

# Effectiveness of PureGRAPH™ in Coolants Confirmed in FlexeGRAPH Trials

## Highlights

- Initial laboratory based testing has confirmed that PureGRAPH™ 5 is a highly suitable product
- FlexeGRAPH is developing advanced coolant technology using graphene-enhanced heat transfer fluids
- FlexeGRAPH's nanofluid coolant technology represents the first breakthrough in liquid coolants in 90 years, establishing a new standard

Advanced materials company, First Graphene Limited ("**FGR**" or "**the Company**") (ASX: FGR) is pleased to confirm laboratory based testing has confirmed that PureGRAPH™ 5 is a highly suitable component which has enhanced production throughput without compromising fluid performance.

## Background

As previously announced FGR agreed to supply PureGRAPH™ to test its suitability for use in car engine cooling to facilitate better fuel efficiency and reduced emissions. Further applications include coolants in electrified systems such as batteries and high-performance computing and data centres, so they can be charged faster with reduced capacity losses as well as improved cooling of high performance computing and data centres to reduce power consumption. The market size for heat transfer fluids in Australia was \$3bn in 2016 and is expected to grow to \$4.5bn by 2022.

To date, whilst at the experimental scale, FlexeGRAPH has been sourcing its graphene under licence from the Canberra-based university. The opportunity existed for FGR to provide more economically priced large-scale graphene supplies.

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FGR  
FGROC

FlexeGRAPH has been trialling FGR's PureGRAPH™ 5 as an input material in FlexeGRAPH's proprietary process for the production of specialty heat transfer fluids. Initial laboratory based testing has confirmed the PureGRAPH™ 5 is a highly suitable component which has enhanced production throughput without compromising fluid performance. This has eliminated a potential production bottleneck leading to a rapid expansion in FlexeGRAPH's fluid production volume capabilities.

Current efforts are focussed on scaling batch sizes to 1,000L of heat transfer fluids incorporating PureGRAPH™ 5. Success in this area will lead to subsequent system testing with one of FlexeGRAPH's downstream partners where superior thermal performance is a necessity.

### **Coolant Technology Being Developed by FlexeGRAPH**

FlexeGRAPH has developed a family of fluids enhanced with graphene nanotechnology to replace existing water and glycol-based coolants and liquids used in heat transfer applications. These results in enhanced thermal conductivity and heat transfer with excellent stability, even at elevated operating temperatures.

The main areas of focus and the benefits achieved are currently;

- a) Car engine cooling
  - i. enabling higher operating temperature
  - ii. reduced fuel consumption and emissions
  - iii. smaller radiators, pumps and fans
- b) EV battery cooling
  - i. reduced charging times
  - ii. extended battery lifetime
- c) HPC and data centre cooling
  - i. Reduced volume of cooling systems and energy consumed
- d) Drilling and cutting fluids
  - i. Improved tool performance and component quality

Managing Director, Craig McGuckin, stated: *"The results of the test work with FlexeGRAPH are further evidence of the suitability of FGR's PureGRAPH™ products in a range of real-world applications. The performance improvements offered by PureGRAPH™ enhanced materials is being demonstrated repeatedly with our partners and customers. The consistent quality of the PureGRAPH™ products provides the end user with a confidence of a quality assured and proven product."*

FlexeGRAPH CTO Shannon Notley stated: *"Consistent material quality from our value chain partners is of the utmost importance as we scale our heat transfer fluid production. FlexeGRAPH is pleased to be entering in the next phase of our testing with the confidence that PureGRAPH™ will provide a versatile material suitable for our bespoke coolant technology."*

### **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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