RENASCOR RESOURCES

ASX Release

November 25, 2020

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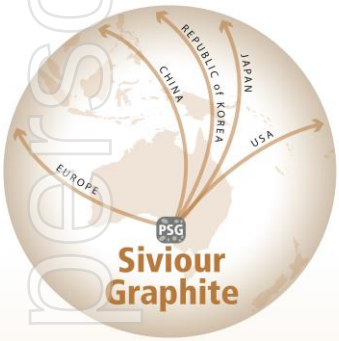

Critical minerals for a secure future

Silicon-Enhanced Anodes Deliver Outstanding Battery Results Using Siviour Graphite

Preliminary half-cell tests confirm suitability of Renascor's Siviour Purified Spherical Graphite for use in silicon-composite anodes

Highlights

- Preliminary half-cell trials of Renascor's Siviour Purified Spherical Graphite (**PSG**) in silicon-composite anodes deliver exceptional electrochemical performance results.
- The addition of silicon in graphite anodes offers the potential to improve the storage capacity of lithium-ion batteries, with considerable attention focused on developing an efficient next-generation, silicon-enhanced anode.
- The silicon-enhanced anode test program, undertaken by next-generation silicon-composite anode developer Sicona Battery Technologies Pty Ltd, was designed to assess initial discharge capacity, the amount of charge delivered by a battery during its initial use.
- The tests, which were an initial, unoptimised trial of silicon-enhanced anodes produced with Renascor's Siviour PSG, returned significantly higher initial discharge capacity than graphite-only anodes (up to 81% higher).
- Silicon-composite anodes produced with Renascor's Siviour PSG met or exceeded the performance of all reference natural graphite previously tested by Sicona, a result attributed by Sicona to the favourable crystallinity, uniformity and surface area of Renascor's Siviour PSG.
- As a result of these positive preliminary results, Renascor and Sicona plan to undertake more extensive full cell tests to further validate the viability of using Renascor's Siviour PSG in Sicona's silicon-enhanced anodes, prior to conducting a commercial trial at Sicona's planned pilot production plant in Wollongong, New South Wales.
- Successful testwork using emerging Silicon composite technology builds on Renascor's previously demonstrated performance in conventional graphite battery anode technology testing.

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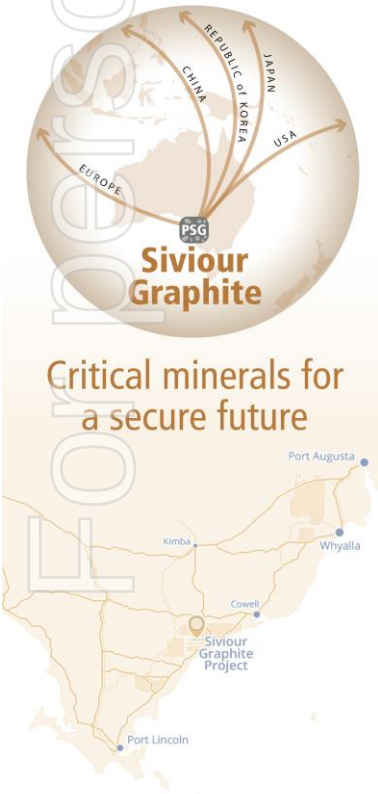

Renascor Resources (ASX: RNU) is pleased to announce the results of preliminary half-cell trials of Renascor's Siviour PSG in silicon-composite anodes.

The tests, which were an initial, unoptimised trial of silicon-enhanced anodes produced by Sicona Battery Technologies Pty Ltd (**Sicona**) with Siviour PSG, returned significantly higher initial discharge capacity than graphite-only anodes, with Siviour PSG meeting or exceeding all reference natural graphite previously tested by Sicona, a result attributable by Sicona to the favourable crystallinity, uniformity and surface area of Siviour PSG.

