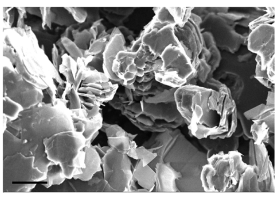
17th February 2016

ASX:TLG

Talga innovation reduces graphite processing steps for Li-ion Batteries

- **Independent testwork on Talga's Swedish ore successfully eliminates five processing steps in refining natural graphite for use in anode of Li-ion batteries**
- **Delivers Talga commercial grade energy capacity in Li-ion battery anode test without need for milling, purification, shaping (spheronisation) or coating**
- **Highlights potential for Vittangi graphite deposit to lower costs and environmental impact of current Li-ion battery production chain**
- **Demonstrates advantage of Vittangi graphite ore in making multiple high value products (alongside graphene) as part of Talga's advanced technology materials strategy**
- **Creates opportunity to solve today's battery cost challenges. Access to emerging battery market remains via graphene opportunities**
- **Sample supply agreements already in progress with international battery manufacturers, suppliers and automotive OEM's**
- **Further tests on Vittangi ore underway which include graphene and graphene-silicon composite anodes**

Figure 1. Diagram highlighting process steps reduced by Talga compared to industry standards in achieving graphite for ~360mAh/g Li-ion battery anode.

Talga Graphite	Spheronised Graphite
Talga Processing Steps	**Peer Processing Steps**
Exfoliate	Crush
↓	Grind Stages
Concentrator single stage	Flotation stages
↓	Micronisation
↓	Purification (chemical/thermal)
↓	Shaping (spheronisation)
↓	Coating
Mix binder and dispersant	Mix binder and dispersant
	
Battery average capacity ~360 mAh/g	***Battery average capacity ~360 mAh/g***

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unearthing tomorrow

Advanced materials company, **Talga Resources Ltd** ("Talga" or "the Company")(ASX: TLG), is pleased to announce highly encouraging results from initial lithium-ion ("Li-ion") battery testwork using anode graphite sourced from the Company's Vittangi project in Sweden ("Vittangi").

Talga's preparation of graphite for the Li-ion battery eliminated a number of processing steps otherwise required under conventional graphite refining pathways (Figure 1) to meet commercial level performance in capacity over 100 cycles in a cell test. The early stage test outcomes are significant as the results match battery makers emerging requirements for lower cost and more environmentally sensitive manufacturing processes.

