

## **First Graphene presenting at a Graphene Council webinar on 8 June 2021**

First Graphene Limited (ASX:FGR; "First Graphene" or "the Company") is pleased to announce that The Graphene Council will host a webinar by the Company on the 8<sup>th</sup> of June 2021, 10:00 AM Eastern Time (USA), presented by Dr. Andy Goodwin, Non-Executive Director and Senior Scientific Advisor.

To register for the webinar please click on the following link  
[https://us02web.zoom.us/webinar/register/WN\\_Kzb2Ko2qTZWgOwgdwoYJZg](https://us02web.zoom.us/webinar/register/WN_Kzb2Ko2qTZWgOwgdwoYJZg)

A copy of the presentation is included below following this announcement.

### **About the Graphene Council:**

The Graphene Council was founded in 2013 with a mission to serve the global community of graphene professionals. Today, The Graphene Council is the largest community in the world for graphene researchers, academics, producers, developers, investors, nanotechnologists, regulatory agencies, research institutes, material science specialists and even the general public.

### **Investors**

#### **Michael Bell**

Chief Executive Officer  
First Graphene Limited  
[michael.bell@firstgraphene.net](mailto:michael.bell@firstgraphene.net)  
+ 61 1300 660 448

### **Media**

#### **Simon Shepherdson**

General Manager Media  
Spoke Corporate  
[simon@spokecorporate.com](mailto:simon@spokecorporate.com)  
+ 61 413 809 404

### **About First Graphene Ltd (ASX: FGR)**

*First Graphene Ltd. is the leading supplier of high-performing, graphene products. The company has a robust manufacturing 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 composites, elastomers, 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 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.*

# ASX ANNOUNCEMENT



## PureGRAPH® Range of Products

**PureGRAPH®** graphene powders are available in tonnage volumes with lateral platelet sizes of 50µm, 20µm, 10µm and 5µm. The products are high performing additives, characterised by their high quality and ease of use.

## First Graphene Limited

ABN 50 007 870 760

1 Sepia Close

Henderson WA 6166

T: +61 1300 660 448

E: [info@firstgraphene.net](mailto:info@firstgraphene.net)

W: [firstgraphene.net](http://firstgraphene.net)

## Directors:

Warwick Grigor

Michael Quinert

Dr Andy Goodwin

## Trading Symbol

**Australia:** FGR  
FGROC

**Frankfurt:** FSE:M11

**USA OTCQB:** FGPHF

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

# Introduction to First Graphene

Graphene Council Webinar

Tuesday 8<sup>th</sup> June 2021

**Presenter: Dr. Andy Goodwin**  
Non-Executive Director & Senior Scientific Advisor

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JUNE 2021





# WHAT DO COMPOSITES, RUBBERS, ENERGY STORAGE AND CONCRETE **ALL HAVE IN COMMON?**

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CORPORATE PRESENTATION  
JUNE 2021



# 'The answer... Graphene'

A growing number of established products and applications globally that are related to these markets, are being significantly enhanced by applying 'graphene' as a chemical additive.



What makes graphene compelling – current trends, facts and statistics:



Rubbers and elastomers show major improvements in tensile strength, elongation, abrasion resistance and tear strength with the **addition of graphene**



Independent studies found graphene can make selected products up to 30% stronger **and more resistant to wear**



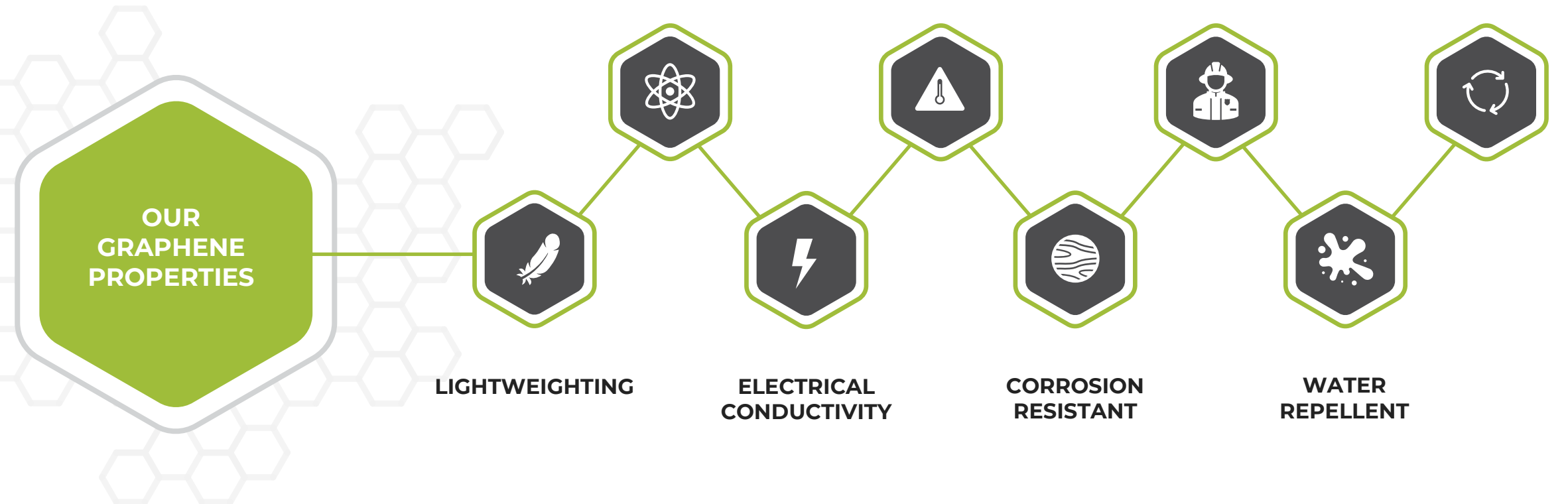
Graphene is the thinnest material ever isolated, despite this, it is up to 300 times stronger than steel and the **most conductive material in the world**