Commenting on the results, Renascor Managing Director David Christensen stated:

> *"Renascor is delighted to expand the suitability of our graphite from applications in conventional electric vehicle battery anodes into the exciting emerging silicon composite technology, which is becoming an increasingly important field in lithium-ion battery development.*
>
> *We will continue to build on these results as we explore and realise the potential for Renascor's graphite in emerging anode technologies as demonstrated through these tests."*

Background

The rise in demand for electric vehicles is driving an increasing demand for lithium-ion batteries and their constituent materials, including graphite, and more specifically, PSG, as the main raw material in lithium-ion battery anodes.

Current commercial production of lithium-ion battery anodes generally involves the use of graphite, in the form of PSG, which is then coated with carbon before being manufactured into battery anodes.

Renascor plans to produce PSG through a vertically integrated battery anode material operation in South Australia that combines a mining operation at Renascor's 100%-owned Siviour Graphite Project with a downstream processing operation to produce PSG. See Figure 1 and Renascor ASX announcement dated 1 July 2020.

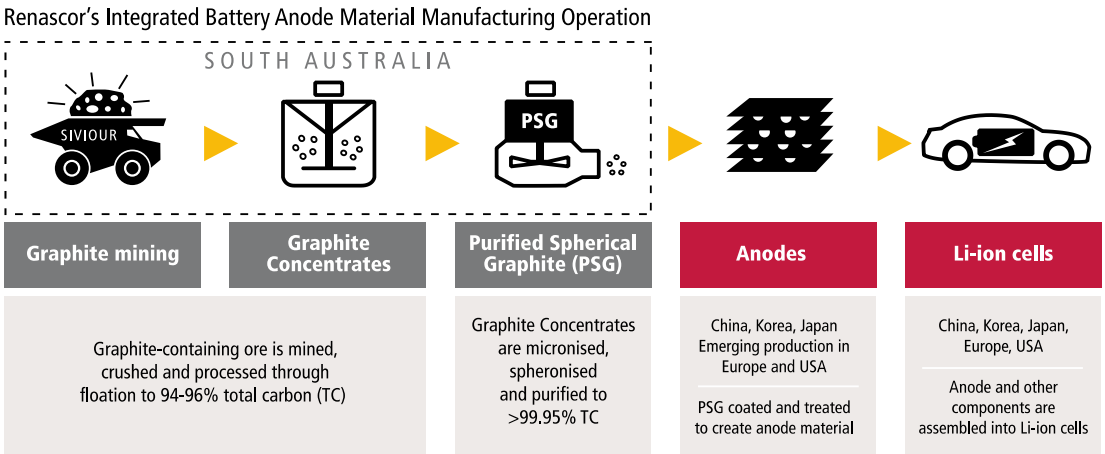

Figure 1. Graphite to anode supply chain, showing activities included in Renascor's proposed integrated Battery Anode Material manufacturing operation

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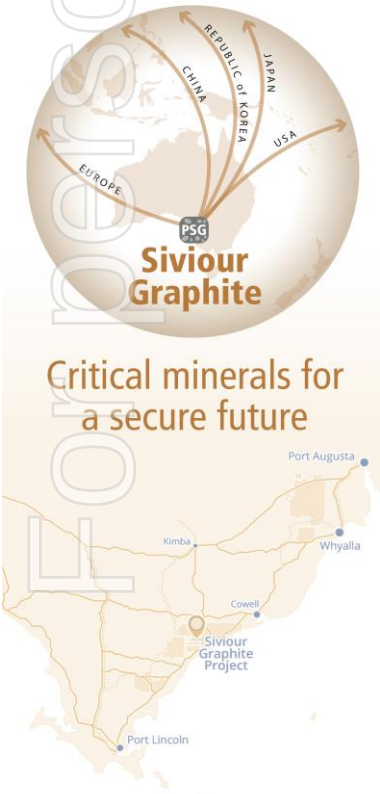

Silicon-enhanced anodes

While graphite is the predominant battery anode mineral for lithium-ion batteries, a range of technologies are being developed to enhance graphite anode's performance by adding silicon (or silicon oxide).

