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ALTECH – BREAKTHROUGH 55% HIGHER ENERGY DENSITY ANODE ACHIEVED IN SILUMINA ANODES™ LITHIUM-ION BATTERY

Highlights

- Altech achieves 55% surge in energy capacity in Li-ion batteries
- Average energy retention capacity of approximately 500 mAh/g
- Stable battery with sound cycling performance
- Follows Altech previously cracking the “silicon barrier” by achieving 30% energy increase
- Dispersion challenges limited further improvements
- Persistent R&D has now resolved these challenges
- Altech aims to revolutionise the Lithium-ion battery industry

Altech Batteries Limited (ASX: ATC, FRA: A3Y) has achieved a remarkable milestone in its Silumina Anodes™ battery material technology. The Company is delighted to announce an average 55% surge in lithium battery anode energy capacity, marking a significant breakthrough. By utilising its innovative proprietary technology, Altech has now improved on the previous 30% energy increase, by blending alumina-coated silicon particles (10%) with battery-grade graphite, to create a composite graphite/silicon anode for the lithium-ion battery electrode. Upon activation, this composite material has now exhibited a remarkable 55% increase in capacity compared to the traditional graphite-only anode material, See Figure 1.

In a series of tests, the Altech lithium-ion battery anode material exhibited an average energy retention capacity of approximately 500 mAh/g, which is significantly higher than the average of approximately 320 mAh/g for a normal lithium-ion battery anode. This represents an average of 55% increase in energy retention capacity. Importantly, the Altech batteries demonstrated good stability and cycling performance, indicating that the technology is highly promising. Altech's technology has the potential to be game-changing and has demonstrated that silicon particles can be modified to resolve the capacity fading caused by both the swelling and first-cycle-capacity-loss problems. Altech's Research and Development team, led by Dr. Jingyuan Liu, achieved this significant breakthrough.

Watch Interview with Dr Jingyuan Liu

<https://youtu.be/N9L5-Nr4T5w>



Altech had previously declared a major achievement in the field of battery technology. The Company reported that it had overcome the "silicon barrier" and had manufactured and evaluated a range of lithium-ion battery anode materials that exhibit a retention capacity of approximately 30% higher than the standard lithium-ion battery anode materials. Following this breakthrough, Altech's research and development laboratory in Perth, Western Australia has been striving to further enhance the technology beyond this initial success.

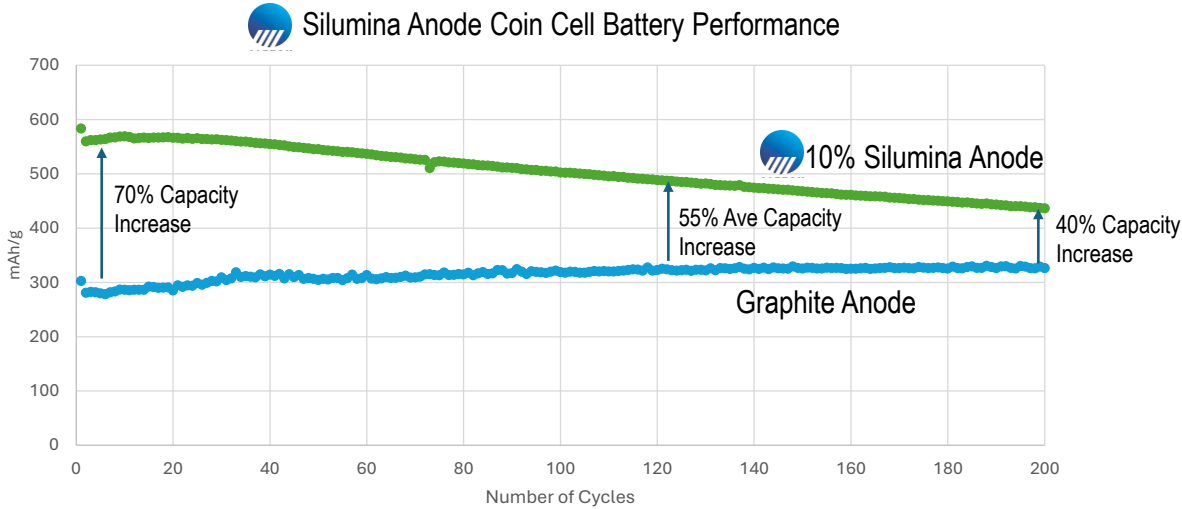


Figure 1 – Coin Half Cell Battery Performance Tests Using 10% Silumina Anode Product

As the Company endeavoured to surpass the 30% retention capacity achieved in the previous generation of batteries by increasing the silicon content, it encountered challenges in dispersing the alumina-coated silicon particles. However, Altech managed to overcome these challenges by implementing improvements in organic binders, coating parameters, and several other innovative solutions. After persistent efforts, the final challenges were eventually resolved, allowing the Company to move forward with the development of the next generation of batteries.



