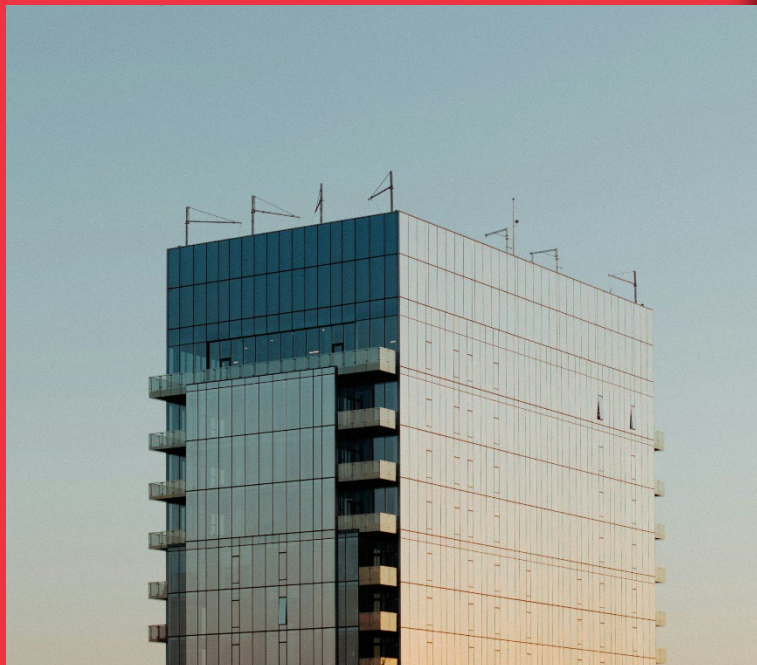




Flame Retardant FRP with Aerogel Additive for Green Buildings

SP Singapore Polytechnic

Technology Licensing Opportunity

Technology Overview

The construction industry faces mounting pressure from new sustainability regulations targeting carbon emission reductions, creating an urgent need for buildings to adopt remodelling strategies that dramatically decrease energy usage through thermal insulation and retrofitting measures. The critical challenge is that traditional reinforcement materials like steel are heavy, prone to corrosion, and lack the flexibility needed for effective building retrofitting applications. Additionally, conventional insulation materials often fail to meet the superior thermal performance and fire safety standards required by new regulations, forcing building owners to navigate complex, costly solutions that may not adequately address all performance requirements simultaneously.

Our breakthrough technology directly solves these challenges through proprietary Fibre Reinforced Polymer (FRP) materials that deliver exceptional performance advantages: 5x lighter weight than steel whilst providing 10x higher tensile and flexural strength, making retrofitting cost-effective and structurally superior. The modified epoxy adhesive used in FRP-adhesive-concrete interfaces provides high corrosion resistance, easy shaping capabilities, and flexibility with tolerance to misalignment. Most significantly, through modification of bonding agents and integration of surface aerogel insulation, the fire retardancy has been enhanced by 3 classes to achieve V-0 rating according to UL 94 standards. The aerogel component delivers significantly lower thermal conductivity than conventional materials whilst offering unique acoustic properties and translucent structure, making this technology the most promising solution for comprehensive building thermal insulation and structural enhancement.

Potential Applications

Energy Performance Enhancement

- Improve building energy efficiency and occupant comfort through superior aerogel insulation
- Reduce operational costs whilst meeting sustainability regulations

Versatile Building Applications

- Suitable for HDB flats, shophouses, commercial, industrial, and residential buildings
- Applicable to both existing retrofitting projects and new construction

Fire Safety & Structural Upgrades

- Upgrade fire performance of structural elements to V-0 rating
- Provide lightweight, corrosion-resistant reinforcement for aging buildings

Commercialization / R&D Opportunities

- ✓ Ready for commercialization
- ✓ Looking collaborators for further development / to develop new applications
- ✓ Available for licensing
- ✓ Accepting business plans from interested parties

Intellectual Property -

- Patent Pending

Technology Features & Specifications

- FRP is regarded as superior to conventional steel due to its notable advantages, including exceptional corrosion resistance, high flexibility, and tolerance to misalignment. It is also lightweight, cost-effective to produce, easy to shape, and possesses high tensile and flexural strength. Furthermore, FRP exhibits elastic properties.
- Silica aerogels typically exhibit a longitudinal acoustic velocity on the order of 100 m/s, making them suitable for various applications in acoustic devices for noise insulation. Furthermore, aerogels boast the lowest refractive index and dielectric constant among all solid materials.
- By modifying the bonding agent used in FRP-adhesive-concrete interfaces, the strength from the modified-FRP developed using the proposed technology can be enhanced by 12%, and its flammability can be improved from an unclassified level to achieving a V-0 rating under the standard UL-94
- Modified-FRP materials are a valuable solution for building retrofitting and structural strengthening applications, particularly in terms of fire safety. These materials combine the strength and flexibility of FRP with fire-resistant properties, making them an effective choice for enhancing the fire resistance of existing structures or strengthening them to withstand fire-related incidents

Unique Value Proposition

- **Market Size & Growth:** The global aerogel market is experiencing robust growth, driven by the increasing demand for energy-efficient and sustainable materials across various industries. In 2024, the global aerogel market was valued at approximately USD 1.38 billion and is projected to reach USD 1.59 billion in 2025. The market is expected to grow at a compound annual growth rate (CAGR) of 17.0% from 2025 to 2030, reaching USD 3.49 billion by 2030.
- **Silica Aerogels Dominance:** Silica aerogels accounted for the largest market share of 64.9% in 2024, owing to their superior thermal insulation properties and widespread applications in construction, aerospace, and oil & gas industries.
- **Regional Insights:** North America held the largest market share in 2024, driven by stringent energy efficiency regulations and high demand from the oil & gas sector. Asia Pacific is anticipated to witness significant growth due to increasing industrialization and infrastructure development. The team is focusing on the applications of silica aerogel blankets in the built environment industries in Singapore, with aspirations to expand into international markets."
- The global Composite Strengthening Systems market was valued at USD 161.3 million in 2023 and is projected to grow at a CAGR of 7.6% from 2024 to 2030. This growth is driven by the increasing need for repair, reinforcement, and retrofitting of aging buildings and infrastructure worldwide, as industries and governments prioritize structural safety and sustainability.

Disclaimer

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