Silicon offers significant potential to improve anode performance because it has a greater capacity to host lithium ions than the carbon atoms in graphite.

Within a lithium-ion battery, when the battery is charged, lithium ions move from the cathode to the anode. See Figure 2. The capacity of an anode to hold a charge is determined by the number of ions the anode can host. If the anode can store more ions, its energy capacity increases, permitting the battery to run longer.

It takes six atoms of carbon to store one lithium ion, whereas one atom of silicon can host four lithium ions. Accordingly, the addition of silicon offers the potential to significantly improve energy density and increase the energy storage capacity of batteries.

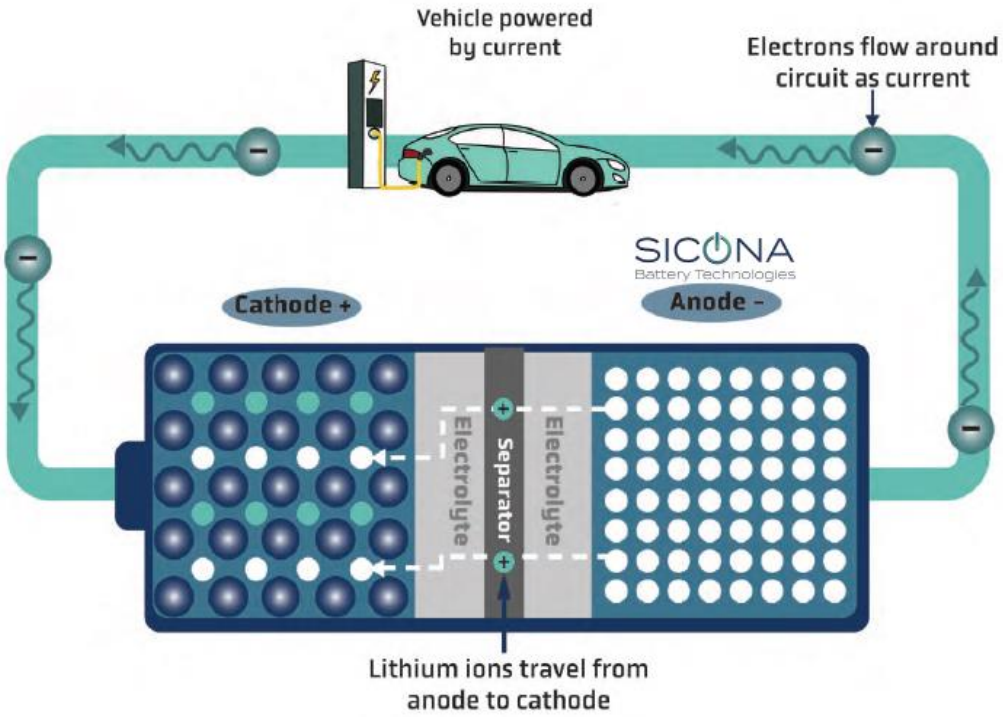

Figure 2. Schematic of electric vehicle battery

However, the enhancement of graphite anodes with silicon also presents design challenges compared to graphite-only anodes since silicon expands and contracts dramatically during each cycle of charging and discharging of the battery. The extra lithium ions that can be stored in silicon anodes cause the silicon to physically swell, with repeated swelling and shrinking increasing the likelihood of battery failure after a limited number of charging/discharging cycles.

