Media Release
23 September 2020

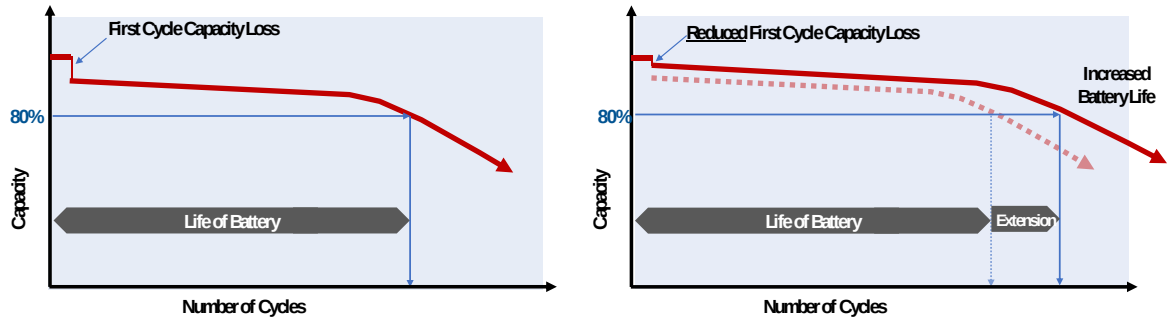
Alumina coated anodes propel lithium-ion batteries to next stage of evolution

Ground breaking research by an Australian high purity alumina company has identified a new alumina product and technology specifically designed for anode applications within lithium-ion batteries. If successful, the thin layer alumina coating of graphite particles used within the lithium-ion battery anode could be a game changer for the evolution of lithium-ion battery performance. Successful thin layer coating of alumina on anode graphite particles can measurably improve lithium-ion battery life, capacity and chargeability.

High purity alumina is commonly applied as 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 performance and life.

Lithium-ion battery anodes are typically composed of graphite. In a lithium-ion battery, lithium ion losses initially present as inactive layers of lithium ions that form during the very first battery charge cycle, but these losses then compound with each subsequent battery usage cycle. Typically, around 8% of lithium-ions are lost during the 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, and the problem is almost exclusively anode associated. Figure 1 shows the potential increase in battery life if the *first cycle capacity loss* can be reduced or eliminated, allowing more lithium ions to participate in the ongoing operation of the battery.

Figure 1 – Impact of reduced "first cycle capacity loss"

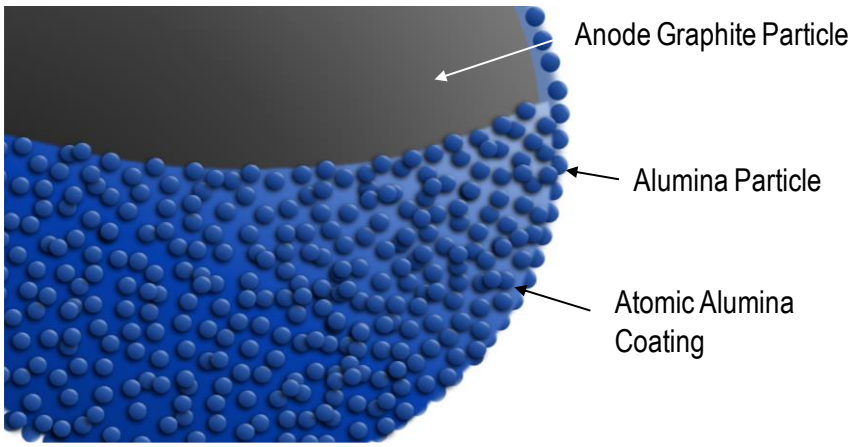


The *first cycle capacity loss* is because of the deposition of lithium ions onto battery anode graphite particles during the battery's initial charging cycle, which forms a layer termed a "solid electrolyte interphase" (SEI). Currently graphite particles used within a lithium-ion battery anode are uncoated, however manufactures are now seeking to coat anode graphite particles with a very thin layer of alumina. Although thin layer alumina coating is currently difficult to achieve, commercialising the process would represent a significant step in lithium-ion battery anode evolution as tests have demonstrated that alumina coated graphite particles have the potential to reduce the *first cycle capacity loss*. In turn, this innovation can measurably increase battery energy retention, extend battery life and improve overall battery performance.

As a result of ground-breaking research and development work led by Altech Chemicals' Dr. Jingyuan Liu, the Company believes that it has found a way to solve the problem – an efficient way of coating layers of alumina on the graphite anode particles. In addition, the use of sub-micron high purity alumina particles as part of the coating alumina is expected to improve Coulombic Efficiency (CE) (especially the CE in first cycle), cycling stability, high-rate performance and fast charging capability.

Altech has stated that it is in the final development stage of a grade of high purity alumina specifically formulated for the alumina coating of graphite particles, and that is now proceeding to the independent verification phase of its method. University and laboratory verification of the process (patent pending) is due for completion during the next quarter, and the Company expects that positive verification will result in potential end-user trials, and eventually commercialisation of the process.

Figure 2: Application of atomic layer alumina to anode graphite particles



The latest breakthrough research seems to be very exciting milestone in lithium-ion battery development. If successful, commercialising the process would represent a significant step in lithium-ion battery anode evolution.

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