TECH OFFER

Long Lasting High Performance and Cost-effective Green Cement

KEY INFORMATION

TECHNOLOGY CATEGORY:
Sustainability - Low Carbon Economy
Waste Management & Recycling - Industrial Waste Management

TECHNOLOGY READINESS LEVEL (TRL): TRL7
COUNTRY: SINGAPORE
ID NUMBER: TO175299

OVERVIEW

The cement industry faces significant challenges, including durability issues, high CO_2 emissions (up to 8% of global emissions), and costly maintenance, particularly in harsh environments like marine and industrial settings. Infrastructure in such conditions suffers a 20-40% reduction in service life, contributing to over $100 billion in annual global repair costs. Addressing these issues, a nanotechnology platform has been developed to create next-generation green cements. These green cements utilise nano-engineering and low-energy geo-engineering, converting waste and low-value materials into sustainable, high-performance solutions.

Products:

- **Type A: Geopolymeric Mortar for Repair and Protection**
  - Crack repair, surface protection and insulation panels.

- High compressive strength, 2x lifespan of traditional cement, fire resistant and impermeable to water/chemicals.

- **Type B: Eco-cement**
  - Marine ecosystems, precast blocks and reef regeneration.
  - High compressive strength, marine compatible and captures CO_2.

Both cements are VOC-free, recyclable, and engineered with low-carbon, eco-friendly processes, making them suitable for extreme environments. Next-gen developments include lightweight, CO_2-capturing, and sensor integrated materials, advancing sustainable construction.

The technology owner is seeking collaboration opportunities with cement manufacturers for co-pilot testing, R&D co-development, or technology licensing partnerships, aiming to revolutionize the cement industry through innovative, sustainable solutions.

TECHNOLOGY FEATURES & SPECIFICATIONS

The nanotechnology platform uses **low-energy geo-engineering processes**, primarily at room temperature, incorporating minerals, inorganic chemicals, and nanomaterials as needed as nano-engineered activators and additives. It transforms waste, by-products, and low-value materials into next-generation green cements, combining high performance, durability, cost-effectiveness, and sustainability across diverse conditions, from marine to industrial environments, including those impacted by climate change.

The nanotechnology platform provides local and regional solutions for a sustainable and resilient built environment. This offers and enables our partners and customers with innovative green cements and green cement-based products, including adhesives, cements, mortars, fine concrete, blocks, bricks, and panels. These products are sustainable, durable, high-performance, cost-effective, and capable of combining advanced properties and diverse performance characteristics.

POTENTIAL APPLICATIONS

Concrete Repair: High-performance mortars for repairing cracks and spalling in concrete, extending structural life.

Surface Protection: Advanced coatings and solutions for protecting and rejuvenating concrete structures.

Thermal Insulation: Panels with low thermal conductivity and high waterproofing for energy-efficient buildings.

Marine Applications: Cement-free concrete for coastal protection, reef regeneration, and marine infrastructure.

Sustainable Construction: Eco-friendly blocks, bricks, and panels for durable, low-carbon building project.

MARKET TRENDS & OPPORTUNITIES

Serviceable Obtainable Market (SOM): $250M in building materials, specialty chemicals, concrete repair, waterproofing, adhesives, and grouts.

High-Performance Green Cement: SOM of $50M, emphasizing cost-effective and high-performance solutions.

Additional Revenue Stream: From waste generators for recycling or upcycling.

UNIQUE VALUE PROPOSITION

The technology delivers unparalleled sustainability and performance, offering **ultra-low CO_2 footprints (60–90% reduction compared to traditional cement)** and significantly **high recyclability**. It **transforms waste and industrial by-products into high-performance materials**, addressing waste management challenges and supporting a circular economy.

The materials are multifunctional, providing **structural performance, thermal insulation, CO_2 capture, chemical and water resistance, and Euroclass A1 fire resistance**. They cater to a wide range of applications, including adhesives, coatings, and prefabricated panels, suitable for both new construction and repair projects in extreme environments such as marine and industrial settings.

Combining cost-effectiveness with superior durability, this technology offers a practical solution for sustainability-focused projects, aligning with global trends and regulatory goals like net-zero emissions. It redefines construction materials by integrating sustainability, multifunctionality, and competitive cost, setting a new industry benchmark.