Figure 2 – Altech Research and Development Facility, Perth Western Australia

Through laboratory testing of the composite graphite/silicon batteries, Altech was able to substantially overcome previously unresolved impediments associated with using silicon in lithium-ion battery anodes. These impediments include silicon particle swelling, first-cycle capacity loss of up to 50%, and rapid battery degradation. Altech's testing showed that the innovative composite graphite/silicon batteries were able to

overcome these challenges, by spherification of the silicon particles. The spherical structure allows the distribution of alumina-coated silicon in graphite voids, hence minimises the electrode layer damaging due to expansion, see Figure 3, and 4. By doing so, via the alumina coating, the negative impact caused by the expansion of silicon is well managed in a lithium-ion battery.

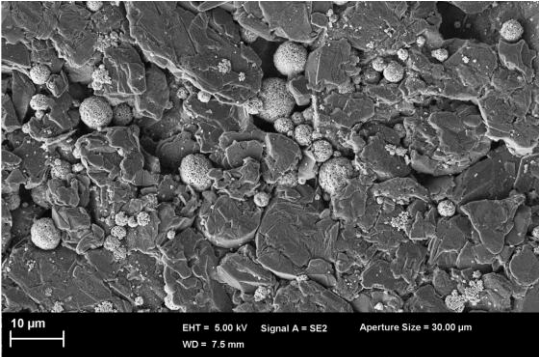
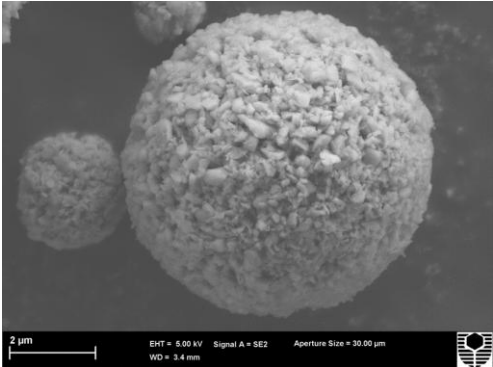


Figure 3 – SEM Image, An Alumina Treated Silicon Sphere Figure 4 – SEM Image, Silicon Sphere Distributed in Graphite Voids

The lithium-ion battery industry has recognised the introduction of silicon in battery anodes as a crucial step in achieving a significant increase in energy density, as well as reducing costs. This is because silicon has approximately ten times the energy retention capacity of graphite, making it an ideal anode material for the next generation of lithium-ion batteries. However, until now, the use of silicon in commercial lithium-ion batteries has been limited due to two critical drawbacks. Firstly, during battery charge, silicon particles expand by up to 300% in volume, leading to particle swelling, fracturing, and eventual battery failure. Secondly, silicon deactivates a high percentage of the lithium ions in a battery, immediately reducing battery performance and lifespan. The industry has been in a race to overcome these obstacles and crack the silicon barrier to unlock the full potential of silicon in lithium-ion batteries.





Figure 5 – Silumina Anode pilot plant in Dock 3, Schwarze Pumpe, Saxony

The Company completed a Definitive Feasibility Study for the construction of an 8,000tpa Silumina Anodes™ plant in Saxony, Germany, that included the following economics.

