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25 November 2021

ALTECH – BREAKTHROUGH 30% HIGHER ENERGY DENSITY ANODE ACHIEVED IN LITHIUM-ION BATTERY

Highlights

- Research team cracks the *"silicon barrier"*
- Lithium-ion battery anode material with 30% higher energy retention and capacity
- Altech's innovative and proprietary technology
- Composite silicon and graphite anode material
- Stable battery with sound cycling performance
- Phase 2 R&D will strive to attain capacity retention beyond the current 30%

Altech Chemicals Limited (Altech/the Company) (ASX: ATC) (FRA: A3Y) is delighted to announce a significant breakthrough in lithium-ion battery technology by its research and development laboratory in Perth, Western Australia.

After almost 12 months of challenging work, Altech has finally *"cracked the silicon barrier"* and successfully produced and tested a series of lithium-ion battery anode materials that have ~30% higher retention capacity compared to conventional lithium-ion battery anode materials. To achieve its breakthrough, Altech successfully combined silicon particles that had been treated with its innovative proprietary technology, with regular battery grade graphite to produce a lithium-ion battery electrode containing a composite graphite / silicon anode. When energised, these materials held 30% more capacity compared to a conventional graphite only anode material. The materials were then subjected to a series of tests over a period of time, including charge and discharge cycling. From laboratory testing, the previously unresolved impediments for using silicon in lithium-ion battery anodes which are: silicon particle swelling; prohibitive first-cycle-capacity-loss of up to 50%; and rapid battery degradation, appeared to have been substantially overcome during Altech's testing of the composite graphite/silicon batteries.

The lithium-ion battery industry has declared that the required step change to increase lithium-ion battery energy density and reduced costs is to introduce silicon in battery anodes, as silicon has ~ ten times the energy retention capacity compared to graphite. Silicon metal is identified as the most promising anode material for the next generation of lithium-ion batteries. However, until now silicon was unable to be used in commercial lithium-ion batteries due to two critical drawbacks. Firstly, silicon particles expand by up to 300% in volume during battery charge, causing particle swelling, fracturing and ultimately battery failure. The second challenge is that silicon deactivates a high percentage of the lithium ions in a battery. Lithium ions are rendered inactive by the silicon, immediately reducing battery performance and life. Industry has been in a race to crack the silicon barrier.

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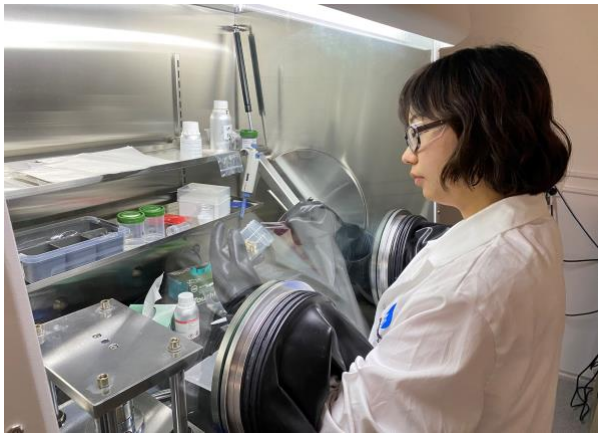
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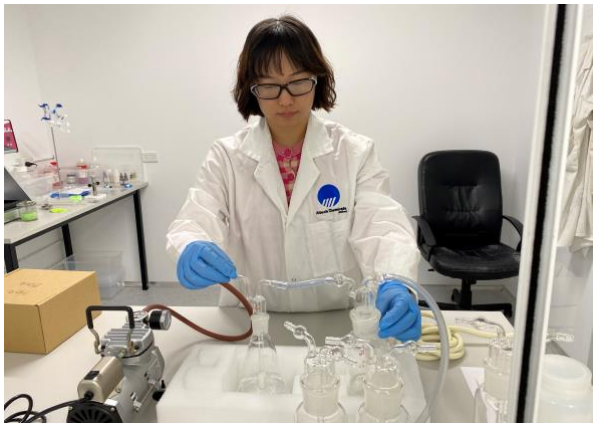
Altech's potentially game changing technology has demonstrated that silicon particles can be modified to resolve the capacity fading caused by both the swelling and first-cycle-capacity-loss problems. After almost 12 months of extensive research, development and trials at its laboratory in Perth, Western Australia, the Altech Research & Development team headed by Dr Jingyuan Liu has finally cracked the silicon problem.

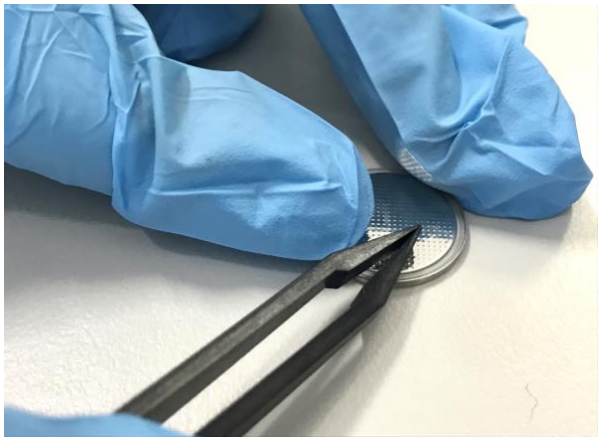
In a series of tests, the Altech lithium-ion battery anode material averaged energy retention capacity of ~430 mAh/g compared to a normal lithium-ion battery anode at around 330 mAh/g, being 30% higher. Importantly, the Altech batteries demonstrated good stability and cycling performance.

