

Placement Completed and GEIC Officially Opened

Highlights

- FGR has completed a placement to raise \$1.5m.
- Graphene Engineering Innovation Centre at University of Manchester officially opened on 10 December 2018.

Advanced materials company, First Graphene Limited ("**FGR**" or "**the Company**") (ASX: FGR) is pleased to report it has completed a placement of 10 million fully paid ordinary shares at a price of 15¢, with no attaching options to raise \$1.5m. The issue of the 10 million shares is within the Company's capacity under Listing Rule 7.1 and will not require shareholder approval. The placement was predominantly to existing institutional and family office shareholders. Funds will be used to support the commissioning of the facilities at GEIC and the recruitment of additional sales and technical staff.

Graphene Engineering Innovation Centre (GEIC) Opening

The GEIC was officially opened on 10 December 2018 by His Royal Highness Prince Andrew, Duke of York.

The official opening was attended by VIP invitees from the political and business communities, including FGR Chairman, Warwick Grigor.

The official opening will be followed today by an Industry Showcase where 250 industrial attendees are anticipated. This will provide an opportunity for FGR's UK based staff to meet downstream partners.

Already there is considerable excitement around the development of new projects and collaborations and positive discussions are already progressing on composites, electrochemical manufacturing of Graphene Oxide, concrete and energy storage materials.

As a Tier 1 participant and provider of graphene materials to GEIC FGR is anticipating an increase in collaboration and sales during calendar 2019.

Chairman, Warwick Grigor, stated: "*The attendance at the opening of GEIC and the Industry Showcase provides a platform for FGR to display its products to a wider industrial audience. We look to 2019, as a year in which the concept becomes a reality, to when opportunity evolves to delivery. FGR is working on a number of new product verticals that it expects will lead to a strong sales growth curve as we progress into 2019.*"

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ASX Symbol

FGR
FGROC



HRH, the Duke of York and Professor Dame Nancy Rothwell Opening the GEIC



FGR Chairman, Warwick Grigor and Marketing Manager, Chris McMahon at the GEIC Opening

About First Graphene Ltd (ASX: FGR)

First Graphene has established a commercial graphene production facility for the bulk scale manufacture of graphene at competitive prices. The Company continues to develop graphene related intellectual property from which it intends to generate licence and royalty payments.

The Company has collaboration arrangements with four universities and is at the cutting edge of graphene and 2D related material developments. Most recently First Graphene has become a Tier 1 participant in the Graphene Engineering and Innovation Centre (GEIC) of the University of Manchester. First Graphene is working with numerous industry partners for the commercialisation of graphene and is building a sales book with these industry partners.

PureGRAPH™ Range of Products

The PureGRAPH™ range of products were released by FGR in September 2018, in conjunction with a detailed Product Information Sheet.

PureGRAPH™ graphene powders are available with lateral platelet sizes of 20µm, 10µm and 5µm. The products are characterised by their low defect level and high aspect ratio.

About Graphene

Graphene, the well-publicised and now famous two-dimensional carbon allotrope, is as versatile a material as any discovered on Earth. Its amazing properties as the lightest and strongest material, compared with its ability to conduct heat and electricity better than anything else, means it can be integrated into a huge number of applications. Initially this will mean graphene is used to help improve the performance and efficiency of current materials and substances, but in the future, it will also be developed in conjunction with other two-dimensional (2D) crystals to create some even more amazing compounds to suit an even wider range of applications.

One area of research which is being very highly studied is energy storage. Currently, scientists are working on enhancing the capabilities of lithium ion batteries (by incorporating graphene as an anode) to offer much higher storage capacities with much better longevity and charge rate. Also, graphene is being studied and developed to be used in the manufacture of supercapacitors which can be charged very quickly, yet also be able to store a large amount of electricity.

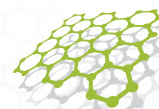
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About First Graphene

Company Overview



first graphene

The world's leading graphene company

First Graphene Ltd. are the leading supplier of high-quality, bulk graphene products. The company has a robust manufacturing and supply platform based upon captive supply of high-purity raw materials and an established 100 tonne/year graphene production capacity. Commercial applications are now being progressed in industrial composites, fire retardancy, construction and energy storage.