- Pre-tax NPV₁₀ €684 million
- Low capital cost of €112 million
- Attractive Internal Rate of Return of 34%
- EBITDA €105 million p.a.
- Payback (full rate) 2.4 years
- Revenue per annum of €328 million

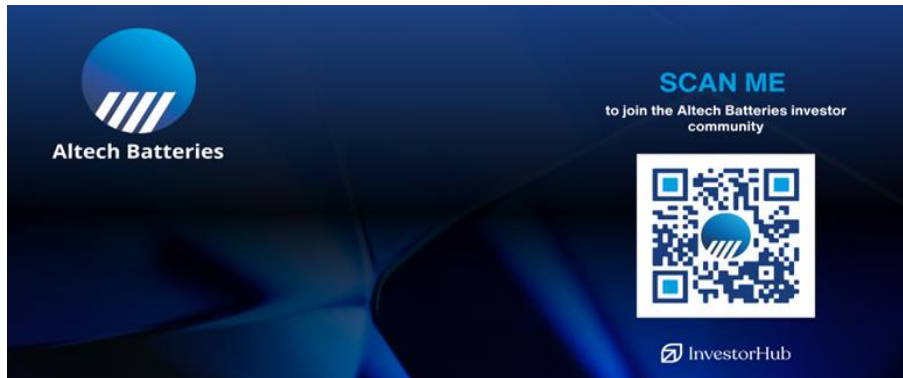
Altech is in a race to get its patented technology to market. To support the development, Altech has constructed a pilot plant adjacent to the proposed project site to enable the qualification process for its Silumina Anodes™ product. The Company has successfully completed the construction of the pilot plant and is now in the process of hot commissioning.

CEO and MD Mr Iggy Tan stated "*We are thrilled with the significant progress we have made in overcoming the critical challenges associated with using silicon in lithium-ion battery anodes. Our breakthrough technology represents a major step forward in unlocking the full potential of silicon in lithium-ion batteries, and we believe it has the potential to revolutionise the battery industry. We are currently commissioning a pilot plant to further scale up our technology and bring it to market.*"

Authorised by: Iggy Tan (Managing Director)

Altech Batteries Interactive Investor Hub

Altech's interactive Investor Hub is a dedicated channel where management interacts regularly with shareholders and investors who wish to stay up-to-date and to connect with the Altech Batteries leadership team. Sign on at our Investor Hub <https://investorhub.altechgroup.com> or alternatively, scan the QR code below.



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About Altech Batteries Ltd (ASX:ATC) (FRA:A3Y)

CERENERGY® Batteries Project

Altech Batteries Ltd is a specialty battery technology company that has a joint venture agreement with world leading German government battery institute Fraunhofer IKTS (“Fraunhofer”) to commercialise the revolutionary CERENERGY® Sodium Chloride Solid State (SCSS) Battery. CERENERGY® batteries are the game-changing alternative to lithium-ion batteries. CERENERGY® batteries are fire and explosion-proof; have a life span of more than 15 years and operate in extreme cold and desert climates. The battery technology uses table salt and is lithium-free; cobalt-free; graphite-free; and copper-free, eliminating exposure to critical metal price rises and supply chain concerns.

The joint venture is commercialising its CERENERGY® battery, with plans to construct a 120 MWh production facility on Altech’s land in Saxony, Germany. The facility intends to produce CERENERGY® battery modules to provide grid storage solutions to the market.



Silumina Anodes™ Battery Materials Project

Altech Batteries has licenced its proprietary high purity alumina coating technology to 75% owned subsidiary Altech Industries Germany GmbH (AIG), which has finalised a Definitive Feasibility Study to commercialise an 8,000tpa silicon alumina coating plant in the state of Saxony, Germany to supply its Silumina Anodes™ product to the burgeoning European electric vehicle market.

This Company’s game changing technology incorporates high-capacity silicon into lithium-ion batteries. Through in house R&D, the Company has cracked the “silicon code” and successfully achieved a 30% higher energy battery with improved cyclability or battery life. Higher density batteries result in smaller, lighter batteries and substantially less greenhouse gases, and is the future for the EV market. The Company’s proprietary silicon product is registered as Silumina Anodes™.

The Company is in the race to get its patented technology to market, and recently announced the results of a Definitive Feasibility Study for the construction of a 8,000tpa Silumina Anodes™ material plant at AIG’s 14-hectare industrial site within the Schwarze Pumpe Industrial Park in Saxony, Germany. The European silicon feedstock supply partner for this plant will be Ferroglobe. The project has also received green accreditation from the independent Norwegian Centre of International Climate and Environmental Research (CICERO). To support the development, AIG has commenced construction of a pilot plant adjacent to the proposed project site to allow the qualification process for its Silumina Anodes™ product. AIG has executed NDAs with German and North American automakers and battery material supply chain companies.