Managing director, Iggy Tan said that "*this major achievement is not just a significant breakthrough for Altech, but also for the lithium-ion battery industry generally. Especially so given the 2020 public statement by US electric vehicle manufacturer Tesla, which said that its aim is to increase the amount of silicon in its batteries to achieve step-change improvements in energy density and battery life. A 30% higher energy capacity lithium-ion battery would translate not just to significant cost benefits, but also to potentially increased range for electric vehicles. Phase 2 of Altech's planned research and development program will see the Company strive in improve on the 30% energy increase, and could include the assembly of a pilot plant for production of the composite material in greater volume. In terms of potential commercialisation of its technology, the Company's 75% owned subsidiary Altech Industries Germany GmbH has already commenced a pre-feasibility study for construction of a 10,000tpa battery materials plant in Saxony, Germany to service the burgeoning European lithium-ion battery market*".

An interview with managing director Iggy Tan, explaining this exciting development for Altech is available for viewing on: https://www.altechchemicals.com/content/market-herald-interview-november-2021









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About Altech Chemicals (ASX:ATC) (FRA:A3Y)



Altech Chemicals Limited (ASX: ATC, "Altech" or "Company") is a specialty alumina technology and production company that has finalised Stage 1 and Stage 2 construction of its high purity alumina (HPA) plant in Johor, Malaysia, and continues with innovative research and development of its downstream alumina coating technology used to improve the battery life and performance in lithium-ion batteries. Altech's alumina coating technology is successful on both silicon and graphite particles, typical of those used in the anode of lithium-ion batteries, particularly within the burgeoning electric vehicle industry.

The Company has commenced a preliminary feasibility study (PFS) for the construction of a high purity alumina (HPA) battery materials coating plant in Saxony, Germany. The PFS is being undertaken by Altech's 75% owned German subsidiary, Altech Industries Germany GmbH (AIG). Work on the preliminary engineering design for the 10,000 tpa battery materials plant is in the final stages of completion. Altech has also commenced the green accreditation of the environmental credentials of the battery materials process.

Altech is further aiming to become one of the world's leading suppliers of 99.99% (4N) high purity alumina (Al_2O_3) through the construction and operation of a 4,500tpa high purity alumina (HPA) processing plant at Johor, Malaysia. Feedstock for the plant will be sourced from the Company's 100%-owned near surface kaolin deposit at Meckering, Western Australia and shipped to Malaysia.

HPA is a high-value, high-margin and highly demanded product as it is the critical ingredient required for the production of synthetic sapphire. Synthetic sapphire is used in the manufacture of substrates for LED lights, semiconductor wafers used in the electronics industry, and scratch-resistant sapphire glass used for wristwatch faces, optical windows and smartphone components. Increasingly, HPA is used by lithium-ion battery manufacturers as the coating on the battery's separator, which improves performance, longevity and safety of the battery. With global HPA demand approximately 19,000t (2018), it is estimated that this demand will grow at a compound annual growth rate (CAGR) of 30% (2018-2028); by 2028 HPA market demand is forecast to be approximately 272,000t, driven by the increasing adoption of LEDs worldwide as well as the demand for HPA by lithium-ion battery manufacturers to serve the surging electric vehicle market.

German engineering firm SMS group GmbH (SMS) is the appointed EPC contractor for construction of Altech's Malaysian HPA plant. SMS has provided a USD280 million fixed price turnkey contract and has proposed clear and concise guarantees to Altech for plant throughput and completion. Altech has executed an off-take sales arrangement with Mitsubishi Corporation's Australian subsidiary, Mitsubishi Australia Ltd (Mitsubishi) covering the first 10-years of HPA production from the plant.

Conservative (bank case) cash flow modelling of the HPA plant shows a pre-tax net present value of USD505.6million at a discount rate of 7.5%. The project generates annual average net free cash of ~USD76million at full production (allowing for sustaining capital and before debt servicing and tax), with an attractive margin on HPA sales of ~63%. (Refer to ASX Announcement *"Positive Final Investment Decision Study for 4,500TPA HPA project"* dated 23 October 2017 for complete details. The Company confirms that as at the date of this announcement there are no material changes to the key assumptions adopted in the study).

The Company has been successful in securing senior project debt finance of USD190 million from German government owned KfW IPEX-Bank as senior lender. Stage 1 and Stage 2 early works construction has been completed on time and on budget.

Forward-looking Statements

This announcement contains forward-looking statements which are identified by words such as 'anticipates', 'forecasts', 'may', 'will', 'could', 'believes', 'estimates', 'targets', 'expects', 'plan' or 'intends' and other similar words that involve risks and uncertainties. Indications of, and guidelines or outlook on, future earnings, distributions or financial position or performance and targets, estimates and assumptions in respect of production, prices, operating costs, results, capital expenditures, reserves and resources are also forward-looking statements. These statements are based on an assessment of present economic and operating conditions, and on a number of assumptions and estimates regarding future events and actions that, while considered reasonable as at the date of this announcement and are expected to take place, are inherently subject to significant technical, business, economic, competitive, political and social uncertainties and contingencies. Such forward-looking statements are not guarantees of future performance and involve known and unknown risks, uncertainties, assumptions and other important factors, many of which are beyond the control of the Company, the directors and management. We cannot and do not give any assurance that the results, performance or achievements expressed or implied by the forward-looking statements contained in this announcement will actually occur and readers are cautioned not to place undue reliance on these forward-looking statements. These forward-looking statements are subject to various risk factors that could cause actual events or results to differ materially from the events or results estimated, expressed or anticipated in these statements.

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