ASX: EV1 | 22 August 2022

ASX ANNOUNCEMENT

Premium performance of non-spherical by-products in high-value applications

HIGHLIGHTS

- **Further processing and testwork of the non-spherical by-product from Evolution's proposed battery anode flowsheet has outperformed leading products in high-value applications including:**
    - **Battery cathode conductivity enhancement – Chilalo non-spherical by-product outperforms premium quality primary synthetic graphite; and**
    - **Electrically conductive coatings – alkaline battery cells containing Chilalo's electrically-conductive coating have a significantly higher discharge capacity (or run time) than premium quality primary synthetic graphite.**
- **This provides confidence that the non-spherical by-product will achieve premium prices, drastically improving the economics of a downstream battery anode plant.**
- **Qualification timeframes for these value-added applications are less than 12 months and Evolution has the data to commence qualification initiatives.**

Evolution Energy Minerals ("Evolution" or the "Company") (ASX: EV1, FSE: P77) is pleased to report the results of a demonstration project conducted by its US-based technology partner to create premium-performance electrically conductive coatings and conductivity enhancement materials.

The demonstration projects have produced conductivity enhancement additives and coatings utilizing the finely-sized, ultra-high-purity graphite generated as a by-product in the Company's process of making spherical graphite for anodes in lithium-ion batteries. Based on testing to date, approximately 36% of the feedstock to the spherical graphite flowsheet generates the non-spherical by-product.

The results reported in this announcement demonstrate the ability to access lucrative market opportunities for this material, indicating the potential to generate value-added revenue from up to 100% of the fine flake concentrate from Chilalo.

Phil Hoskins, Managing Director of Evolution Energy Minerals, commented:

"*We are extremely pleased that Chilalo graphite has not only proven itself to be an exceptional anode material for lithium-ion batteries but also that the non-spherical by-product can find lucrative uses in value-added electrically conductive applications.*

"While our commercialisation priority is firmly on the use of Chilalo graphite in the production of anode material for lithium-ion batteries, the ability to utilise the non-spherical by-product in high-value electrically conductive applications is a significant opportunity that we plan to advance in parallel with the production of battery anode materials."

BACKGROUND

Evolution has been undertaking a commercial verification program with an established US manufacturer of battery graphite products to evaluate the amenability of Chilalo graphite to produce coated battery-ready anode materials using thermal purification and proprietary coating technologies.

The battery anode process flow sheet adopted by Evolution's US-based technology partner involves thermal purification prior to spheroidization (see Appendix 1 for how Evolution's flowsheet differs to the conventional flow sheet).

Due to the performance of purified Chilalo graphite in lab testing, the program has expanded to include demonstration projects for the non-spherical by-product in value-added applications with shorter qualification timeframes than EV battery anodes.

Following are details of the products that have been investigated for the non-spherical by-product.

Product 1 – Conductivity enhancement in battery cathodes

By-products from the spherical graphite process are generated in the course of separating usable graphite spheroids from non-spherical graphite. The Company's US technology partner has milled this non-spherical graphite further to generate a product with a d50 of approximately 8.3 microns. Owing to the fact this non-spherical graphite is high-purity (>99.99% C), it can be sold into a host of electrically conductive applications, such as conductivity enhancement graphite in primary lithium, lead-acid and alkaline battery cathodes.