Add just 0.01% of graphene into concrete - responsible for around 8% of the world's CO<sub>2</sub> emissions - **reduces its carbon footprint by approximately 30%**

# Graphene properties

Our graphene has a unique chemical fingerprint which makes it easy to use and **disperse in a multitude of solvents, polymer resins, elastomers and water-based formulations**





## WHO WE ARE

- First Graphene (ASX:FGR) is an Australian technology and manufacturing company.
- World leading graphene manufacturer based in Henderson, Western Australia.
- Tier 1 partner at the Graphene Engineering and Innovation Centre (GEIC), Manchester, UK.
- New substance registration in United Kingdom (UK-REACH), Europe (EU-REACH) and Australia (AICIS) in place.
- Active membership of ISO standards committee for graphene registration.
- Market capitalization: **AUD\$133m**
- Share price 50-day average: **AUD\$0.24**

## WHAT WE DO

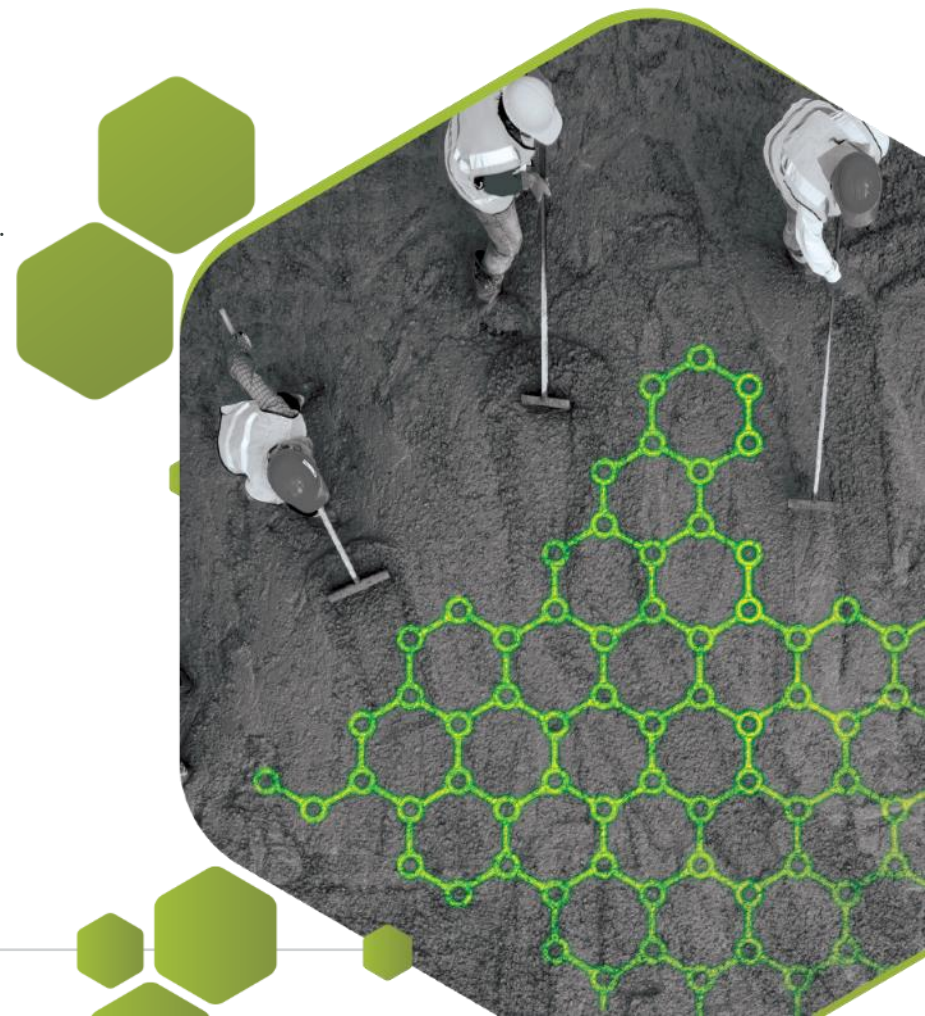
- Producer of high performing PureGRAPH® products creating value in key markets.
- Quality leader in graphene materials – acknowledged by our customers.
- Robust 100 tonne/year modular manufacturing facility - built and operational today.
- Developed IP to mass produce commercial scale graphene for multiple products and industries.

