



Utilizing Recycled Waste Tyre Fibres to Enhance Properties of Concrete

SP Singapore Polytechnic

Technology Licensing Opportunity

Technology Overview

The global surge in vehicle production has created a massive environmental crisis as discarded vehicle tyres accumulate in landfills, leaching toxic substances including cadmium, lead, mercury, and zinc into the environment. While waste tyre processing can produce recycled materials like rubber particles, polymer microfibres, and steel fibres, incorporating recycled rubber aggregates into concrete significantly reduces structural strength due to poor bonding and rubber's hydrophobic nature, creating less dense, weaker concrete structures. This fundamental incompatibility has prevented the construction industry from effectively utilizing waste tyre materials, leaving millions of tyres as environmental hazards whilst concrete production continues to rely on virgin materials, missing opportunities for sustainable construction solutions.

Our innovation eliminates these performance barriers by developing optimized fibre-reinforced rubberized concrete (FRRuC) formulations that maintain structural integrity whilst incorporating waste tyre materials. The technology focuses on concrete grade 30 - the industry standard for high-strength, low-cost applications - using recycled tyre polymer microfibre (RTPM) as an additive that effectively arrests both micro and macro-level cracks. Most significantly, our formulations mitigate plastic shrinkage cracks on concrete surfaces whilst maintaining compressive strength, workability, density, and water penetration resistance. This transforms waste tyres from environmental liabilities into valuable construction materials, creating a circular economy solution that addresses both tyre waste management and concrete performance enhancement for sustainable construction applications

Potential Applications

- Concrete industry for concrete additive
- Precast construction industry
- Site mass pour tunnelling & slab concrete
- Shotcrete concrete
- Tyre recycling plants to generate another source of income

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 -

- Know-how

Technology Features & Specifications

- Minimize the environmental impact of fibre-reinforced concrete by reducing tyre waste in landfills and lowering the concrete's embodied emissions
- Reducing surface cracks of concrete, especially for plastic shrinkage at the early stage of concrete casting
- Reduce the use of polypropylene fiber, which involves an energy-intensive production process
- Minimize the formation of fibre balls during concrete production
- Increased productivity by reducing construction time and labour, while lowering the frequency of maintenance required
- Maintain workability of concrete mix, upon incorporation of fibre
- Proposed fibre is durable, remaining resistance to corrosion even for the exposed surface

Unique Value Proposition

- In summary, the present invention offers promising market opportunities due to its attractive physical benefits and growing demand for sustainable construction materials. The invention also contributes to reduce the use of polypropylene fibre by replacing it with recycled waste tyre fibre, thereby minimizing its environmental impact. According to a study which account for 90% of the world's vehicles conducted by World Business Council for Sustainable Development (WBCSD), approximately 26 million tons of tyres reach the end-of-life every year. End-of-life tyres can be repurposed by recovering and reconstructing materials for engineering purposes or harnessing energy. Among these, only about 69% are repurposed as tyre-derived fuel or materials, with approximately 17 million tons being utilized in civil engineering and backfilling. The remaining 31% end up in landfills or stockpiled, posing significant environmental challenges due to their non-biodegradability and harmful impact on ecosystems.
- The Global concrete market was valued at approximately USD 820 billion in 2024 and is projected to reach USD 1.53 trillion by 2031, reflecting a CAGR of 8.1%.
- Key Growth Drivers of the Concrete Market include:
 - Rapid urbanization and infrastructure development across emerging and developed economies
 - Expanding residential, commercial, and industrial construction activities
 - Increasing investments in smart cities, highways, bridges, and mass transit systems
 - Rising demand for high-performance and sustainable concrete formulations
 - Technological advancements in ready-mix, precast, and self-healing concrete systems

Disclaimer

Although due care and attention have been taken to ensure that the preparation of this material is as accurate as possible, the contents of this brochure are provided for information purposes only. Neither the Singapore Polytechnic nor the inventors offer any warranty, written express or implied, as to the accuracy of the said contents. Applicants are advised to undertake independent evaluation of the technology.