TECH OFFER

Advancing Low-Carbon Biochar-Concrete for Building Sustainability

KEY INFORMATION

TECHNOLOGY CATEGORY:
Materials - Bio Materials

TECHNOLOGY READINESS LEVEL (TRL): TRL5
COUNTRY: SINGAPORE
ID NUMBER: TO175395

OVERVIEW

Concrete production is a major contributor to carbon emissions due to its high cement content and intensive resource use. In Singapore, the challenge is amplified by reliance on imported materials and increasing pressure to meet Green Mark and national decarbonisation targets, while maintaining cost and performance requirements.

Biochar Concrete integrates biochar, a carbon-negative material derived from biomass into conventional concrete mixes. Biochar permanently sequesters carbon and enhances the concrete's microstructure, while remaining compatible with existing batching and construction processes.

By reducing embodied carbon and reliance on high-carbon cement, Biochar Concrete enables more resource-efficient and sustainable construction without compromising durability or performance. This scalable solution supports Singapore's Green Building goals and advances the transition towards a low-carbon built environment.

The technology is suitable for collaboration with concrete producers, precast manufacturers, construction and engineering firms,

property developers, research institutions, biomass suppliers, and government for R&D collaboration, licensing, IP acquisition and test-bedding.

TECHNOLOGY FEATURES & SPECIFICATIONS

The project of innovation in concrete enhancement technology redefines sustainability by directly integrating biochar produced from upcycled local wood waste in Singapore. This approach converts biomass waste into a valuable resource, Biochar to support a circular economy and significantly reduce landfill use. It was remarkably improved over conventional concrete, which typically relies on resource-intensive materials.

A core advantage of this technology is its enhanced carbon sequestration capability. The biochar acts as a stable, long-term carbon sink, effectively preventing CO_2 from re-entering the atmosphere for centuries. This leads to significantly lower embodied carbon in our concrete. By enabling partial replacement of cement with biochar, the technology reduces CO_2 emissions compared to traditional concrete formulations. For users, this interprets projects with a significantly reduced environmental footprint, aligning with global sustainability goals.

Importantly, technology ensures performance comparable to traditional concrete. It maintains similar physical and chemical properties, demonstrating reliable compressive strengths (e.g., 52 MPa at 28 days) and adhering to BS EN 197-1 standards. This seamless compatibility means it integrates effortlessly into existing construction practices without requiring costly retrofits or changes in methodology, offering a diverse and practical advantage over other sustainable concrete solutions.

POTENTIAL APPLICATIONS

- Green building projects requiring low-carbon construction materials
- Sustainable infrastructure development initiatives
- Commercial and residential construction projects
- Precast concrete manufacturing
- Ready-mix concrete production
- Environmental construction projects

UNIQUE VALUE PROPOSITION

- Eco-friendly and low-carbon alternative
- Turns waste into a high-value material for construction
- Similar physical and chemical properties to conventional concrete
- Does not compromise structural performance in construction, making it a viable and sustainable alternative.