## CORE MARKETS

- Rubbers and elastomers – automotive, industrial and leisure.
- Cement and concretes – recycled, precast panels, ready mix and grouts.
- Composites and plastics – plastic parts, carbon and glass fibre, including boats, surfboards and swimming pools.
- Coatings – thermal, antistatic and anti-corrosion.
- Energy storage – supercapacitors, battery anodes, petroleum feedstock derived green hydrogen.

## OUTLOOK

- With the production process and capacity “banked”, strongly focused on the commercialisation of PureGRAPH® and driving sales demand.
- Invest into new applications for emerging PureGRAPH® markets.



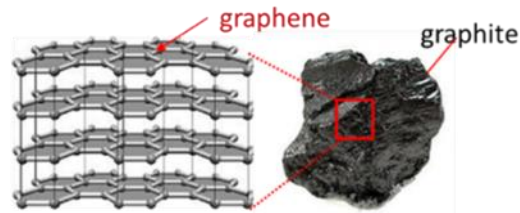


# FGR – World Leading Supply Capabilities



## VEIN GRAPHITE RM's

- Captive – ensures reliability
- No processing at mine
- In-house stock
- Low metals
- Large graphene plates



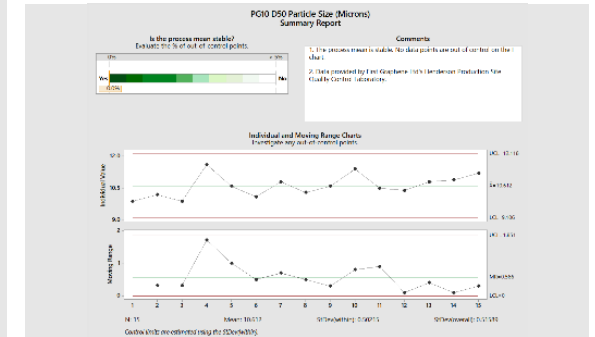
## ELECTROCHEMICAL EXFOLIATION

- High Yield
- Single Step
- Unique to FGR
- Scalable/Low Cost
- Low waste



## INDUSTRIAL FINISHING

- Well established
- Controlled Quality
- Finishing Options
- Scalable/Low Cost
- Low Waste



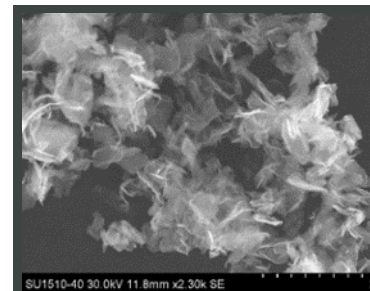
## QUALITY ASSURANCE

- 6-sigma approach
- Industry leading measurement techniques
- ISO/TC229 aligned
- At-line testing
- C of A for each batch

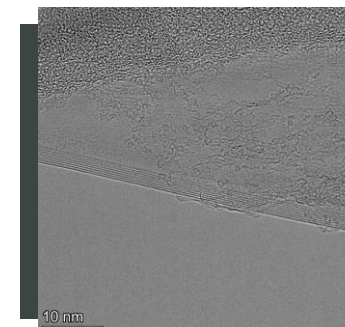
# About PureGRAPH®

first graphene

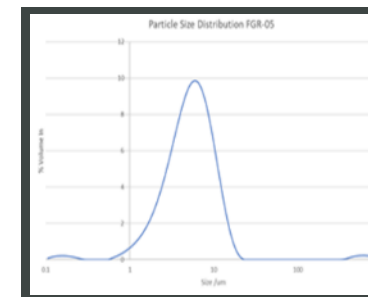
- Highest performing graphene additive available at tonnage quantities
- **PureGRAPH®** powders contain pristine, high aspect ratio platelets with typical thickness of 5-10 carbon atoms
- Lateral sizes are carefully controlled in the **PureGRAPH®** range at 5µm, 10µm, 20µm and 50µm ensuring consistent and repeatable performance
- Easily dispersed, delivering **multiple benefits** across a range of materials
- **PureGRAPH® AQUA** products allow easier dispersion into water and solvent-based formulations, beneficial for specific applications including coatings, cement and rubbers
- Continued **product development** to make tailored **PureGRAPH®** platelet sizes and functionalised platelets – to aid formulation and extend applications.



PureGRAPH® 5 Scanning Electron Microscopy (scale bar = 20µm): This analysis of dried product powder shows aggregated powders of high aspect ratio graphene platelets. These particles disperse readily in solvent and polymer media.



PureGRAPH® 5 Transmission Electron Microscopy image of platelet edges, showing 8 layers thickness. An average of 6 layers was reported - Courtesy of University of Adelaide.



PureGRAPH® 5 Malvern Mastersizer analysis showing  $D_v(50) = 5\mu\text{m}$  and  $D_v(90) = 11\mu\text{m}$  i.e no large particle tail is present. Laser light scattering is used as a powder size quality control tool. PureGRAPH® products have very reproducible  $D_v(50)$  and  $D_v(90)$ .

