

Talga Graphene Agreement with Chemetall, part of BASF

Talga Resources Ltd

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Corporate Information

ASX Codes **TLG, TLGOA**

Shares on issue **181.9m**

Options (listed) **44.9m**

Options (unlisted) **28.7m**

Company Directors

Terry Stinson

Non-Executive Chairman

Mark Thompson

Managing Director

Grant Mooney

Non-Executive Director

Stephen Lowe

Non-Executive Director

Technology minerals company, Talga Resources Ltd (“**Talga**” or the “**Company**”) (ASX: TLG), is pleased to announce that it has signed a Joint Development Agreement (“**JDA**”) with Chemetall, a global business unit of BASF Coatings Division, to co-develop and commercialise graphene-enhanced metal surface coatings (the “**Agreement**”).

This is the first initiative in the coatings sector under Talga’s commercialisation strategy.

- Joint Development Agreement executed with Chemetall, a global business unit of BASF’s Coatings Division, and a leading supplier of surface treatment technologies
- Cooperative program created to develop Talga graphene enhanced metal protective treatments (estimated market size c. US\$10.4bn¹)
- Talga to be the exclusive graphene supplier to Chemetall for jointly developed products for an agreed time period
- Talga to generate first revenue from graphene sales to Chemetall during Q2 CY2017

Under the terms of the Agreement, Talga and Chemetall will cooperate to develop Talga value-added graphene products for use in Chemetall surface treatment products. The joint development program aims to set new industry standards for eco-friendly, high performance, corrosion resistant surface treatments.

The Agreement is a significant milestone in Talga’s transition from development into commercialisation and concludes extended negotiations and graphene product sample testing with Chemetall.

The program will see co-development of graphene enhanced metal surface coatings that provide high performance. The program has the potential to expand the pre-treatment product range, including pretreatment coatings for steel.

Key terms to the Agreement including development program and exclusivity timelines as well as pricing on graphene supply are subject to ‘commercial in confidence’ restrictions. Sale of Talga graphene formulations will begin with commencement of the development program.

Talga Managing Director Mark Thompson commented:

“This contract is particularly pleasing because it not only starts our partnership commitment with Chemetall, it also validates our product and corporate strategy. The collaboration presents opportunity for Talga’s value-added graphene products to access the global protective treatments market and is a major commercial milestone for Talga’s technology. We will use this partnership as a model to develop long-term supply opportunities to other industry end users within Talga’s other target markets.”



Chemetall GmbH Technical Director Peter Schubach commented:

“The development resources we are committing is a clear reflection of our belief in the revolutionary properties of graphene-enhanced products. We are excited to partner with Talga and co-develop new metal surface coatings products that leverage the superior performance and eco-friendly properties of graphene in what we see as a significant commercial opportunity for Chemetall.”

Next steps

The first step in advancing the joint development program is the preparation of functionalised formulations for incorporation with Chemetall products and testing (Fig 1) to commence in Q2 2017. Talga will, via its UK-subsiary, Talga Technologies Ltd, prepare products and interface with Chemetall technical staff to fulfil work programme outcomes and deliverables. The work program includes integration work with Chemetall at their premises near Frankfurt in Germany.

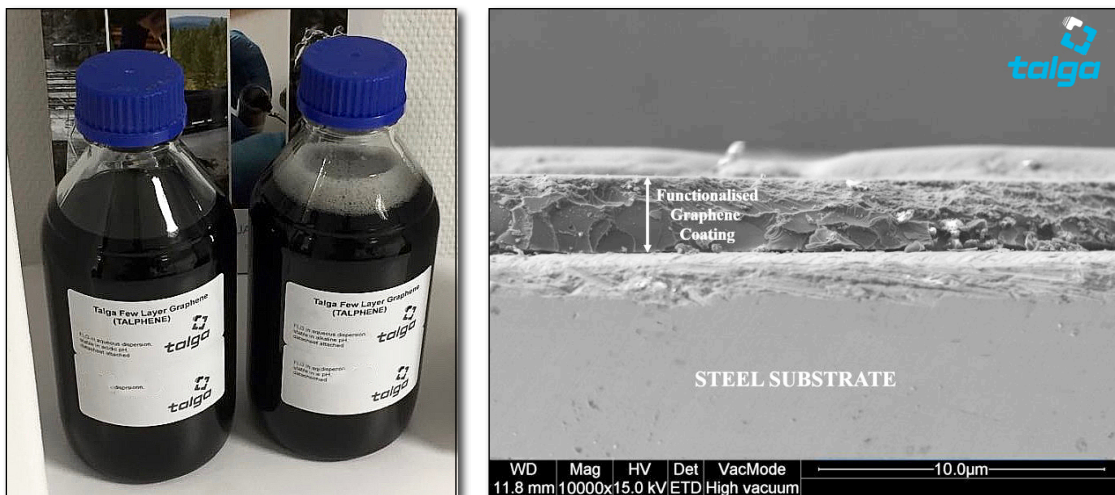
Talga aims to use the Agreement as a model to progress product and commercialisation developments in its other three target markets (energy/batteries, construction/building materials and polymer composites), where we have demonstrated early prototype successes and have established mature dialogues and product testing collaborations with potential customers.