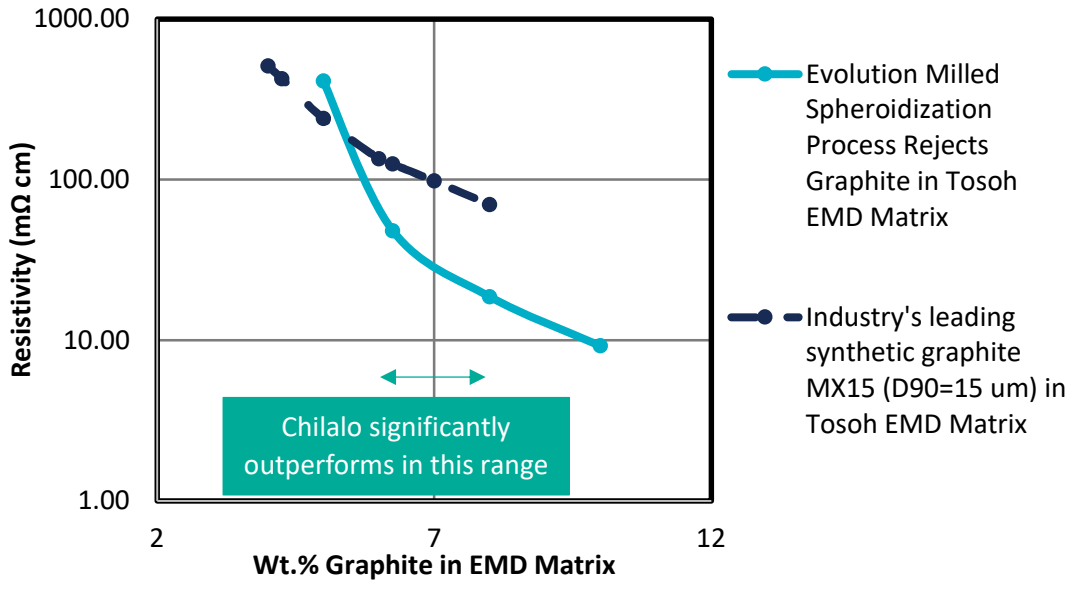
To determine the suitability of Chilalo's thermally purified non-spherical by-product for conductivity enhancement, its performance has been compared to the industry's premium grade of primary synthetic graphite, TIMREX MX15 (a product produced by IMERYS Graphite & Carbon, Bodio, Switzerland). The selling price of this product is believed to be approximately US$12,000 per tonne and its main applications are in the cathodes of alkaline batteries (Zinc Manganese Dioxide or EMD batteries) and lead-acid batteries.

Presented below are the testwork results in an alkaline battery industry-standard four-probe (**4-T**) resistivity test of compression moulded Electrolytic Manganese Dioxide (**EMD**) pellets that contain Chilalo's thermally purified non-spherical graphite rejects as conductive additive.

This industry-standard test measures the electrical resistance of an EMD pellet as a function of weight percent addition of graphite. The lower the resistance, the better battery it will make, meaning it will produce a longer lasting battery that has higher voltage.

These important features of any battery are directly linked to how conductive the cathode matrix is, which is a feature enabled by graphite. One can see that the higher the weight percent loading of graphite, the lower the resistance. Figure 1 demonstrates that Chilalo's non-spherical by-product displays similar electrical performance for batteries containing 5.25% loading of graphite (ie. where the 4T curves intersect). However, most alkaline batteries employ 6.25-8% graphite in their cathodes and in this range, Chilalo's non-spherical by-product significantly exceeds the performance of the premium grade primary synthetic graphite, TIMREX MX15.

Figure 1: Alkaline battery 4-T resistivity test



These results indicate that alkaline batteries containing Chilalo's non-spherical by-product are positioned to:

- last longer;
- work at higher operating current densities;
- demonstrate reduced tool wear in cathode manufacturing processes (i.e. natural graphite is far more lubricious than synthetic graphite); and
- enable cost reductions to alkaline battery manufacturers since the superior purity of Chilalo graphite will likely allow reduced loadings of gas suppressant on the anode (which is one of the most expensive materials used in a typical alkaline battery).

The market size for purified graphite as a conductivity enhancement in alkaline batteries is approximately 18,000 tonnes per year in alkaline batteries alone. However, when primary lithium, lead acid, metal-air and lithium-ion battery cathodes are added, the market size is approaching 50,000 tonnes per year.

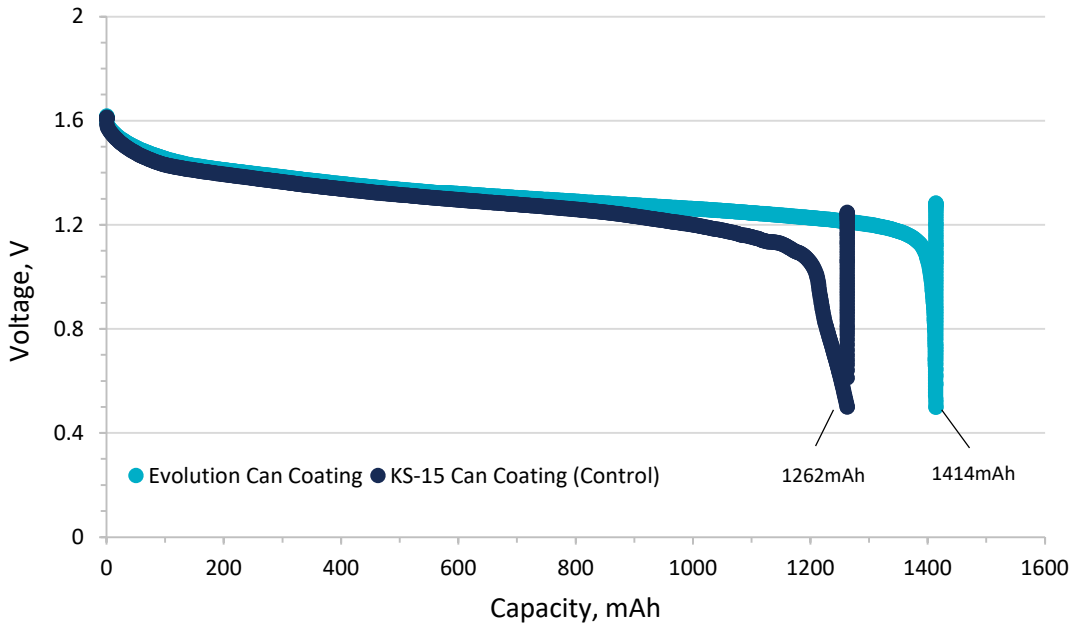
Product 2 – electrically conductive coatings