# Executives and Board of Directors



**Michael Bell**

Chief Executive Officer

- International sales, engineering and business leadership expertise across a diverse range of industries
- 20 years' experience in high growth across both SME and Corp. environments - former Senior Vice President of ST Engineering Group Singapore
- Bachelor of Science - Physics, Management Science University of Canterbury



**Paul Ladislaus**

Senior Process Engineer

- Chartered Chemical Engineer with 20 years' chemicals experience in operational, design, project management and R&D roles
- Extensive particle manufacturing expertise with Huntsman and Thomas Swan.
- Master's Degree in Chemical Engineering from the University of Cambridge



**Aditya Asthana**

Chief Financial Officer

- More than 15 years experience in finance and business across Australia and Asia
- Significant expertise in risk management, transformation and business turnarounds with Orica Ltd and its international subsidiaries
- Held a number of CFO and Director roles in Australia, Singapore and Indonesia.



**Warwick Grigor**

Non-Executive Chairman

- Respected and experience mining analyst
- Graduate of the Australian National University, with degrees in law and economics
- Former Chairman of Cannacord Genuity Australia Ltd



**Michael Quinert**

Non-Executive Director

- Founding partner of Quinert Rodda Lawyers
- Focus on capital raising and listing rule compliance
- Over 20 years experience with ASX-listed companies in the capacity as legal counsel and director, in the mining and technology sectors
- Non-Executive Chairman of West Wits Mining Ltd.



**Dr Andy Goodwin**

Non-Executive Director

- Ph.D. scientist with extensive leadership experience in innovation and new business growth with specialty chemicals industry
- 35 years in pharma & specialty chemicals with Sanofi, Dow Corning Corporation and Thomas Swan.
- Business leadership in carbon nanomaterials since 2012.

# Sales and growth strategy

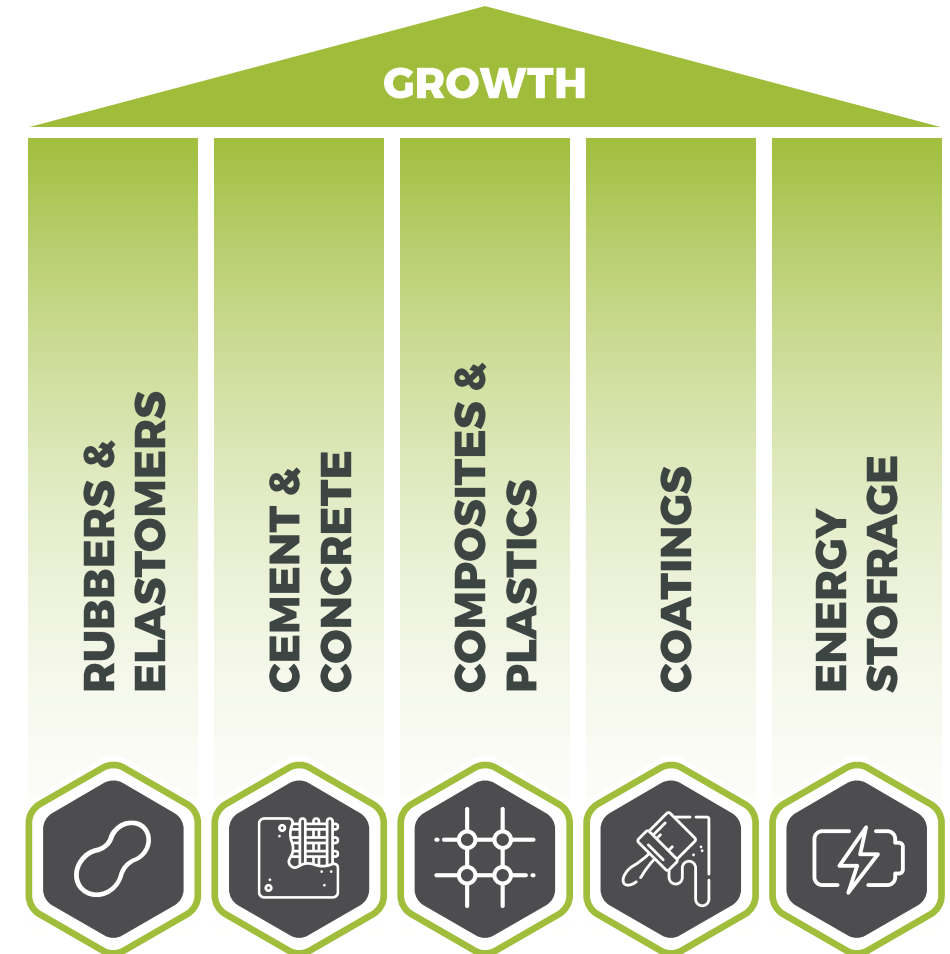
## 1. Global markets

Clear sales focus on immediate sectors include:

- **Rubbers & Elastomers**
- **Composites & Plastics**
- **Cement & concretes**
- **Coatings**
- **Energy storage**

## 2. New & innovative solutions

- Discovered new hydrodynamic cavitation process to convert petroleum feedstock into high-grade graphite and graphene.
- Applicable in lithium-ion battery anodes for electricity storage devices, also produces 'green' hydrogen' - appealing to oil producers looking to enter the green energy market.
- Successful tonnage sales in polymer strengthening and wear resistance.
- Qualifying trials with composites and concrete.
- Progress in novel supercapacitor and battery materials.