First Graphene Ltd. is publicly listed in Australia (ASX:FGR) and has a primary manufacturing base in Henderson, near Perth, WA. The company was recently 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.

First Graphene Ltd. has a well-established manufacturing and supply platform:

- Secure supply of high-quality graphite raw material.
- 99% graphite ore used directly from the ground.
- Single step, high yield electrochemical exfoliation process.
- Established and operational 100 tonne graphene capacity.
- Scaled finishing and drying steps.



Secure supply of high-purity graphite raw material



Established 100 tonne/year graphene facility



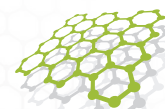
100 tonne/year manufacturing facility at Henderson, WA

ASX:FGR

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Graphene Goes Large

Case Study – PureGRAPH™ performance in mining equipment



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PureGRAPH™ graphene products are used to increase strength and abrasion resistance in wear liner products used in the mining and mineral handling industries. The technology has been developed in close collaboration with a customer, newGen Group who has now launched a series of ArmourGRAPH™ branded high performing wear protection products.

Background:

The global mining industry excavates, transports and processing 50 million tonnes of ore every year, with the iron ore industry alone processes approximately 50 million tonnes of ore per year. Inevitably, the equipment that handles this ore suffers from wear and the industry uses a range of strategies to prevent wear and prolong equipment running times.

Sacrificial polymer liners are routinely used to protect the steel equipment from wear; the key benefit being that the production downtime to replace a polymer liner is relatively short. Wear is equipment dependent but a typical life time for a liner is six months. A typical application is shown in Fig. 1 with a Sandvik reclaimer, in this case each polymer bucket liner weighs about 200kg.



Fig. 1 - Typical Sandvik 12,000 tph bucket-wheel reclaimer.

newGen Group are a mining services company that offer a range of turn-key wear protection systems for mining equipment, providing a range of polymer and ceramic linings to leading mining companies which include BHP Iron Ore, Fortescue and Rio Tinto.

The Collaboration:

In June 2018, newGen and First Graphene Ltd began a collaboration to develop rubber liners with improved wear properties through the use of PureGRAPH™ graphene additives. Initial studies were carried out on polyurethane based liners. PureGRAPH™ graphene powders were mixed into polyurethane resin using standard industrial mixing equipment. No pre-treatment of the graphene additive or other formulation changes were required. A typical cast liner for the Sandvik reclaimer is shown in Fig. 2.

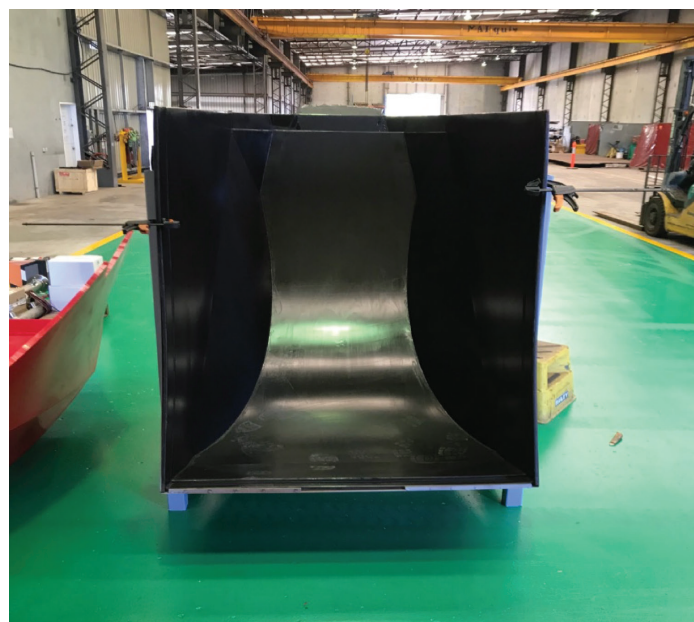
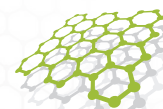


Fig. 2 – Typical Polyurethane rubber liner weighing ca. 200kg.

