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Lithium Australia to pilot test its LieNA® spodumene conversion process

HIGHLIGHTS

- **Lithium Australia's LieNA® pilot plant given the green light.**
- **Pilot concentrate being prepared from spodumene-bearing drill chips.**
- **Construction of critical pilot-plant components has begun, with order for autoclave placed.**
- **Initial pilot-plant test run scheduled for September 2021.**
- **Programme to be completed with a pre-feasibility study of the LieNA® process.**

Comment from Lithium Australia MD Adrian Griffin

"Lithium Australia's LieNA® technology is the pinnacle for hydrometallurgical processing of spodumene, the principal hard-rock source of lithium. LieNA® is capable of recovering lithium from fine and/or contaminated spodumene that fails to meet the feed specifications of current converters. It also provides the highest levels of impurity rejection. It is these characteristics that set it apart. LieNA®, then, is designed to improve overall recovery and achieve better utilisation of existing resources: it's about cost reduction, sustainability and maximising the benefit of our critical (and finite) resources."

Introduction

Conventional processes to recover lithium from spodumene (the principal ore of lithium) involve roasting as a first step. As implemented by currently operating converters, such processes are critically sensitive to particle size (fine particles cannot be processed) and also sensitive to impurities. It is the physical properties of spodumene (its two perfect cleavages, among others) that result in the generation of large volumes of fine material during the recovery of lithium to concentrate. Any fine material that falls below the size specification of commercial converters **cannot** be used as feed and is thus rejected, resulting in less-than-optimal recoveries.

Currently, when spodumene ore is converted to commercial concentrates, somewhere between 25 and 50% of the lithium within the ore fed to the concentrator is lost. This leads to mining costs that are unnecessarily high and hence the higher-than-optimal cost of the lithium chemicals produced.

The revolutionary LieNA® hydrometallurgical process developed by Lithium Australia NL (ASX: LIT, 'the Company') is in stark contrast to those used by conventional converters, given that LieNA® requires no roasting, is capable of handling very fine spodumene particles and exhibits superior impurity rejection during the lithium recovery process.

Being able to process fine/contaminated spodumene efficiently potentially removes one area of low recovery inherent in the lithium industry. LieNA® is designed to remedy such loss and thus reduce the mining costs associated with lithium chemical production. In so

doing, it could extend the life of existing and future resources, a goal the mining industry should be striving for.

Government support

As announced on 13 February 2020, the Company was awarded a grant under the Australian federal government's CRC-P (Co-operative Research Centre Projects) initiative, to support the next stage of its $3.6 million research and development ('R&D') programme for the recovery of lithium from spodumene using LieNA®. Much of the preparatory work has now been completed, including collection of an initial test sample recovered from drill chips (Figure 1) and bench-scale test work (Figure 2) to characterise the flotation conditions required for pilot-plant production of concentrates from the drill chip sample, optimise caustic conversion conditions and confirm the final autoclave design specification.

The advent of COVID-19 in 2020 made operation of the pilot plant impractical, but with Australia's internal travel restrictions now lifted the programme has been reinvigorated. R&D testing of the first concentrates is scheduled to commence in September 2021.

Figure 1. Initial sample of spodumene-bearing drill chips for testing.

Figure 2. Bench-scale concentrate recovery.

The LieNA® process

LieNA® is a caustic conversion technology with strong parallels to the production of alumina from bauxite. The digestion process, undertaken in sodium hydroxide at elevated temperature and pressure, invokes a phase change from spodumene to sodalite; impurities are rejected and a product from which lithium is readily leached is created (see diagram next page).

The LieNA® process can produce a range of lithium chemicals, including hydroxide, carbonate and phosphate. Lithium phosphate is the preferred product, as it is easy to refine, commands a price premium over hydroxide or carbonate and is the ideal precursor to the production of lithium ferro phosphate ('LFP') batteries. LFP is a safe, low-cost type of lithium-ion battery ('LIB') and, as such, comprises the fastest growing sector within the LIB market. Factors that include safety, quality, longevity and cost are what is driving the dominance of LFP, in not just energy storage applications but also electric vehicles, among them two- and three-wheelers, cars, trucks, buses and trains.