The second demonstration project performed by Evolution's US technology partner subjected Product 1 above to wet grinding using proprietary, commercially scalable technologies from Japan. The end product was formulated into an ultra-high purity electrically conductive dispersion known as an 'alkaline battery can coating'. Can coating is sprayed onto the interior of alkaline battery can casings to enhance electrical conductivity, thereby increasing the discharge capacity (run time) of the battery.

Coatings containing Chilalo graphite proved to be significantly more conductive than the control formulation consisting of premium quality primary synthetic graphite. This was measured by resistivity of 21 Ω*in (Ohm-inches) for Chilalo material compared to 29.5 Ω*in for the control formulation (note that industry-standard resistivity is 30 Ohm-inches and Chilalo material is 30% lower (ie. more conductive)).

To further quantify the benefits of Chilalo's premium-performance electrically conductive coatings, Evolution's US technology partner assembled AA-sized alkaline battery cells. The interiors of the alkaline battery cans were separately spray-coated with both Chilalo and the aforementioned premium quality primary synthetic graphite formulations. The electrochemical outcomes are presented in Figure 2.

Figure 2: Performance of alkaline battery cells with a can coating based on Evolution's ultra-high purity flake vs the commercial premium performance primary synthetic graphite



It is clear that alkaline battery cells containing Chilalo's electrically-conductive can coating have a significantly higher discharge capacity (or run time) than premium quality primary synthetic graphite.

In particular, cells with the Chilalo formulation displayed a discharge capacity of 1,413.5 mAh[1], while the control formulation cell delivered 1,263 mAh. This represents a ~10.7% improvement in run time of the Chilalo formulation over the control.

Current market pricing for graphite with similar properties to Chilalo's non-spherical by-product is US$12,000 per tonne. For use in the can coating application, the graphite pigment amounts to approximately 20% of the overall formulation, while the rest of the dispersion is fairly low-cost commodity chemicals and water. This effectively increases the commercial value of graphite by a factor of five to a true sales value up to US$60,000 per tonne on a dry graphite product basis.

The non-spherical by-products produced from Evolution's spherical graphite flowsheet have numerous applications outside of electrically conductive can coatings including as electrically conductive coatings and dispersions for plastics, polymers and rubber. These have a market size of approximately 13,000 tonnes per year.

Commentary

A focus on quality over quantity is critical to maximising the value of Chilalo graphite and these demonstration projects are just part of the continued product innovation and discovery to unlock the significant value in Chilalo's high quality graphite as the Company progresses towards becoming a vertically integrated producer.

As an example, selling 200 tonnes into alkaline battery can coatings at effectively US$60,000 per tonne generates equivalent revenue to selling 15,000 tonnes of fine flake concentrate for US$800 per tonne.

Following these excellent results, Evolution is reviewing its entire downstream business plan to not just target battery anode materials but other high-value products with potentially shorter qualification timeframes.

The technology required to transform Chilalo fine flake concentrate into high-value downstream products is well understood and relatively inexpensive, particularly with regards to the potential value uplifts that are possible.

This announcement has been approved for release by the Evolution Board of directors.