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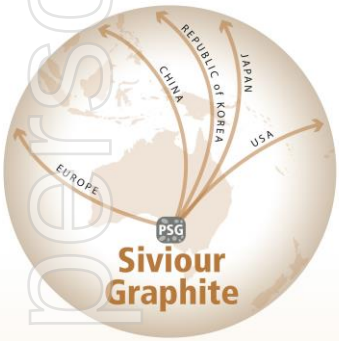

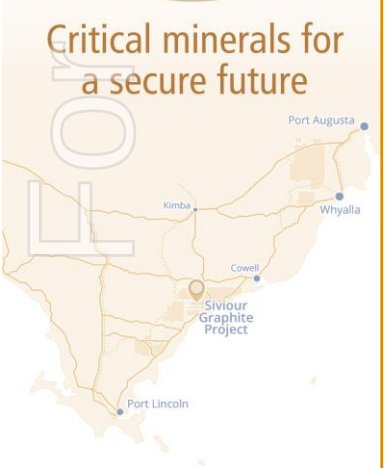

As a result, anode companies are researching effective ways to control swelling by adding controlled amounts of silicon into graphite anodes in ways that provide the added capacity benefit of silicon, while overcoming expansion issues.

Sicona is developing a technology that mitigates these issues through the production of anodes containing secondary silicon nanoparticles, which increase both the energy density and electrical efficiency of the anode, and through the use of a special elastic polymer binder that avoids the expansion and subsequent mechanical stability issues associated with high-silicon containing anodes.

Renascor and Sicona entered into a non-binding memorandum of understanding to jointly develop battery anode material using Renascor's Siviour PSG and Sicona's next generation battery technology. See Renascor ASX Announcement dated 18 December 2019.

Silicon-anode test program using Renascor's Siviour PSG

Renascor recently completed a test program with Sicona designed to assess the performance of silicon-composite anodes manufacutered with Siviour PSG.

The testing was an initial, unoptimised trial of silicon-enhanced anodes produced with Siviour PSG and was designed to assess initial discharge capacity, a key anode performance metric that measures the capacity of the anode to host lithium-ions.

It is important to note these tests were a preliminary trial, designed to test initial discharge capacity, as a key performance metric of lithium-ion battery anodes. The tests did not adopt optimised anode manufacturing conditions, including the use of multifunctional binders, optimised electrolyte and typical additives that would be expected to improve battery performance.

The tests were conducted by Sicona at the Australian Institute for Innovative Materials (**AIIM**) at the University of Wollongong using active anode materials produced with Sicona's proprietary silicon-composite production process. CR2032 coin cells were prepared using 80% w/w active material, 10% w/w binder material and 10% w/w conductive material, a standard formulation for half coin cell testing at research institutions globally.

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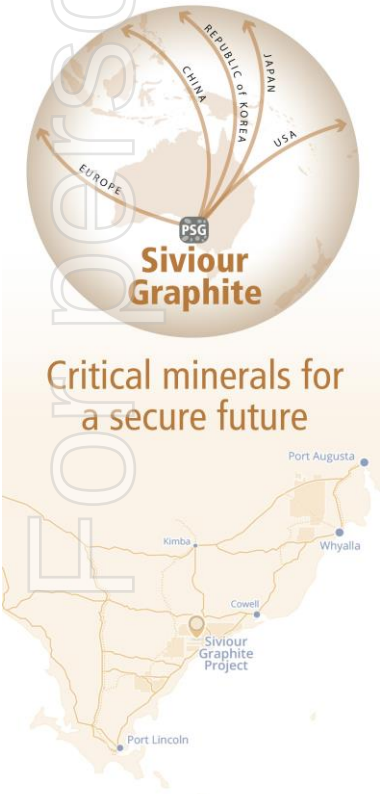

As shown in Table 1, the results of the tests demonstrated the potential to achieve significant improvements in performance. Silicon-enhanced anodes produced with Siviour PSG returned significantly higher initial discharge capacity than graphite-only anodes.