# Commercial sales team



**Neil Armstrong**

Commercial Manager –  
Composites & Plastics

- Chemical engineer with 10 years commercial experience
- Significant role in developing FGR's production facility and facilitating early adopters of PureGRAPH®
- Previously held roles with Wear Systems Solutions



**Todd McGurgan**

Commercial Manager –  
Cement & Concrete

- More than 25 years experience in the global cement industry
- Former leadership position at Holcim Australian & NZ
- Previous roles include BASF, Cement Australia, Sunstate Cement and Readymix



**Matt Curthoys**

Commercial Manager –  
Marine Composites &  
Windfarms

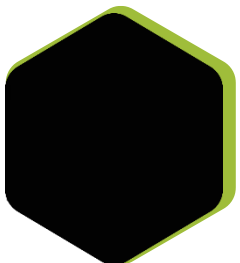
- More than 25 years experience in the Marine industry
- Chartered Naval Architect in Europe and Asia
- Expertise designing, engineering and producing composite structures for America's Cup and other boats



**Recruiting**

Commercial Manager –  
Rubbers & Elastomers

- TBC



**Recruiting**

Commercial Manager –  
Energy Storage

- TBC



**Recruiting**

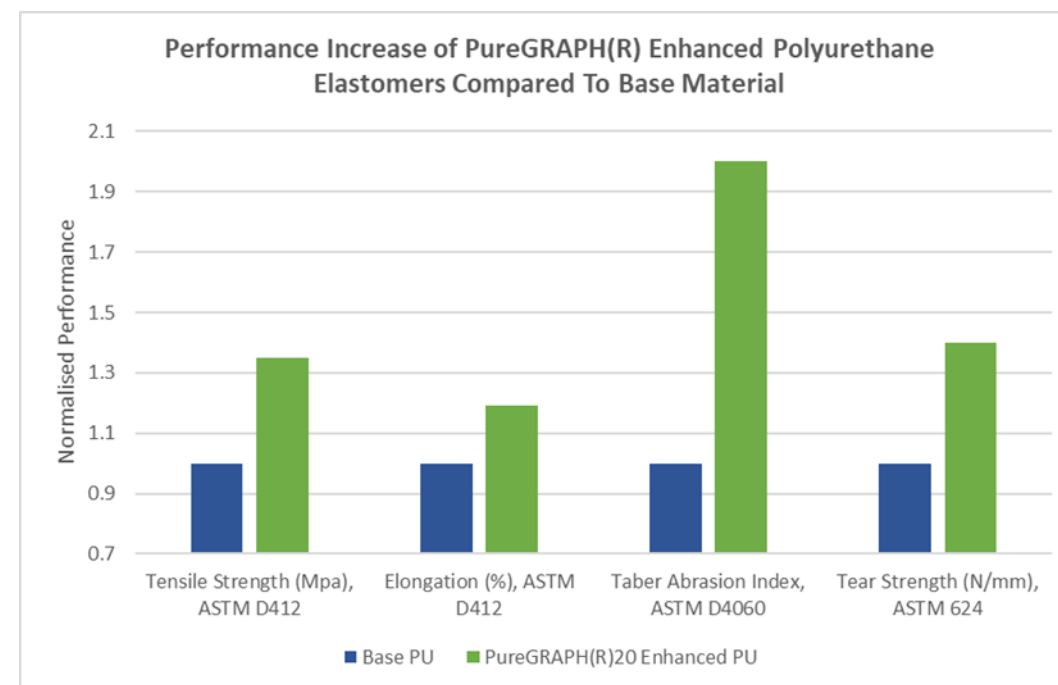
Commercial Manager –  
Coatings

- TBC

# Rubbers & Elastomers

## PureGRAPH® Advantage:

- Robust supply
- Dependable quality
- Increased strength
- Increased durability
- Increased fire retardancy
- Easy dispersion
- Latex rubber compatible



TDI based polyurethane thermoset with <1% PureGRAPH® additive show improvements in tensile strength, elongation, abrasion and tear strength

# Rubbers & Elastomers



Sales Client

## PureGRAPH® enhanced footwear

- Steel Blue product launch in 2021
- Scuff Cap, Outsole, Met Guard, Toe Cap and Midsole
- Lighter,
- Improved grip
- Improved wear resistance



Product Launched

## PureGRAPH® enhanced wear liners

- ArmourGRAPH™ product line launch by newGen
- Tier 1 mining companies moving to adoption based on reduced cost of ownership.
- Iron ore trials (>12 months) at Pilbara WA show six times improved durability



App. Validation

## PureGRAPH® enhanced rubber components

- Conveyor belts for bulk material handling applications
- Increased cut/tear properties
- Reduced abrasion loss
- Increased fire retardance