Introduction

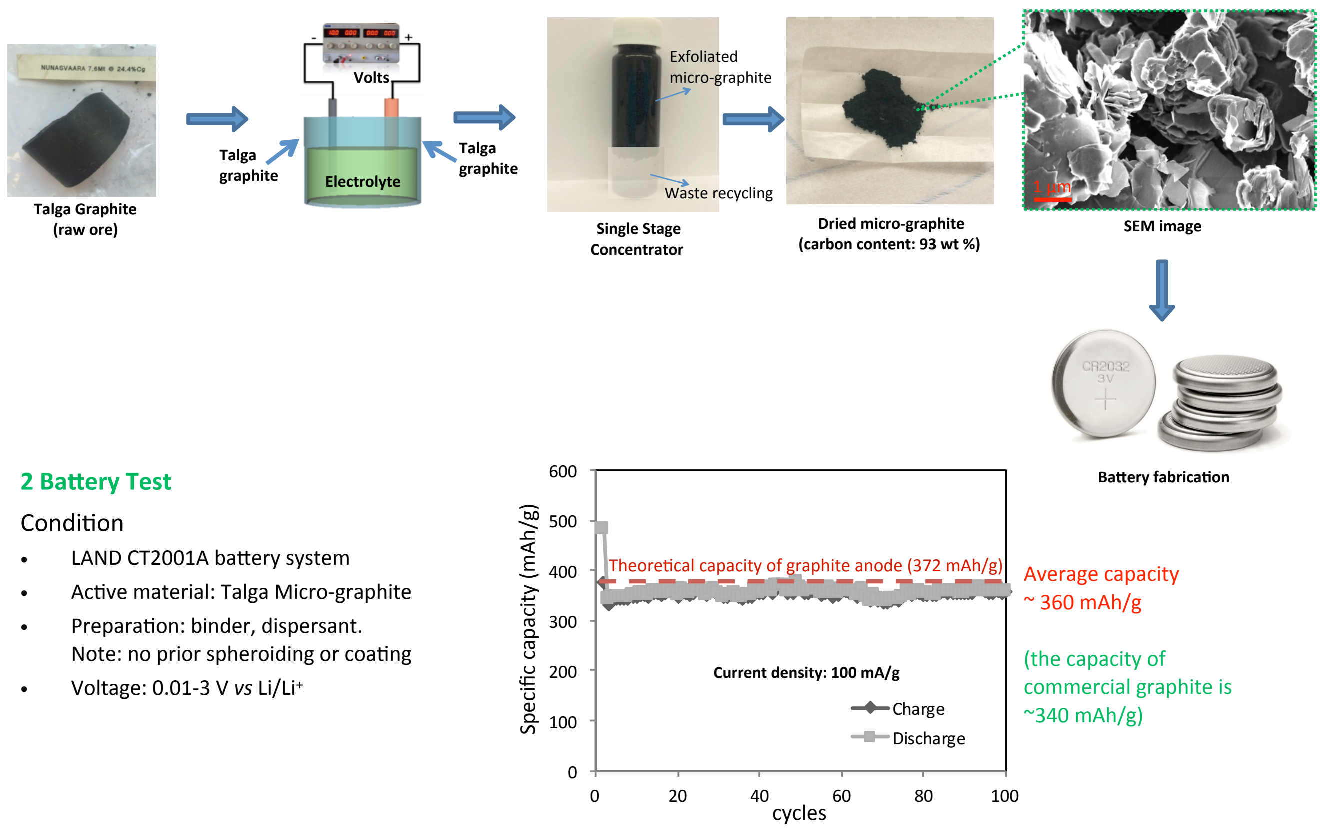
Talga has been closely examining the energy storage market for some period. Trials at the Company's German pilot test facility coupled with feedback from partners has in recent times identified the exact characteristics of Talga's micro graphite products (essentially the majority of material produced that does not report to the graphene 'stream'). Previously Talga held the view that its focus in energy storage should be directed solely to next generation batteries that are enhanced with graphene – this view has now been expanded.

Today's Li-ion market relies on graphite anodes that are supplied from costly synthetic or natural large flake graphite products. Given that spherical graphite for use in Li-ion battery anodes ends up being very small (it is micronised), Talga has been investigating the use of its un-milled ultra fine flake graphite particles from its Vittangi graphite deposit (that are naturally this scale already). The objective being to form a Li-ion battery anode with the least amount of processing steps while attaining industry standard energy capacity.

Independent testwork, as part of an ongoing and broader graphene battery program, was carried out at the Max Planck Institute of Polymer Research and Dresden Technical University in Germany using samples of Talga's Vittangi feedstock (Figure 2).

Ordinarily, natural graphite cannot be used in Li-ion battery anode material without extensive physical and chemical refining. In this testwork, Talga's unpurified graphite (natural <10 microns grading 93%Cg purity) was used directly as the active anode material without any micronising, spheroiding and coating steps used currently by industry.

Figure 2. Diagram of Talga graphite processing route and Land CT20001A battery test results.



After report by Max Planck Institute for Polymer Research and TU-Dresden

Test Results

Talga micrographite used as active material enabled the battery to achieve first charge capacity of 375mAh/g, a first discharge capacity of 481mAh/g and average charge capacity over 100 cycles of 357mAh/g (Table 1). The first charge and discharge capacities exceeded the theoretical maximum of graphite (Figure 2) and the average specific capacity achieved was comparable to that of highly refined spherical graphite.