Anode Type	Silicon-enhancement	Initial discharge capacity (mAh/g)[1]	Improvement in initial discharge capacity over graphite-only anodes	
			Natural graphite anodes[2]	Synthetic graphite anodes[3]
Sicona Si-4	4% w/w	557	+53%	+56%
Sicona Si-8	8% w/w	644	+77%	+81%

Table 1. Results of silicon-enhancement trials

Additionally, silicon-composite anodes produced with Siviour PSG met or exceeded all reference natural graphite previously tested by Sicona, a result attributable by Sicona to the favourable crystallinity, uniformity and surface area of Siviour PSG.

Significance

The test results are significant because they confirm the suitability for Siviour PSG to be used with emerging silicon composite technology, which is becoming an increasingly important field in lithium-battery development.

The results also suggest that Siviour PSG has favourable crystallinity, uniformity and surface area, characteristics that are critical in achieving good lithium-ion battery anode performance in both conventional and silicon composite anodes.

The results further build upon Renascor's earlier test work that has returned similarly positive battery performance results using Siviour PSG in conventional electric vehicle battery anodes. See Renascor ASX announcement dated 17 April 2018.

Next steps

As a result of these positive preliminary results, Renascor and Sicona will proceed to more extensive coin cell tests designed to further validate the viability of using Siviour PSG in Sicona's silicon-enhanced anodes with Siviour PSG, to be followed by a commercial trial at Sicona's planned pilot production plant in Wollongong, New South Wales.

Bibliography

1. Renascor ASX announcement dated 17 April 2018, "Battery Anode Material Successfully Produced from Siviour"

[1] Milliamphere hours per gram.
[2] While theoretical maximum capacity of natural graphite is 372 mAh/g, commercially available natural graphite anodes generally achieve initial discharge capacities of up to 363 mAh/g.
[3] Most commercially available synthetic graphite reach levels of 350 to 355 mAh/g.

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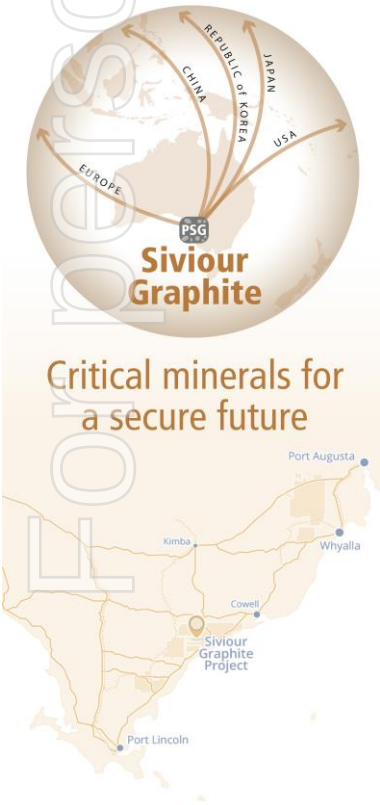

2. Renascor ASX announcement dated 18 December 2019, "Joint Development Agreement with Battery Anode Company"
3. Renascor ASX announcement dated 1 July 2020, "RNU Announces Battery Anode Material Manufacturing Operation"

Renascor confirms that it is not aware of any new information or data that materially affects the information included in the original market announcements and that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. Renascor confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.

This report may contain forward-looking statements. Any forward-looking statements reflect management's current beliefs based on information currently available to management and are based on what management believes to be reasonable assumptions. It should be noted that a number of factors could cause actual results, or expectations to differ materially from the results expressed or implied in the forward-looking statements.

This ASX announcement has been approved by Renascor's Board of Directors and authorised for release by Renascor's Managing Director David Christensen.

About Renascor

Renascor Resources is an Australian-based company focused on the discovery and development of viable mineral deposits. Renascor has an extensive tenement portfolio in South Australia, including our flagship project, the Siviour Battery Anode Material Project.

About Sicona

Sicona is a Sydney-based battery technology company developing next generation battery technology used in lithium-ion battery anodes, including an innovative silicon-composite battery anode and binder technology, developed and perfected over the last ten years at the Australian Institute for Innovative Materials. See www.siconabattery.com.

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