Sales Client

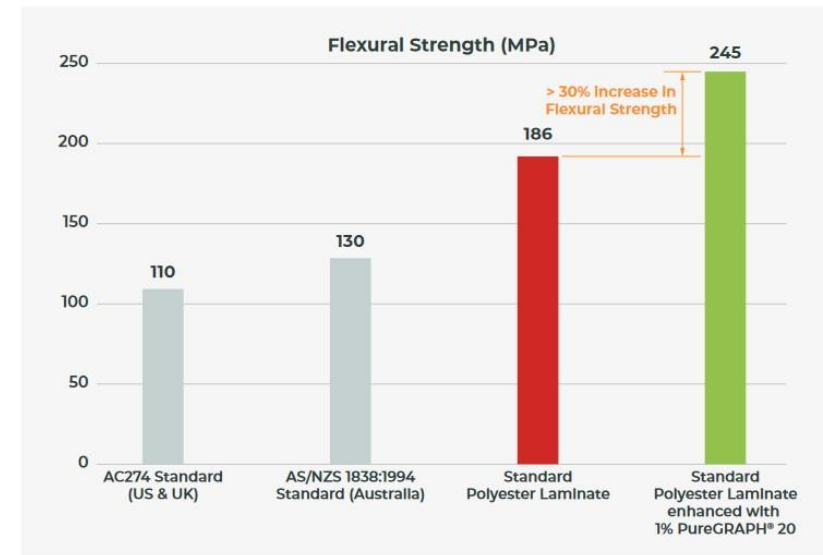
## PureGRAPH® enhanced upcycled rubber products

- Increased strength
- Improved incorporation of rubber crumb
- Multiple adjacent opportunities

# Composites & Plastics

## PureGRAPH® Advantage:

- Robust supply
- Dependable quality
- Increased strength
- Increased durability
- Improved water & chemical barrier
- Easy dispersion
- High concentration plastic MBs available



Flexural stress/strength performance measured by ASTM D7264 three point bending of chopped glass fibre reinforced polyester-styrene resin pool composite vs. industry standards.



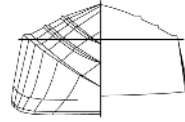
# Composites & Plastics



Product  
Launched

## PureGRAPH® GRP swimming pools

- Product launch by Aquatic Leisure Technologies – May 2021
- Graphene Nanotech incorporated into all pool products.
- 30% increased flexural strength
- 30% light-weighting
- Improved water resistance



Ascent Shipwrights



Sales  
Client

## PureGRAPH® GRP boats

- Boat launch - June 2021
- Increased flexural strength
- Increased stiffness
- Improved water resistance
- Moving to adjacent markets



Sales  
Client

## PureGRAPH® enhanced HDPE oyster pots

- Increased yield strength
- Increased abrasion resistance

## PureGRAPH® Advantage:

- Robust supply
- Dependable quality
- +34% in compressive strength
- +27% in tensile strength
- Peer reviewed & published data
- Known mechanism – controlled hydration from high aspect platelets
- Enables use of recycled concrete as aggregate
- Ease of use in powder and aqueous dispersions



- **After water, concrete is the most widely used material in the world.**
- **The use of cement-based concrete contributes ca. 8% of global CO<sub>2</sub> emissions**
- **Increasing the strength can potentially reduce cement use and associated CO<sub>2</sub> emissions by 30%.**



App.  
Validation

## PureGRAPH® enhanced green concrete

- Portland cement is being substituted with green options such as geopolymers.
- PureGRAPH® provides increased mechanical properties.
- Improved integration of recycled concrete aggregate



App.  
Validation

## PureGRAPH® enhanced concrete for structures

- Increasing compressive and tensile strength
- Improved corrosion resistance
- Reducing surface abrasion



App.  
Validation

## PureGRAPH® enhanced prefabricated components

- Increasing compressive and tensile strength
- Reduced water permeability



App.  
Validation

## PureGRAPH® protected concrete

- Reduced water permeability
- Improved corrosion resistance

**Multiple PureGRAPH® opportunities along the cement value chain**



# Innovative Solutions – Dispersible Graphene

first graphene

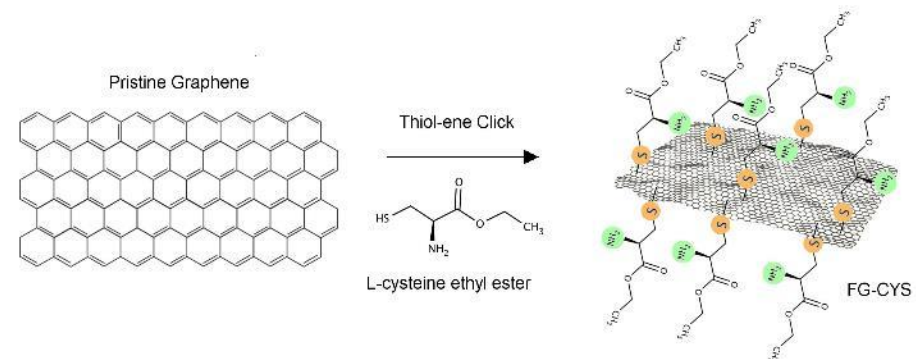


PureGRAPH® AQUA launched March 2021.

