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Lithium Australia subsidiary VSPC further reduces cathode material costs

HIGHLIGHTS

- **VSPC Ltd ('VSPC') has produced high-purity, battery-grade iron oxalate made from various iron sources.**
  - **Up to 10% savings in chemical costs for the manufacture of lithium ferro phosphate ('LFP') cathode powder.**
- **Excellent electrochemical performance of the LFP produced from VSPC's battery-grade iron oxalate**
  - **Equivalent to LFP created using commercial iron oxalate.**
- **VSPC's final laboratory synthesis trials with lithium phosphate have further validated reduced-cost process route.**
- **Planning for pilot-plant-scale manufacture of LFP using lithium phosphate and testing of that LFP in commercial format lithium-ion batteries planned.**

VSPC has recently completed successful trials for the production of lithium ion battery ('LIB') cathode precursors from various, low-cost, iron sources.

Lithium Australia managing director, Adrian Griffin, commented:

> ***"Safety, cost and performance will be the drivers for the lithium ion batteries of the future and we are already witnessing a significant shift in the direction of LFP to optimize those important characteristics.***
>
> ***The ability to utilize low-cost feed materials for the production of LFP batteries puts Australia one step closer to becoming a competitive location for battery production. The programme, which is co-funded by the Australian Manufacturing Growth Centre, augments VSPC's achievements in the production of high-capacity LFP derivatives which provide the potential for far greater safety while maintaining energy densities comparable with more common lithium ion battery chemistries."***

Background

VSPC is a 100%-owned subsidiary of Lithium Australia NL (ASX: LIT, 'the Company'). In October 2019, at its Brisbane research and development facility, VSPC initiated a project to explore low-cost raw-material options for its proprietary process for cathode material synthesis. The project is co-funded by the AMGC (Australian Manufacturing Growth Centre) (see ASX announcement dated 23 January 2020), a not-for-profit organisation established by the Australian federal government to support the development of world-leading advanced manufacturing within Australia.

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Project objectives include the following.

- Demonstrate the technical feasibility of producing advanced LFP cathode material via an optimised process that, significantly, uses less chemical reagents.
- Evaluate the techno-economic feasibility of LFP synthesis using lower-cost raw materials such as iron sulphate, iron oxides and lithium phosphate derived from several sources, among them:
    - mixed metal dust derived from spent lithium-ion batteries by 90% Company-owned subsidiary Envirostream Australia Pty Ltd, a mixed-battery recycling entity located in Melbourne, Victoria.
    - the Company's patented SiLeach® process (which targets lepidolite); and
    - the Company's LieNA® process (which targets fine and/or low-grade spodumene).

Stage 3 outcomes

With stage 3 of its programme now complete, VSPC is pleased to confirm the following.

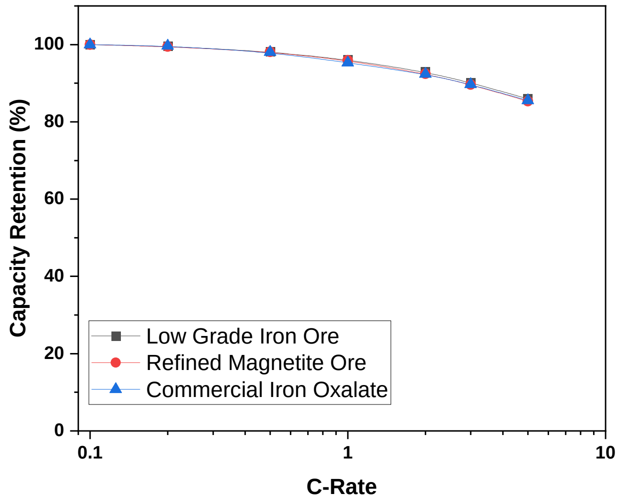
- A new process for the production of high-purity, battery-grade iron oxalate has been developed and demonstrated at laboratory scale, using an optimised acid digestion of low-cost iron ore, including haematite and magnetite, as well as synthetic iron oxides.
- Cost-modelling of the new process suggests that a net reduction of 5-10% in the cost of LFP chemical inputs can be achieved via in-house iron-oxalate production. This confirms VSPC's initial cost estimates from stage 2.
- The process, which has produced battery-grade iron oxalate from a variety of iron sources including iron ores and industrial waste products with widely varying impurity levels (between 5% and 20%), has been highly effective in eliminating the impurities, as shown in the table below. This is significant, as it indicates that iron streams of variable quality, including iron-rich waste from several industrial sources, can be used as feed for the process.
- The process is cost-efficient in terms of its utilisation of low-cost iron oxides and complete usage of acid reagents. Other processes, such as the synthesis of iron oxalate from iron sulphate, incur costs related to the disposal of waste acid.

	Low-grade iron ore		Refined magnetite ore	
Type of impurity	Impurities in ore as received (%)	Impurities in iron oxalate (%)	Impurities in ore as received (%)	Impurities in iron oxalate (%)
SiO_2	12.75	<0.01	1.92	<0.01
Al_2O_3	4.56	0.05	2.12	0.04
CaO	1.06	0.02	0.29	<0.01
MgO	1.71	0.08	0.05	<0.01
Na_2O	0.02	<0.01	<0.01	<0.01
K_2O	0.35	<0.01	<0.01	<0.01

Cr_2O_3	0.003	<0.002	0.008	0.002
TiO_2	0.18	0.01	0.04	<0.01
MnO	0.51	0.06	0.03	<0.01
P_2O_5	0.04	<0.01	0.07	<0.01
SrO	0.02	<0.01	0.01	0.01
BaO	0.02	<0.01	<0.01	<0.01

LFP cathode material quality

LFP produced using high-purity iron oxalate derived from VSPC's new process exhibited electrochemical performance equivalent to that of LFP produced using commercial battery-grade iron oxalate, as indicated by the rate retention curves shown in the graph below.



Next steps

This project has now advanced to stage 4, with work on process refinements and scale-up ongoing.

- Laboratory experiments to optimise the iron source, acid/reagent consumption and process conditions will continue, the aim being to maximise both recovery and iron-oxalate quality while minimising manufacturing costs. The work will include synthesising iron oxalate from iron-rich waste streams.
- Pilot-scale manufacture of iron oxalate from iron ores and iron-rich wastes will also continue, with the iron oxalate used to manufacture LFP for testing in commercial format lithium-ion batteries.
- Stage 4 will also include pilot-scale manufacture of LFP using lithium phosphate as an alternative to lithium carbonate; the former is expected to provide a lower-cost raw material option in the future.

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 old lithium-ion batteries to new is intrinsic to this plan. While rationalising its portfolio of lithium projects/alliances, the Company continues with R&D on its proprietary extraction processes for the conversion of *all* lithium silicates (including mine waste), and of unused fines from spodumene processing, to lithium chemicals. From those chemicals, Lithium Australia plans to produce advanced components for the battery industry globally, and for stationary energy storage systems within Australia. By uniting resources and innovation, the Company seeks to vertically integrate lithium extraction, processing and recycling.

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