Table 1. Summary of Talga graphite anode specific energy capacity test results

First Charge Capacity	First Discharge Capacity	Charge Capacity after 100 cycles
375 mAh/g	**481 mAh/g**	**357 mAh/g**

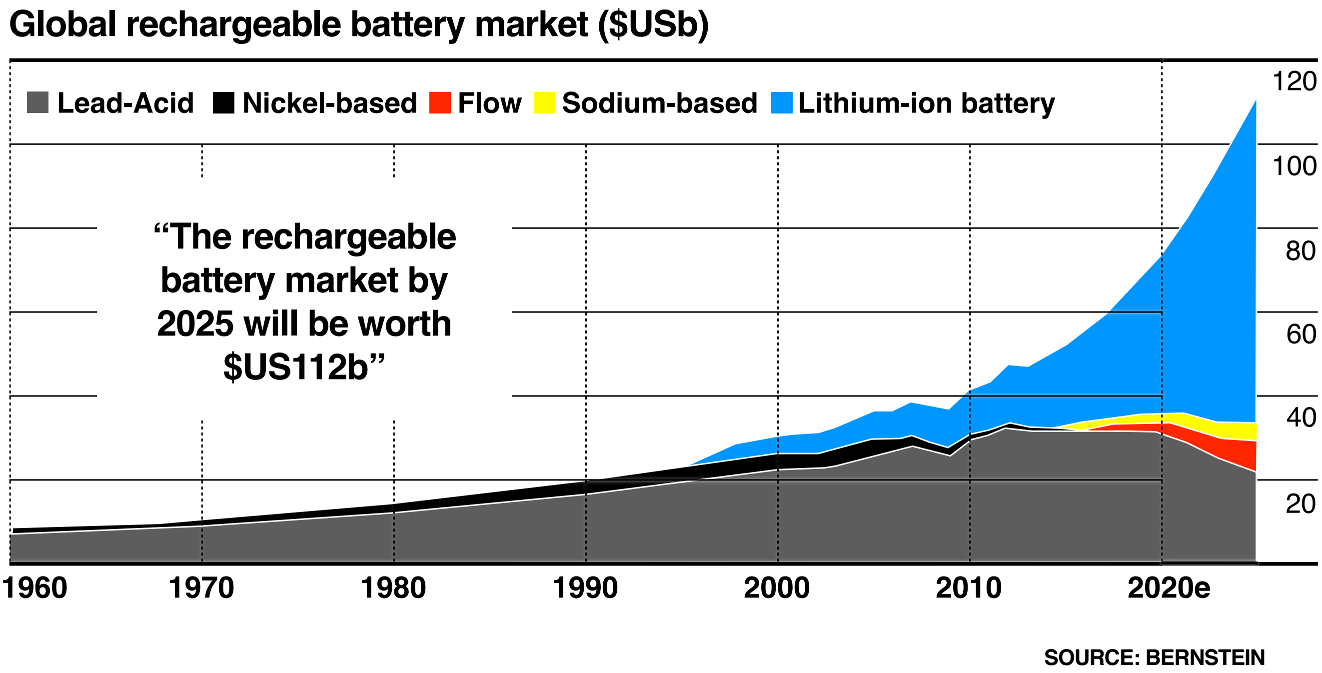
Talga Managing Director, Mr Mark Thompson said "*These results are significant because charge capacity results matched, and for a period, surpassed those from batteries reliant on industry standard spherical graphite anodes. The difference being that Talga's sample came in a relatively raw natural state and did not require energy hungry milling and toxic refining steps. Aside from operational cost reductions without micronizing and spheronising, any opportunity to avoid significant capital outlay on complicated spherical graphite plant and equipment is a huge bonus.*

These results highlight the benefit of owning 100% of a very special resource that affords a truly new opportunity in the fast growing lithium-ion battery market."

Li-ion Production and Hurdles

Li-ion batteries are a fast growing part of the energy storage sector and have rapidly become the favoured power source for consumer electronics, stationary storage and automotive applications with the market value for these products valued at over $US50b at present (Figure 3). Li-ion batteries are restrained however by limits to material performance (power capacity) and high production cost.