## PureGRAPH® AQUA

### For improved dispersion in polar systems

- Pre-dispersed hydrogel
- Pristine platelets have water spacers
- Easy formulation in paints, inks, cements and latex rubbers
- AQUA products available in all **PureGRAPH®** sizes.



Tailored PureGRAPH® functionality reproduced from Materials **2021**, 14, 2830.

## Custom Functionalisation

### For improved dispersion and bonding

- Bespoke chemical functionality for covalent resin bonding
- **PureGRAPH®** is ideal precursor for Thermal Thiol-Ene Click Chemistry deployed

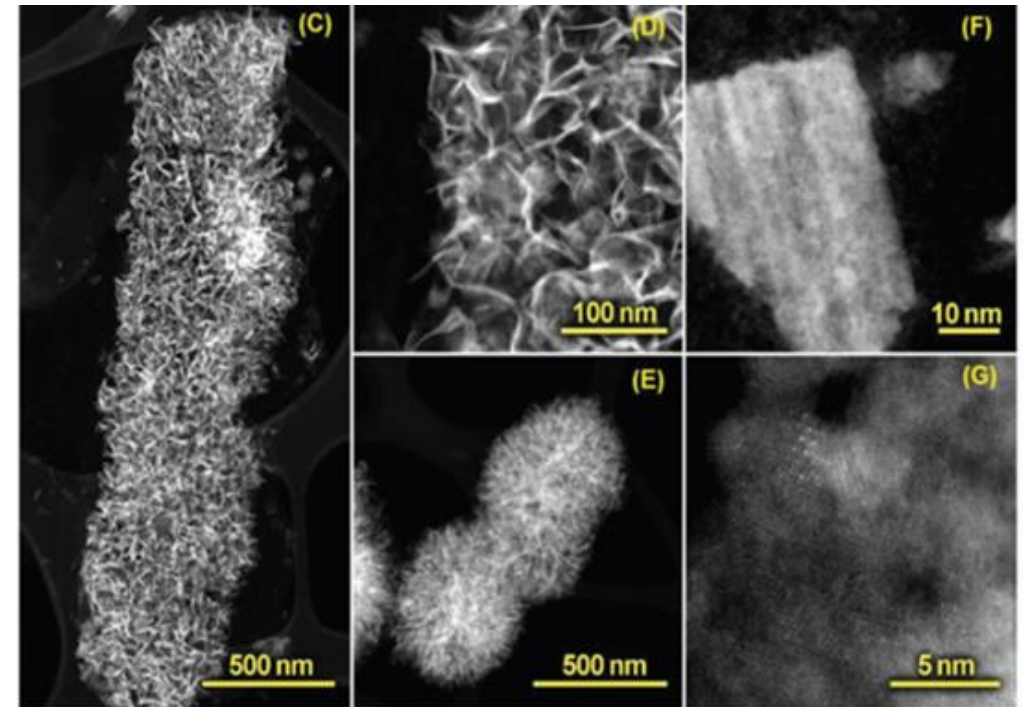


## Supercapacitors:

- Patented process to manufacture metal oxide decorated graphene
- High capacitance materials for superior supercapacitors
- Pseudo capacitance giving high capacitance/area enabling high energy density storage devices
- *Further testing in progress with WMG*

## Fuel Cells:

- Metal decorated graphenes are excellent de-oxygenation catalysts in hydrogen fuel cells.
- Potential platinum catalyst replacement
- *Further development funded by UK government underway with the Manchester Fuel Cell Innovation Centre*

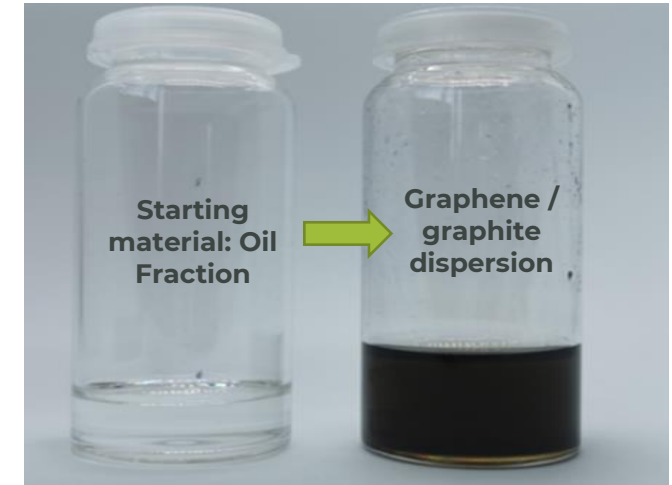


**Fig 1:** SEM images of the graphene scaffold with metal oxide structures for use in pseudo capacitors or electrocatalysts

