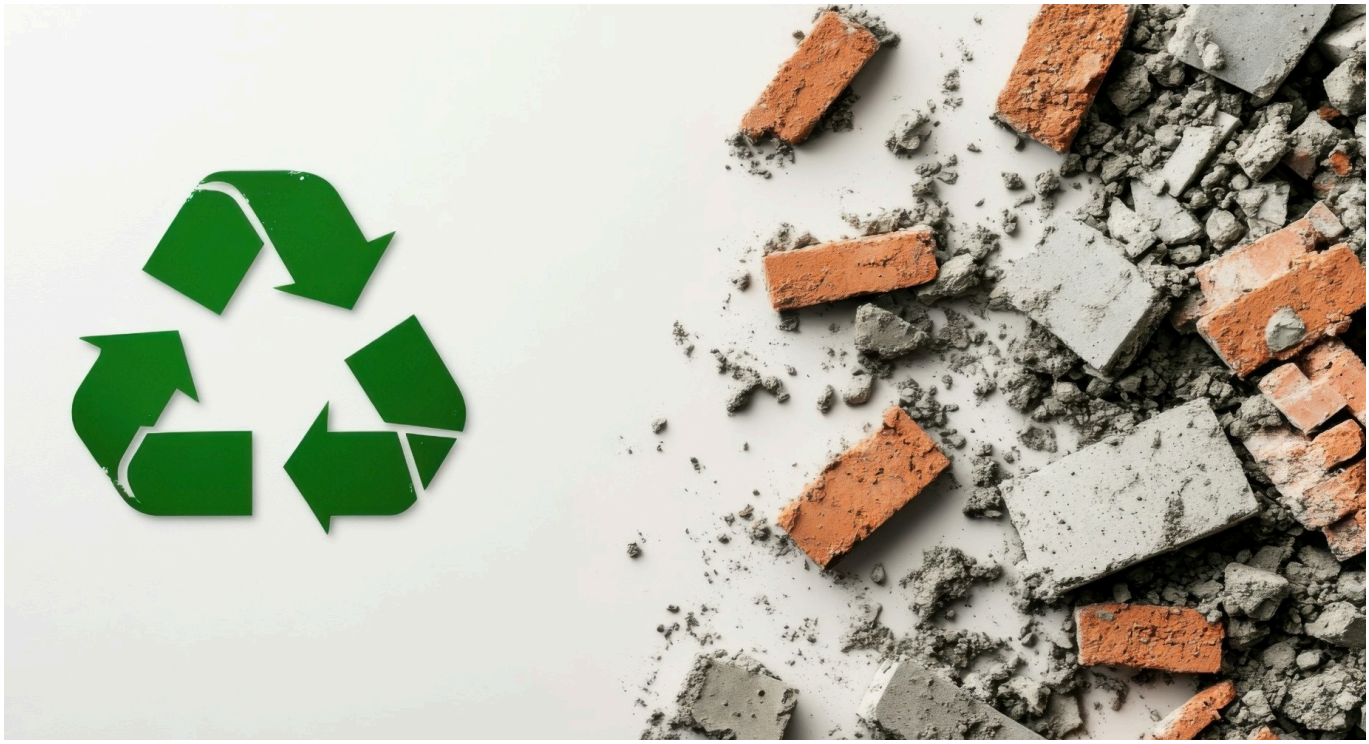
TECH OFFER

Green Concrete with Spent Graphite and Manufactured Sand



KEY INFORMATION

TECHNOLOGY CATEGORY:
Waste Management & Recycling - Industrial Waste Management

TECHNOLOGY READINESS LEVEL (TRL): TRL5
COUNTRY: SINGAPORE
ID NUMBER: TO175385

OVERVIEW

Ready-mix concrete suppliers, precasters, and cement manufacturers are increasingly seeking sustainable alternatives to traditional cement due to the material's significant carbon footprint. Cement alone contributes to approximately 8% of global CO_2 emission. This innovation focuses on developing a low-carbon, cost-effective concrete by incorporating spent graphite, GGBS (Ground Granulated Blast-furnace Slag), and manufactured sand (M-sand)—all of which are by-products or waste materials.

- Spent graphite (supplied from used electric vehicle (EV) batteries)
- Ground Granulated Blast-furnace (GGBS - supplied from iron and steel production)
- Manufactured Sand (supplied by crushed granite, which is a more sustainable alternative to natural river sand)

This innovation delivers an optimal concrete mix that achieves the ideal balance of performance, cost efficiency, and environmental sustainability. Rigorously tested to meet Singapore's building standards the formulation is specifically engineered for the nation's climate, durability demands, and construction norms—ensuring reliable performance while advancing sustainable

building practices.

The technology owner is seeking collaboration with ready-mix concrete suppliers, precast manufacturers, and cement producers for R&D collaboration and test-bedding.

TECHNOLOGY FEATURES & SPECIFICATIONS

The technical advantages over similar existing methods are:

- **Cost-efficient performance upgrade** – Achieves cost reduction for Grade 30 concrete while improving key material properties such as strength and durability.
- **Low-carbon formulation** – Incorporates spent graphite, GGBS, and manufactured sand to significantly lower embodied carbon while enhancing mechanical and durability characteristics.
- **Optimised for demanding applications** – Mixes can be tailored for large pours, delivering enhanced long-term strength and durability through GGBS integration.
- **Customisable to project needs** – Concrete mix designs can be adjusted to meet specific workability ranges, cost targets, carbon reduction goals, and performance requirements across various use cases.

POTENTIAL APPLICATIONS

- Cement industry as a cementitious replacement material to reduce the product carbon footprint
- Concrete industry for cement replacement
- Precast construction industry
- Contractors using site mortar mix for precast and concrete joint applications

UNIQUE VALUE PROPOSITION

- Significant CO_2 reduction – Lowers A1–A3 (cradle-to-gate) CO_2 emissions by up to 55%, supporting decarbonisation goals.
- High cost savings – Achieves up to 66% cost reduction compared to conventional concrete.
    - Use of alternative materials – Incorporates three sustainable by-products:
    - Spent graphite from used EV batteries
    - GGBS from steel production
- Manufactured sand from crushed granite
- Versatile formulation – Materials can be used individually or together to customise mixes for different performance, cost, and sustainability targets.