ASX ANNOUNCEMENT

19th APRIL 2023

Accelerating the drive to reduce CO_2 emissions in cement and concrete

Highlights

- **One of the world's largest graphene enhanced green cement trials to start in June**
- **CO_2 offset benefits confirmed in graphene enhanced cement**
- **One tonne order secured to develop graphene enhanced concrete**
- **University of Manchester releases report highlighting ease of PureGRAPH® AQUA product dispersion and how cement hydration is enhanced**
- **Results from trials applying graphene to recycled aggregates at MTC due for release**

First Graphene Limited (ASX: FGR; "First Graphene" or "the Company") is pleased to provide an update on research and development, order activity and its growing footprint in the emerging green cement and concrete sector.

Trial dates with Breedon under the UK Government's Transforming Foundation Industries Program confirmed

A First Graphene led consortium, which includes Breedon Cement Ltd (Breedon), Morgan Sindall Construction and The University of Manchester, is tracking towards conducting one of the world's largest scale trials, supported by the UK Government's Transforming Foundation Industries (TFI) program.

Receiving significant funding from Innovate UK through a £190,034 grant, graphene will be added to the cement production line using a range of additions methods with minimal changes to the existing plant. A key aim of the trial is to find a simple, low-cost method of introducing graphene to industrial scale cement production processes.

In June 2023, approximately 2,000 tonnes of graphene enhanced cement will be produced at Breedon that will be marked for use in real world demonstrations.

The cement's performance as a binder in mortar and concrete systems will be analysed to assess the performance improvement, prior to use in real-world demonstrations by Morgan Sindall Construction, a leading British construction and regeneration group.

Data from Breedon and FGR production sites has already been analysed by the University of Manchester and found graphene enhanced cement to both offset CO_2 and demonstrate potential mechanical benefits, even at graphene loading levels less than 0.06%.

One tonne PureGRAPH® order secured

FGR has secured a one tonne order for a further trial in graphene enhanced concrete, anticipated to be executed within Q4 2023. This one-off order, although not material from a profitability point of view, is an important step in scaling up to meet the increased requirements of the cement and concrete segment, and continues to help build the Company's pipeline of revenue opportunities.

University of Manchester releases new report on aqueous graphene

This month a collaboration between First Graphene and the University of Manchester published a paper titled *Effects of using aqueous graphene on behaviour and mechanical performance of cement-based composites* in international journal *Construction and Building Materials.*

The paper highlights ease of dispersion of PureGRAPH® AQUA products and their suitability for aqueous applications. Lead author Dr Tien-Dung Nguyen of the Department of Mechanical, Aerospace and Civil Engineering said he was pleased to discover hydrated graphene can enhance cement hydration.

Dr Nguyen added: "By incorporating hydrated graphene into cement based materials we can reduce the embodied carbon of concrete structures. In the future, I see potential for hydrated graphene to improve the electrical conductivity of cement for smart construction."

Graphene admixture development continues

First Graphene is continuing work with commercial partners to design a liquid admixture suitable for downstream concrete users in precast and batching admixtures. A functional mixture has been developed, with positive results, but work continues on shelf-life improvements which are required to deliver the product to our global client base.

Functionalisation of the graphene allows it to be mixed with concrete and only become active when mixed with water. These additives could demonstrate the effectiveness of graphene in client laboratories and will form a basis for future products for our partners who would like to formulate with graphene.

Collaborative research with the UK's National Physical Laboratory pays dividends

In Q4 2022 First Graphene secured a circa $13,000 grant from Innovate UK's Analysis for Innovators (A4i) competition to develop a technique to quickly identify graphene in a sample of concrete paste. This work was conducted with the UK's National Physical Laboratory a world-leading centre of excellence that provides cutting-edge measurement techniques.

Electromagnetic detection and measurement techniques of graphene at low loading levels (0.01%-0.1%) were trialed for their speed and sensitivity to the conductivity of graphene. Among the techniques used were; time domain terahertz spectroscopy, microwave waveguide, microwave box resonator and microwave dielectric resonator.