Graphene Goes Large

Case Study – PureGRAPH™ performance in mining equipment



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Results:

The initial study focused on tensile strength, elongation and abrasion resistance. Results are presented in Fig. 3. Analysis was carried out by an independent NATA accredited laboratory.

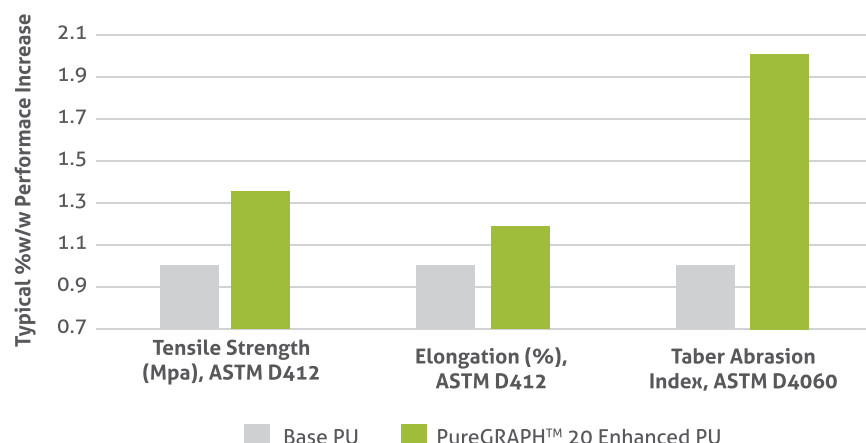


Fig. 3. Performance Results of PureGRAPH™ enhanced Polyurethanes.

Outcomes:

newGen Group have now launched a product range of wear protection liners under their newly created ArmourGRAPH™ brand. Scaled trials are underway with key customers. The products are being introduced across mining and mineral handling operations including reclaimer bucket liners, pipe spooling, dryer chutes and conveyor applications.

This opportunity represents a significant milestone for the emerging graphene industry with tonnage quantities of PureGRAPH™ being required to fulfil the needs of the mining industry.

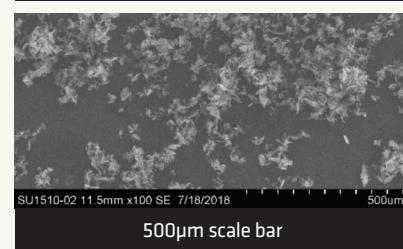
For more information on PureGRAPH™ products please contact us at info@firstgraphene.com.au

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PureGRAPH™ Graphene powders are low defect, high aspect ratio graphene platelets available in three product sizes

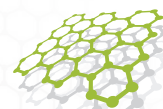
- PureGRAPH™ products have well controlled particle sizes at 5µm, 10µm and 20µm for consistent and repeatable performance.
- PureGRAPH™ products disperse readily and easily in solvents, polymer resins, rubber and water-based formulations.
- PureGRAPH™ products are high purity with very low metal and silicon contaminant levels.



Typical SEM analysis of PureGRAPH™ 20

About First Graphene

Company Overview



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High performing PureGRAPH™ graphene products are characterised by their large platelet size, high aspect ratio and low defect levels. PureGRAPH™ products are easy to use and batch to batch consistency is ensured through leading edge quality control testing.

First Graphene Ltd. is also investing in downstream graphene markets and working with some of the best scientific minds with an increased focus on the development of graphene applications and opening downstream markets.

University of Manchester - development of applications in industrial composites and rubbers, fire retardancy, construction materials and energy storage. Projects are already underway and will be accelerated through partnership with the GEIC.

University of Adelaide - formulation of FireStop™ a toxic free and low-cost fire-retardant coating and also development of concrete strengthening additives for the construction industry.