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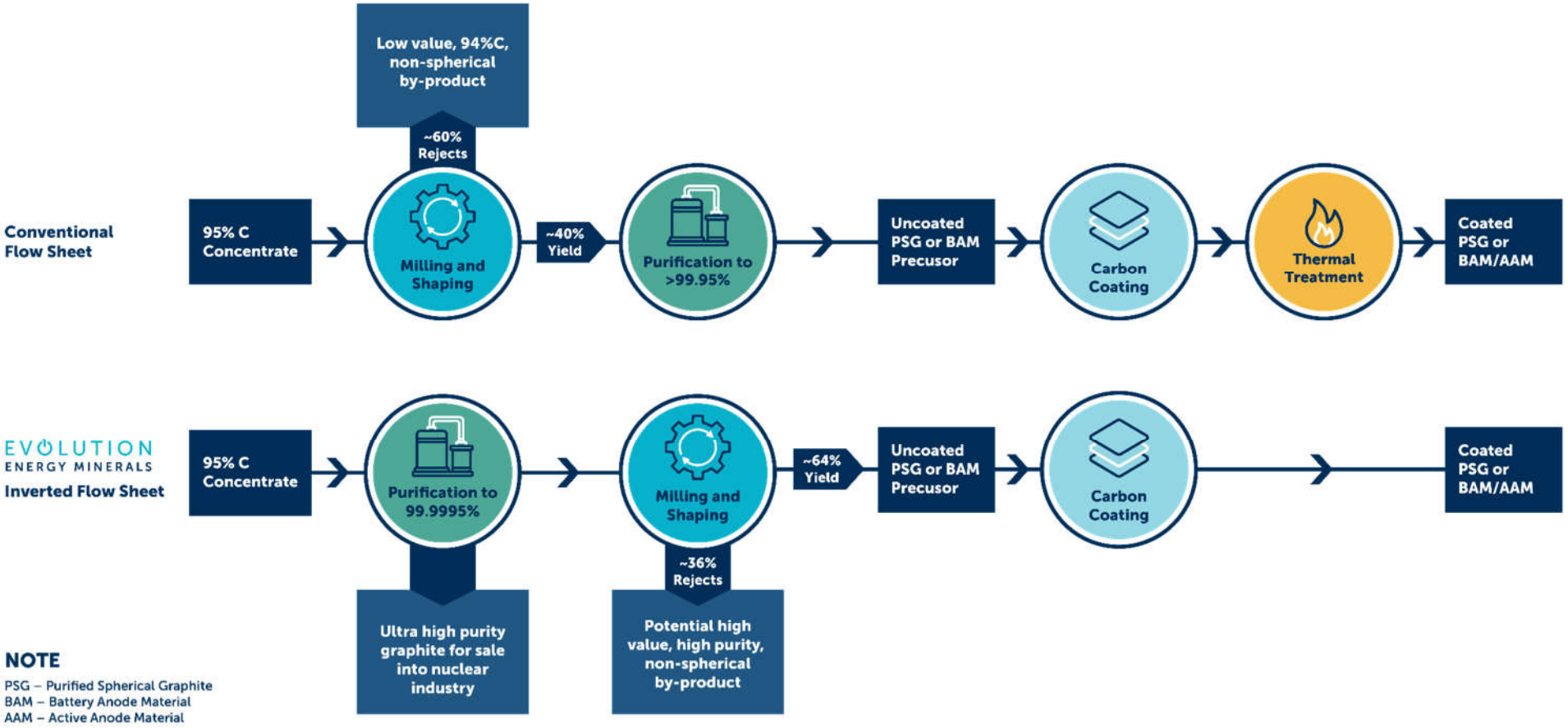
[1] mAh = Specific capacity rating of the battery in milliampere hours (mAh)

Appendix 1: Evolution's flow sheet to produce battery materials compared to conventional flow sheet



ABOUT EVOLUTION (ASX:EV1)

Development ready
Chilalo Graphite Project in Tanzania

58% > 80 Mesh
World leading flake size = highest margins

Unique offtake and downstream collaboration
Extensive product qualifications with YXGC, global leader for EG and foil

Framework agreement
To provide Tanzanian government certainty

FID by H2 2022
Strategic ESG fund cornerstone support

Sustainable battery anode strategy
Superior performance, environmentally friendly thermal purification

Carbon neutrality
Pursuing net zero carbon from day one

Evolution's vision is to become a vertically integrated company that will only supply sustainably sourced graphite products and battery materials.

This will be achieved by combining our unique graphite source with industry-leading technology partners, working closely with customers and producing diversified downstream products in both Tanzania and strategically located manufacturing hubs around the world. Evolution is committed to being global leaders in ESG and ensuring its operations support the push for decarbonisation and the global green economy.

EVOLUTION ENERGY MINERALS

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