinner and lighter insulation layers without compromising energy efficiency
- **Enhanced Acoustic Insulation:** Provides noise reduction, ideal for environments where soundproofing is essential
- **Thin and Lightweight:** Delivers high-performance insulation with significantly reduced thickness and weight, optimizing space and reducing material usage compared to traditional materials like fiberglass and polystyrene
- **High Safety and Durability:** Non-flammable and highly stable under extreme temperatures, offering better safety than traditional insulation materials
- **Sustainability:** Contributes to long-term energy savings, space optimization, and overall building performance, providing both environmental and economic benefits for sustainable construction