

Scientific paper released on benefits of graphene in wastewater concrete and mortar applications



Highlights

- Peer-reviewed paper highlights PureGRAPH[®] benefits for concrete and mortar in corrosive water environments
- Highlights significant compressive strength and sulphate resistance in both concrete and mortars used in wastewater and other corrosive water applications
- Ratifies earlier results that prove benefits of PureGRAPH[®] in wastewater and similar applications

First Graphene Limited (ASX: FGR; “First Graphene” or “the Company”) is pleased to announce the release of a peer reviewed paper¹ on findings from a study undertaken by the University of Wollongong and an Australian domestic water, sewerage and drainage statutory authority investigating the use of pristine graphene to enhance durability of concrete and mortar in corrosive water environments.

The paper was released in the peer-reviewed journal *Coatings* and followed on from initial findings from the study, led by the University’s School of Civil, Mining and Environmental Engineering, that were announced by First Graphene in January 2022 (see ASX release *University of Wollongong study confirms improvements in concrete and repair mortar durability*, 24 January 2022)².

The latest paper, which was co-authored by the Company, reports that based on the mix formulation for wastewater infrastructure, results showed that adding graphene to both concrete and mortar enhanced 28-day compressive strength by 10 – 20%. The best admixture level was found to be 0.02 – 0.1% of PureGRAPH[®] 50.

The product also showed a reduction of the apparent volume of permeable voids (AVPV) of mortar by 11.7% and concrete by 19.3% at the optimal dosages. This was reported to most

¹ See: *Enhancing Concrete and Mortar Properties and Durability Using Pristine Graphene Particles* (<https://www.mdpi.com/2079-6412/12/11/1703>)

² See ASX release: *University of Wollongong study confirms improvements in concrete and repair mortar durability*, 24 January 2022 (<https://firstgraphene.net/university-of-wollongong-study-confirms-improvements-in-concrete-and-repair-mortar-durability/>)

likely be due to a reduction in the number or size of pores in the paste.

Graphene enhanced concrete and mortar with 0.2% and 0.15% dosage rates showed significant sulphate resistance, by reducing 62% and 60% of extension respectively, after exposure to a sulphate solution for 16 weeks.

The release of the paper concludes the research phase and provides the company with validated scientific evidence the benefits PureGRAPH® can deliver in wastewater concrete pipe applications in terms of greater durability and greater resistance to corrosion.

The Company is now aiming to leverage the findings to seek commercial opportunities in the wastewater and similar environments.

The combined water and wastewater pipe market is projected to be worth US\$46.457 billion by 2030, with a CAGR of 6.5 per cent during the forecast period from 2022 – 2030. The market was valued at US\$30.05 billion in 2021.³

The results add further strength to ongoing research, development and commercialisation opportunities in the cement and concrete segment for First Graphene.

Commercial-scale trials continue with global construction chemical manufacturers including Fosroc International, and leading cement companies such as Breedon Cement. The ability of PureGRAPH® to increase the strength and durability of concrete enables a reduction in the clinker required during the cement manufacturing stage, thus reducing CO₂ emissions by up to 18%.

First Graphene Managing Director and CEO Michael Bell said:

“The public release of this peer-reviewed paper is significant as it verifies the applicability and suitability of the Company’s pristine graphene products to overcome real-world challenges.

It is just one of the areas across the cement and concrete industries in which our product applications are showing significant performance benefits and major sustainability improvements, opening the way to significant global market opportunities.”

³ See Market Research Future: Water and wastewater pipe market
(<https://www.marketresearchfuture.com/reports/water-and-wastewater-pipe-market-7997>)

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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.

With authority of the board, this announcement has been authorised for release by Aditya Asthana, Chief Financial Officer and Company Secretary.