Figure 3. Value of global rechargeable battery market showing evolution of lithium-ion value.



The accelerating demand for Li-ion batteries is driving materials demand, which has been projected to increase to 1.2 trillion yen (US$10 billion) as shown in Figure 4. The anode materials segment has been projected to account for over 40% of battery material sales in 2019.

Figure 4. Battery materials demand projected to grow to US$10 billion in 2019.

Li-ion battery anodes typically use highly refined and expensive synthetic or natural graphite. For natural graphite to be made fit for purpose - mining, crushing, grinding and concentration steps must be followed by intense refining to form spherical graphite particles less than circa 15 microns in size (0.015mm).

As a consequence of the significant chemical, thermal or physical energy required in these steps, Li-ion batteries remain commercially and environmentally expensive. The cost of Li-ion batteries for automotive applications is between 400-800% that of lead acid batteries, and 100-400% that of nickel metal hydride batteries. Major industry initiatives to reduce costs include finding economies of scale or novel production techniques (Tesla's 'gigafactory' and 24M's manufacturing ambitions are examples).

A fundamental way to make Li-ion batteries more economic is to decrease the cost of the battery materials, including the cost of graphite required in the anode. Coated spherical graphite currently sells for more than US$5,000 per tonne and uncoated spherical graphite sells in excess of US$3,500 per tonne.

Anode manufacture using spherical graphite relies on circa 20 year old technology and reducing the cost (and environmental footprint) is challenging owing to process complexity. Graphite spheronisation is intricate because it is an amalgamation of several processes: purification, micronization, shaping and coating (see Figure 1). These usually include:

- flotation (mechanical losses and chemical waste)
- leaching (toxic chemicals and/or high temperature energy costs)
- micronisation (intense size reduction/milling energy costs)
- shaping (spheronisation/milling energy costs)
- coating (chemical additive costs)

Talga Solution

Vittangi predominantly consists of highly crystalline flake graphite that is naturally less than 15 microns, approximately the size of graphite commonly used in Li-ion battery anodes. This size flake graphite would ordinarily be difficult to separate using current standard methods, but as a result of Talga's process technology (patent pending) the ultra fine graphite particles from Vittangi can be liberated and concentrated without any milling and with less steps than current commercially viable flow-sheets/mines. This process has already been scaled up from lab to bench; to pilot test scale and is currently being scaled up further at Talga's pilot test facility in Germany.

Coupling Vittangi ore with Talga's patent pending processing technique has the potential to produce a battery anode that requires 100% less milling energy compared to current industry practice. Particle size sought by industry is found in-situ within the rock.

End Users and Next Steps

No material processing equipment changes are required for next stage battery testwork and follow up work is underway to build on these initial promising results. Further identification of products for energy applications will be planned based on future results, research and commercial partner feedback.

Samples and/or discussions on sample supply agreements have commenced with Li-ion battery manufacturing leaders and material suppliers to the consumer electronic, transportation and energy storage system markets.

Further positive outcomes in energy storage testwork, as well as testwork in other applications requiring high value premium graphite could positively impact the existing Vittangi project economics. Maximising production output that reports to high value specialised markets forms a large part of Talga's strategic agenda.

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

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About Talga

Talga Resources Ltd ("Talga") (ASX: TLG) is an advanced materials company with patent pending technology to produce industrialised supply of graphene and micro to nano-graphite sourced from it's 100% owned natural graphite ore deposits in Sweden. Talga's unique deposits and proprietary processes provide a nominal cost path to high quality graphene production that overcome cost and volume barriers to graphene supply, thereby unlocking commercial applications.

Ultra fine graphite as well as graphene platelets are being manufactured for industry partners at Talga's German pilot testwork facility. End applications of materials may include the production of intermediates such as inks, polymers, master-batches and dispersions based on Talga graphene and ultrafine graphites.