Summary of graphene coatings market opportunity

Talga’s graphene enhanced metal pre-treatments have been proven to significantly decrease corrosion². Results from the peer-reviewed Flatchem anti-corrosion coating study demonstrate 74% less water permeation and superior anti-corrosion results on mild steel using Talga’s graphene coating (refer to TLG ASX announcement dated 22 September 2016).

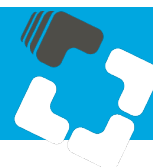
There is emerging evidence that graphene, due to its high impermeability, high electrical conductivity and ultra-thin shape, is a new and effective additive for coatings of many types, of which anti-corrosion is one application³. According to a Freedonia 2014 report the global coatings industry consumes over 40 million tonnes per annum of materials⁴. Refer to the Appendix for detailed market information.

Figure 1 Talga functionalised graphene formulation for metal protective coating (L) and cross-section of protective coating on steel (R).



About Chemetall

Chemetall, a global business unit of BASF’s Coatings Division, is a leading global supplier of special chemicals with a focus on processes for the surface treatment of metals, glass and plastics. Chemetall is headquartered in Frankfurt am Main, Germany, and comprises about 40 companies and 21 production sites worldwide. With 2,500 employees, the Group achieved sales of about US\$845 million (2015). More www.chemetall.com.



About BASF's Coatings Division

The Coatings Division of BASF is a global expert in the development, production and marketing of innovative and sustainable automotive OEM and refinish coatings, as well as decorative paints. We create advanced performance solutions and drive performance, design and new applications to meet our partners' needs all over the world. BASF shares skills, knowledge and resources of interdisciplinary and global teams for the benefit of customers by operating a collaborative network of sites in Europe, North America, South America and Asia Pacific. In 2016, the Coatings Division achieved global sales of about €3.2 billion.

In 2016, BASF acquired Chemetall, a leading global supplier of applied surface treatments for metal, plastic and glass substrates in a wide range of industries and end markets. With this expansion in portfolio, BASF becomes a more complete solution provider for coatings.

Solutions beyond your imagination – Coatings by BASF. For more information about the Coatings Division of BASF and its products, visit www.basf-coatings.com.

About BASF

At BASF, we create chemistry for a sustainable future. We combine economic success with environmental protection and social responsibility. The approximately 114,000 employees in the BASF Group work on contributing to the success of our customers in nearly all sectors and almost every country in the world. Our portfolio is organised into five segments: Chemicals, Performance Products, Functional Materials & Solutions, Agricultural Solutions and Oil & Gas. BASF generated sales of about €58 billion in 2016. BASF shares are traded on the stock exchanges in Frankfurt (BAS), London (BFA) and Zurich (BAS). Further information at www.basf.com.

About Talga

Talga Resources Ltd (ASX: TLG) is a technology minerals company enabling stronger, lighter and faster products for the coatings, battery, construction and carbon composites markets using graphene and graphite. Talga has significant advantages owing to 100% owned unique high grade conductive deposits in Sweden, a pilot test facility in Germany and in-house graphene product technology. Testing of Talga materials and products is underway with a range of corporations including industrial conglomerates Tata and BASF subsidiary Chemetall, UK listed Haydale and German based Jena Batteries.

For further information visit www.talgaresources.com or contact:

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References

- 1 *Global Protective Coatings Market 2016 - 2021 Report*, pp41, Mordor Intelligence 2016
- 2 *Functionalised Graphene as a barrier against corrosion*, Flatchem, September 2016.
- 3 *Graphene against corrosion*. Nature Nanotechnology, October 2014.
- 4 *Study 3135 Coatings*, Freedonia Industry Report, March 2014.
- 5 *Graphene based anticorrosive coatings for Cr (VI) replacement*, Nanoscale, September 2015.
- 6 *MarketandMarkets Coating Pretreatments Report*, 2016.



APPENDIX

Why graphene for corrosion protection

A growing body of research and testing has demonstrated that graphene's high impermeability, high electrical conductivity and ultra-thin shape may prove a new and effective additive to improve coatings, including surface coatings and particularly anti-corrosion coatings² (Fig 2).

Worldwide corrosion is reported to cost US\$2.2 trillion (2010) annually in economic impacts through the maintenance and replacement costs of infrastructure and equipment, particularly transport and shelter infrastructure, which has high impact costs of failure³.

The exact mechanism of graphene's success in anti-corrosion coatings is still being investigated but is understood to include reduction of liquid and gas permeation by increased barrier and tortuous path effect. In addition, graphene's conductivity may provide an alternative path for electrons in corrosive reactions to stay in the coating above the metal substrate, thereby retarding the overall corrosion process⁵.