The project revealed different properties of graphene could be detected in concrete samples using

each of the techniques, allowing the compilation of a range of data, which will be used in an upcoming trial to detect graphene in concrete on a production site.

These proven identification techniques provide a more streamlined way to identify dispersion of graphene in cementitious systems and an alternative to traditional prism testing, which requires long wait periods associated with the curing process.

Microstructural analysis project update

Work is currently underway with leading industry expert, Nick Winter from WHD Microanalysis Consultants Ltd to better understand the reinforcing mechanism of graphene in cementitious systems.

Advanced techniques of scanning electron microscopy (SEM) and energy dispersive X-Ray analysis (EDX) are being used to investigate the microstructure of graphene enhanced cement. To date, various samples have been produced containing different grades and amounts of graphene utilizing distinct dispersion methods. Imaging and analysis are currently underway.

The aim of this work is to provide a fundamental understanding of the role graphene plays in reinforcing cementitious systems.

Microstructural analysis will be used on graphene-enhanced cement produced at Breedon trials in June. It will place First Graphene at the leading edge of scientific understanding of how graphene improves cement systems, giving their R&D teams an obvious competitive advantage.

MTC recycled aggregate trials complete

FGR has been working with a subsidiary of Mexican multi-national building materials company CEMEX at the Manufacturing Technology Centre (MTC) to trial graphene in railway sleepers cast using recycled aggregates.

Graphene was added to improve compressive strength and reduce porosity of recycled aggregate. The experimental plan contained 16 mixes and is generating data that could demonstrate a performance enhancement.

The experimental portion of this project has been completed and results are due to be shared internally with project partners in late April, coinciding with a meeting of project collaborators including FGR.

First Graphene Managing Director and CEO Michael Bell said:

“Our research and development in collaboration with some of the world’s most innovative materials technology organisations, coupled with buy-in from industry partners to trial our graphene products, sets the foundation for a strong commercialisation pathway.

"Greening of the concrete and cement sector provides our Company a great opportunity to strengthen both our revenue and ultimately profitability as market demand for decarbonisation technologies and materials increases.

"The emerging green cement and concrete market is estimated to be worth US$56bn by 2027. We have experienced a surge in demand for our "PureGRAPH® enhanced products at a time commercial scale trials are dialing up.

"With pressure growing on the cement and concrete industry to reduce carbon emissions, First Graphene anticipates interest in PureGRAPH® products will have an increasingly positive impact on our Company's revenue streams from this segment."

This release has been approved for release by the board

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About First Graphene Ltd (ASX: FGR)

First Graphene Limited is focused on the development of advanced materials to help industry improve. The Company is a leading supplier of graphitic materials and product formulations with a specific commercial focus on large, high-growth global markets including cement and concrete; composites and plastics; coatings, adhesives, silicones and elastomers (CASE); and energy storage applications.

One of the key outcomes these advanced materials offer is the reduction of carbon dioxide emissions, whether directly through a reduction in output of these harmful greenhouse gases or lower energy usage requirements in manufacturing, or indirectly due to enhanced performance characteristics and extending the usable life of products.

First Graphene has a robust manufacturing platform based on captive and abundant supply of high-purity raw materials, and readily scalable technologies to meet growing market demand. As well as being the world's leading supplier of its own high performance PureGRAPH® graphene product range, the Company works with multiple industry partners around the world as a supplier of graphitic materials and partner to research, develop, test and facilitate the commercial marketing of a wide range of sector-specific chemical solutions.

First Graphene Ltd is publicly listed in Australia (ASX:FGR) and has a primary manufacturing base in Henderson, near Perth, WA. The company is incorporated in the UK as First Graphene (UK) Ltd and is a Tier 1 partner at the Graphene Engineering and Innovation Centre (GEIC), Manchester, UK, where it has a strong marketing and R&D capability.