Flinders University - commercialising novel process tools for the synthesis of graphene oxide in an environmentally acceptable process, representing a major breakthrough when compared to existing methods.

Swinburne University of Technology - prototyping a graphene oxide-based supercapacitor. This technology will enable the recharging of mobile phones, for example, in less than 30 seconds and recharge cycles exceeding 10,000 times, which is 10x better than current lithium-ion technology.



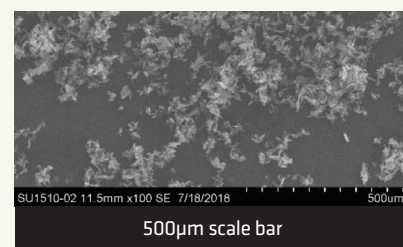
Graphene based supercapacitor prototypes



High quality graphene powder supplied in bulk

PureGRAPH™ Graphene powders are low defect, high aspect ratio graphene platelets available in three product sizes

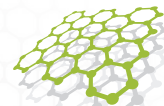
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Graphene Enhanced Concrete

Case Study – PureGRAPH™ performance in cement composites



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PureGRAPH™ graphene additives give stronger, lighter concrete structures enabling novel and potentially greener approaches in building and infrastructure project design. Testing at the University of Adelaide show a 34% increase in the compressive strength and a 27% increase in the tensile strength of concrete, when tested to international standard methods.

Background:

Population growth and rapid urbanisation continue to boost the growth of concrete products; the precast concrete market size alone is expected to reach US\$130.11 billion by 2025. The concrete admixtures market is estimated to be worth US\$18.10bn by 2020. The industry faces major challenges notably the pressure to reduce the carbon footprint (CO₂ contribution) of cement-based products. The use of graphene admixtures can increase strength, reduce materials usage (reducing carbon footprint) and potentially increase longevity of products.

The technology has the potential to deliver stronger, lighter concrete structures enabling a new generation of concrete designs.

The Collaboration:

Working within the Australian Research Council (ARC) Graphene Hub at the University of Adelaide significant improvements in the strength of concrete products has been demonstrated in a systematic study. Full scientific results have been submitted to *Cement and Concrete Composites Journal*.



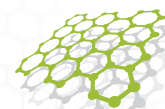
Building technology evolution demands high performing materials

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Graphene Enhanced Concrete

Case Study – PureGRAPH™ performance in cement composites



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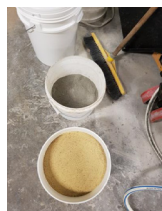
The world's leading graphene company

Results:

It has been confirmed that addition levels of 0.02% w/w of PureGRAPH™ additive, produces increases in compressive strength of 34% and increases in tensile strength of 27% in concrete mortars.

The PureGRAPH™ concrete additive was introduced as a concrete admixture directly in the water used for preparing the concrete mortar. No additional mixing equipment or processing steps were required. Strengthening was dependent upon the type of graphene additive used, with higher aspect ratio graphenes providing the best improvement. The increase in strength opens up the possibility of stronger or lighter concrete structures with an associated reduction in carbon footprint for major infrastructure projects.

Typical cement mortar mixing steps:



Dry ingredients



Mixer



Solid added
and mixed



Graphene/
water/plasticiser
added



Concrete
mixed

Outcomes:

These results are currently being reviewed with cement manufacturers and consultants in the construction sector to initiate industry evaluation in 2019.

In a further development, the programme is being extended to evaluate the reduction in water permeability and ion transport which would reduce issues with concrete corrosion around reinforcement bars (rebars). First Graphene is supporting a 2019, UK government funding proposal with the School of Mechanical, Aerospace and Civil Engineering at the University of Manchester to develop graphene additives for reduced water permeability.

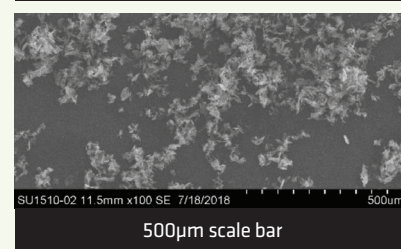
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