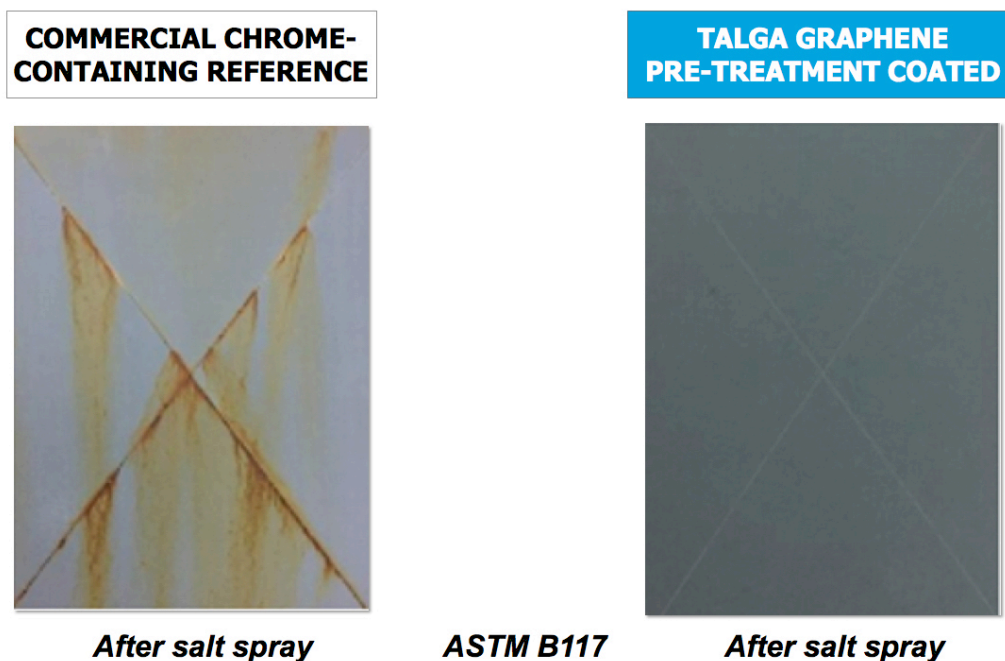
Being highly inert, graphene can act as a corrosion barrier against oxygen and water diffusion and does not suffer from human health hazards and environment issues associated with hexavalent chrome (Cr6+) coatings which have been the historical mainstay for corrosion pretreatment coatings.

Like most heavy metals, Cr6+ is toxic and a suspected carcinogen, the release of which is regulated by the USA Environmental Protection Agency and the Occupational Safety and Health Administration, as well as many other nations regulatory agencies. In spite of its toxicity, Cr6+ remains an essential ingredient in the metal finishing industry for corrosion control and there is a high interest from industry in finding substitutes⁶.

Talga graphene scientific validation

Scientific peer-review studies² released in 2016 highlighted that adding Talga's graphene in a coating increased corrosion protection of steel by up to 74% with loadings of graphene in the range 0.1 - 5%. The peer review study "*Functionalised Graphene as a Barrier Against Corrosion*" was published in the scientific journal, FlatChem and used Talga's graphene nanoplatelets produced at the Company's pilot test facility in Germany to manufacture a coating for corrosion resistance tests on mild steel (refer ASX:TLG announcement 21 September 2016).

Figure 2 ASTM standard Salt Spray tests show Talga's graphene based coating superior corrosion protection over current commercial coating reference.



Metal surface coatings background

Coating pre-treatment is a process in which the surface of a component is chemically or mechanically cleaned, protected and prepared for further painting and coating. Metallic components such as steel, aluminium, cold-rolled steel, hot-dip galvanised steel, electro-galvanised steel, iron/zinc alloy-coated steel, zinc/aluminium alloys, and die cast metals are cleaned of impurities with pre-treatment coatings, which can also enhance further coating adhesion and reduces the rate of service corrosion. The main application areas of coating pre-treatments are in the automotive and transportation, appliances, building and construction industries. On the basis of type of pre-treatment, the market is further divided into phosphate based, chromate based, chromate free and blast-clean based pre-treatment.

The coating pre-treatment market is highly consolidated with large producers forming the majority of the international market share including Chemetall GmbH (Germany), Henkel AG & Co. (Germany), PPG Industries (USA), Nihon Parkerizing Co., Ltd. (Japan), and Nippon Paint Co. Ltd. (Japan).

MarketandMarkets report⁶ that the global coating pre-treatment market is projected to reach 1,610,700 tons by 2021, from 1,246,700 tons in 2016 (a CAGR of 5.25%) and the market value will reach approximately US\$3.8 billion by 2021 from an estimated US\$2.9 billion in 2016 (a CAGR of 5.76%).

Growing demand from the automotive and transportation industry and increasing demand for appliances are major factors driving market growth. Accelerating demand for water rather than toxic solvent-borne coatings, chromium free and volatile organic compound free coating technologies like powder coating is creating a strong drive for eco-friendly coatings to suit these sectors.

Supply chain

The supply chain of coating pre-treatments includes raw material suppliers, coating pre-treatment manufacturers, and end users. Graphene may be sold as raw material or functionalised graphene formulations as liquid dispersions can be sold into coating products at a manufacturer level.

Figure 3 The supply chain of coating pre-treatment products.
Sourced from MarketandMarkets, secondary literature and industry statistics.

