

MANUFACTURING OF LIQUID GRAPHENE



Graphene Manufacturing Group is one company that is part of a global race to commercialise new products using graphene, the world's first 2D material. The Brisbane-based business has developed a novel process to synthesise and tailor graphene and is working with project partners to incorporate liquid-based graphene into various applications.



How the Growth Centre helped?

The Advanced Manufacturing Growth Centre (AMGC) is supporting this multi-partner collaborative project through \$226,861 in co-funding. GMG credits the support in helping scale and push development forward on graphene in multiple new products.

What's changed?

Development work underway is predicted to create between five and 10 new jobs within GMG and as many as 50 among its partners. In addition, partners will gain a competitive edge for their products through an advanced material with remarkable strength, conductivity and other properties.

Success story overview

Graphene was created in 2004 and earned the two scientists responsible for this achievement a Nobel Prize in Physics six years later¹.

It is the world's first 2D material², and is an atom-thin layer of hexagonally arranged carbon atoms. Its properties often see graphene described in superlatives: the lightest, strongest, most electrically conductive material known to man. It boasts exceptional heat conductivity.

Interest in exploiting the material's properties has led to much industrial and fundamental research. According to a count performed in 2018, over 53,000 patents were filed on graphene technology in the years since the substance's discovery³.

1 <https://www.nobelprize.org/prizes/physics/2010/press-release/>

2 <https://www.manchester.ac.uk/discover/magazine/features/the-2d-revolution/>

3 <https://grapheneindustry.org.au/about/what-is-graphene/>

Graphene's founders famously used pencil lead (graphite) and scotch tape to separate graphite into single layers⁴. Since then, other, more scalable methods of "mechanical exfoliation" have been developed, but cost has remained a barrier to widespread industrial adoption.

Graphene Manufacturing Group was formed in 2016 to develop a new method of bulk graphene production. The confidential process uses hydrocarbons rather than graphite as a feedstock. According to the company, it can produce graphene nanoplatelets and tailor its size to suit an application, and for what is likely the lowest cost of production in the world.

“When you can appropriately make that into carbon atoms in the form of graphene, in a bulk process, continuous, low-cost way, you would be able to then develop a business that could provide an enormous amount of graphene to an enormous amount of different industries at low cost, high-value-add way,”

says Craig Nicol, Founder, Managing Director and CEO at GMG.

“That was the reason why we started the business.”

GMG's method requires a comparatively small footprint, low capital expenditure, and can be scaled up in a modular fashion.

The company has identified 14 sectors with a cumulative global value of \$11.5 trillion which it believes can benefit from industrialised graphene production.

This project links GMG with a cross-section of the vast industrial opportunities, and develops a new way to distribute, transport and mix graphene in liquid form. GMG began R&D on graphene dispersions in fluid in late-2018, and will develop and optimise various dispersion procedures for several project partners.

GMG is investing \$226,861 and \$140,000 in-kind to develop various graphene-based liquid product, allowing for accurate and effective mixing when compounded in other materials.

University of Queensland's Australian Institute for Bioengineering and Nanotechnology is contributing nanomaterial dispersion expertise, providing testing, characterisation and optimisation of blends.

Molekulis, Australia's leading supplier of specialty naphthenic base oils is developing a series of high performance fluids integrating GMG's graphene technology for use by domestic and international customers across a wide range of applications such as lubricant and industrial rubber manufacturing. Wagners is trialing graphene to augment its building materials. CME will also work GMG Graphene fluids in trialing graphene to improve rubber and plastic products. Sierra Chemicals is trialing graphene within various paints and fluids for its heat transfer properties.

AMGC is supporting this project through \$226,861 in co-funding.

The collaborative R&D on new graphene-based formulations and uses offers opportunities to develop new intellectual property and products based on a technically-superior processing technology.

GMG estimates that it will create between five and 10 new jobs as a result of the development work, and that as many as 50 roles could be created among project partners through new products.

Nicol says AMGC's support has helped crystallise plans to add fluid graphene products and solutions to the powder-based applications GMG had developed.

“That has enabled us to see how liquid graphenes can be commercialised faster than powder graphene,” he says, adding that test results for new, graphene-augmented coolant products have been impressive.

“Then that comes through working on this project with AMGC and realising that it is a highly unique ability that we are developing for fluids, but also to actually scale that and push that forward is definitely something AMGC's project enabled us to focus on.”

4 <https://www.bbc.com/news/science-environment-11478645>

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