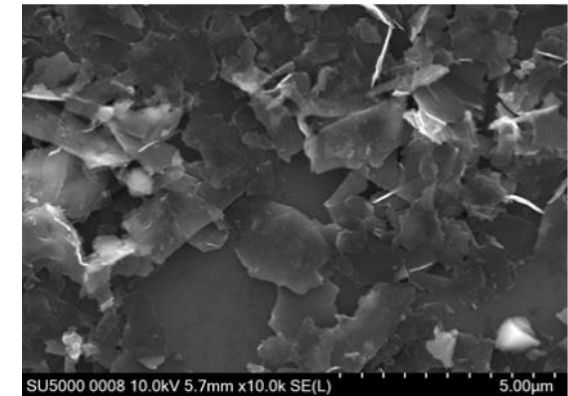
# Innovative Solutions – Novel Supply

## High Purity Graphite from Oil Feedstock

- **Patented process** funded by the U.K. Government to convert petroleum fraction to high purity Graphite/Graphene suitable for Li-Ion Anodes.
- Process creates **Hydrogen** as a valuable by-product; with no CO<sub>2</sub> generation (No combustion or burn off required).
- Resultant **Graphite** is high purity and optimized for a Li-Ion anode manufacture.
- Resultant **Graphene** can be used in composite anodes and cathodes for next generation Li-ion batteries.
- **Entry opportunity** for oil suppliers to participate in battery technology. Actively seeking and engaging with oil supply companies.

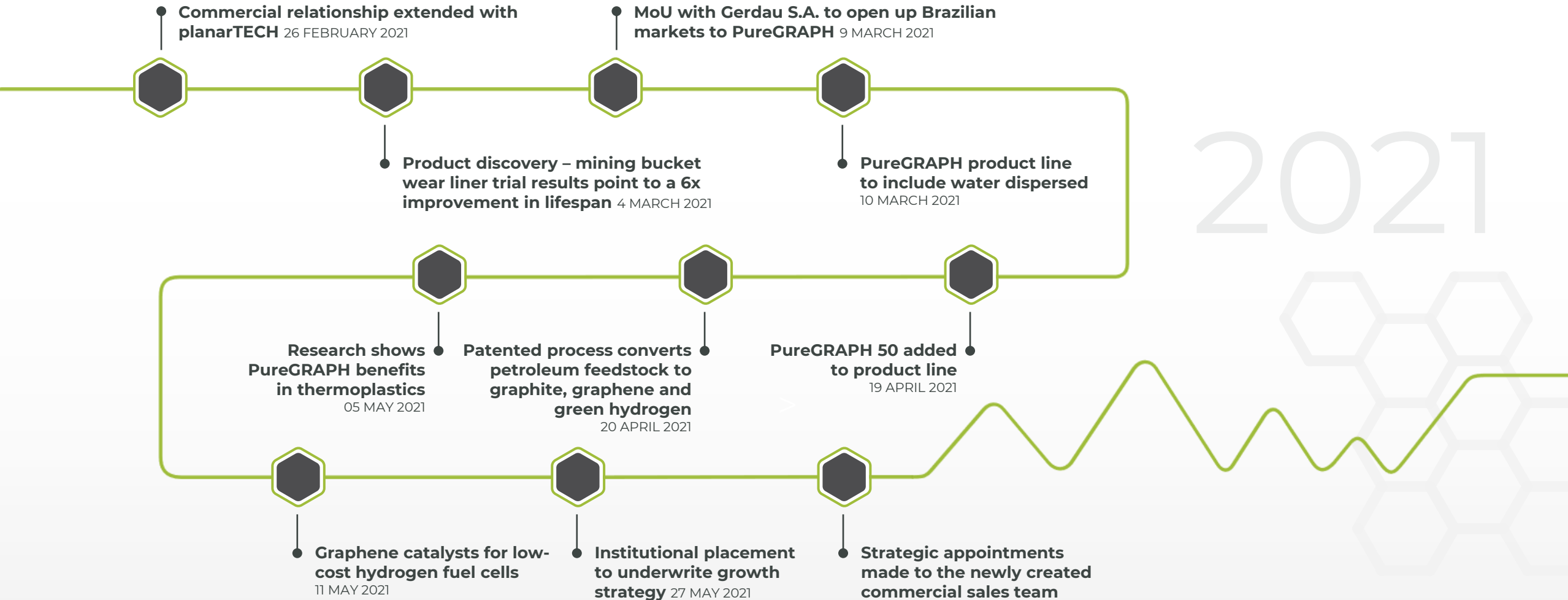


One-step conversion of oil fraction to graphite for Li-ion battery anodes.



High-quality graphitic flakes from the process – SEM analysis

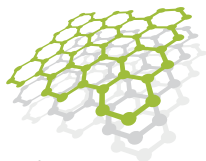
# Progress and recent FGR accomplishments



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**first graphene**

The world's leading graphene company

## **Corporate Headquarters & Manufacturing Plant**

1 Sepia Close, Henderson  
Western Australia 6166

**P.** +61 1300 660 448

## **Global R&D & Marketing Facility**

Graphene Engineering & Innovation Centre  
University of Manchester  
Sackville Street, Manchester  
M13 9PL, United Kingdom

**P.** +44 (0)161 826 2350

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FIRSTGRAPHENE.NET

info@firstgraphene.net