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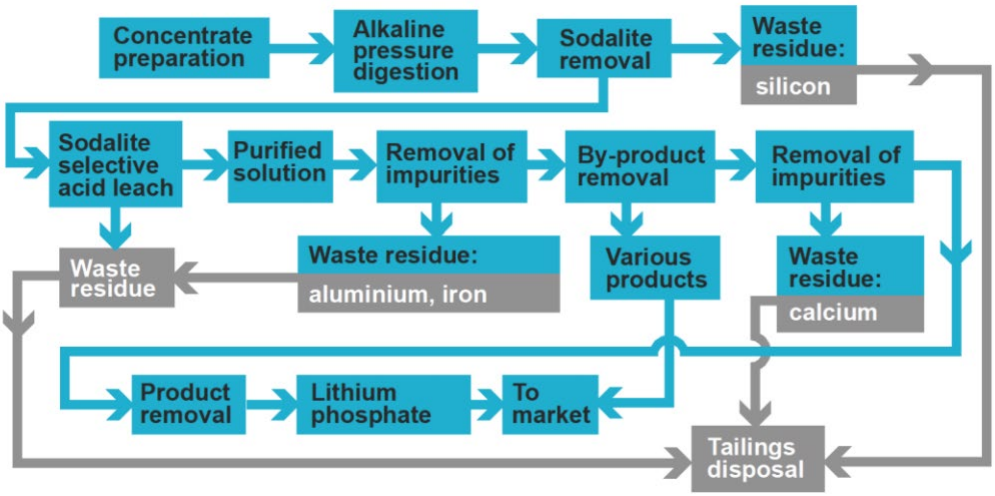

LieNA® test programme

Construction of a bespoke autoclave – designed specifically for the elevated temperature and pressure conditions of the caustic slurry inherent to the LieNA® process – has been the rate-constraining step in establishing the pilot plant. However, autoclave construction is now underway, with plans for fabrication of the rest of the plant well-advanced at the facilities of Australia's Nuclear Science and Technology Organisation ('ANSTO'), located at Lucas Heights in New South Wales.

The LieNA® test programme is designed to:

- assess the veracity of the LieNA® process on a semi-continuous basis;
- evaluate the quality of the lithium chemicals produced;
- produce LFP battery cells, which can then be tested to assess the electrochemical properties of the lithium chemicals produced;
- characterise the nature of the waste materials produced and their further application;
- establish performance criteria for further design studies, and
- provide the required inputs for a pre-feasibility study.

LieNA® patent protection

On 6 April 2020 the Company announced the grant of an Australian patent for the LieNA® process, with a priority date of 2 August 2016. International patents are pending.

LieNA® test partners

A bulk sample of spodumene-bearing pegmatite was provided by Essential Metals Limited (ASX: ESS, previously Pioneer Resources Ltd). That sample will be processed by ALS Metallurgy Pty Ltd, to provide concentrate feed for at least one pilot-plant run of approximately 7 days' duration. Meanwhile, alternative sources of samples are being evaluated, in order to secure a broader range of feed materials.

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ANSTO will construct and operate the LieNA® pilot plant, with Murdoch University, Curtin University and Carnac Project Delivery Services offering specialised input into the project.

The lithium chemicals produced at the pilot plant will be sent to the Company's wholly owned subsidiary VSPC Ltd ('VSPC'), where they will be used to generate cathode powders and LFP coin-cell LIBs. These will be tested and their performance compared in relation to VSPC benchmarks, as well as that of other commercially available materials.

Conclusion

The aim of running a semi-continuous LieNA® processing circuit and taking the product right through to the production of LFP coin cells for electrochemical testing is to demonstrate the ability to reduce the number of steps involved in the supply chain. This would be a significant achievement, with success paving the way for better resource utilisation and a more direct route to the production of LFP LIBs ... which would benefit consumers and the environment alike.

Authorised for release by the Board.

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About Lithium Australia NL

Lithium Australia aims to ensure an ethical and sustainable supply of energy metals to the battery industry (enhancing energy security in the process) by creating a circular battery economy. The recycling of spent LIBs to create new batteries is intrinsic to this plan. While it continues to rationalise its portfolio of lithium projects/alliances, Company R&D involving its proprietary extraction processes for the conversion of *all* lithium silicates (including mine waste), and of unused fines from spodumene processing, to lithium chemicals is ongoing. Using those lithium chemicals, the Company plans to produce advanced components for the battery industry globally and for stationary energy storage systems within Australia. By uniting resources and innovation, Lithium Australia seeks to vertically integrate lithium extraction, processing and recycling to achieve a more sustainable industry overall.

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