Media Release
10 March 2021

Battery tests confirm graphite alumina coating technology - key to lithium-ion battery evolution

Ground breaking research that is poised to underpin a step-change in improved lithium-ion battery performance has just been announced by a small-cap Australian company – the coating of graphite particles with a nano layer of alumina. Specifically, the company has successfully applied an alumina coating to graphite particles that are designed for anode applications within lithium-ion batteries. Plus the company has also announced that is has completed a first phase of battery performance testing of its alumina coated graphite particles that has delivered very positive and encouraging results.

In December 2020, the company – Altech Chemicals Limited, announced the successful demonstration of its proprietary alumina coating technology. The demonstration showed that the company was able to deposit a uniform, consistent and extremely thin layer of alumina onto graphite particles typical of those used in the anode of lithium-ion batteries. The uniformity and consistency of an alumina layer deposited onto anode grade graphite particles is expected to be key to improving lithium-ion battery performance. Why? Because anodes coated with alumina performed much better than the non-coated anodes in a battery, specifically they reduce the rate at which lithium-ions become "trapped" during the battery charge and discharge cycle, thereby extending battery life.

A successful first round of battery testing was recently completed. A batch of battery electrodes were produced using non-coated standard anode grade graphite particles (the control), and a separate batch was produced that contained anode grade graphite particles coated with HPA using the company's technology. The company's general manager operations and chief scientist, Dr Jingyuan Liu was very encouraged by the initial phase of results "*we now have to optimise the testing conditions and conduct additional tests to demonstrate repeatability and consistency. The performance of the alumina coated graphite is meeting our expectations so far*", he said.

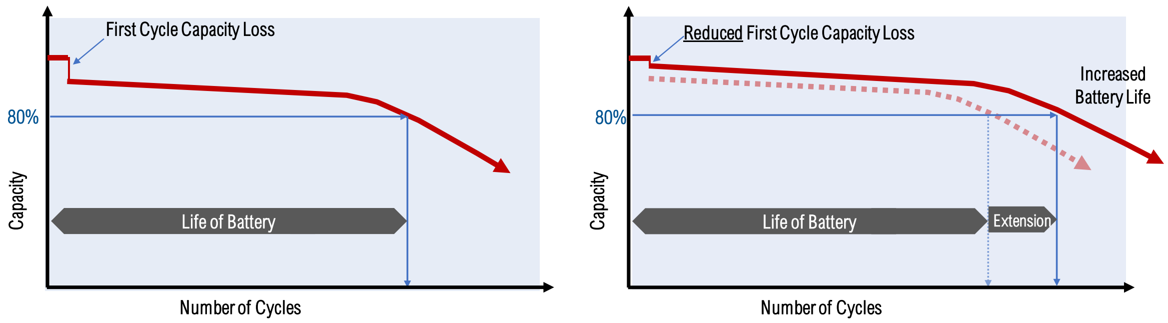
Test work will now proceed to the next stage where additional runs of battery charge and discharge will be undertaken with the aim of obtaining results that demonstrate repeatability and consistency.

Background

HPA is commonly applied as a coating on the separator sheets used within a lithium-ion battery, as alumina coated separators improve battery performance, durability and overall safety. However, there is an evolving use for alumina within the anode component of the lithium-ion battery because of the positive impacts that alumina coated graphite particles have on battery life and performance.

Lithium-ion battery anodes are typically composed of graphite. In a lithium-ion battery, lithium ion losses initially present as inactive layers that form during the very first battery charge cycle, the losses then compound with each subsequent battery usage cycle. Typically, around 8% of lithium ions are lost during the very first battery charge cycle. This "*first cycle capacity loss*" or "*first-cycle irreversibility*" is a long recognised but as yet poorly resolved limitation that has plagued rechargeable lithium-ion batteries. Figure 1 shows the potential increase in battery life if the *first cycle capacity loss* can be reduced or eliminated, thereby allowing more lithium ions to participate in ongoing operation of the battery.

Figure 1 – Illustration of potential impact of reduced *"first cycle capacity loss"*



First cycle capacity loss in a lithium-ion battery is because of the consumption of lithium ions within the battery during the initial battery charging cycle. This forms a layer of material on the anode termed a *"solid electrolyte interphase"* (SEI). Currently the graphite particles used in lithium-ion battery anodes are uncoated, however manufacturers are now seeking to coat anode graphite particles with a very thin layer of alumina. Tests have demonstrated that alumina coated graphite particles have the potential to reduce *first cycle capacity loss*. In turn, this innovation can measurably increase battery energy retention, extend battery life and improve overall battery performance.