



16 December 2019

# **Battery Program Update**

### **Highlights**

- New Cross Linked Binder development progresses rapidly and captures interest from Collaborator 1
- New Silicon Composite samples produced for Collaborator 1
- Work on silicon composite program continues with Collaborator 2 using new proprietary AnteoTech silicon samples
- First samples of AnteoTech Silicon Composite sent to Collaborator 3 for evaluation
- Collaborator 3 approves AnteoTech site visit for sharing of development methods
- Commercial objectives and discussions on track
- Business development activity to intensify in 2020 as commercial discussions focus on next phase of development

AnteoTech Ltd (ASX: ADO) ("AnteoTech" or "the Company") is pleased to announce the battery program is progressing toward commercialisation objectives and provides this update covering the period since the November AGM.

# Development of Cross Linked Binder for Li Ion Batteries

In recent development work, AnteoTech has been testing the use of a modified version of AnteoCoat in the production of a Cross Linked Binder for use in Li Ion batteries.

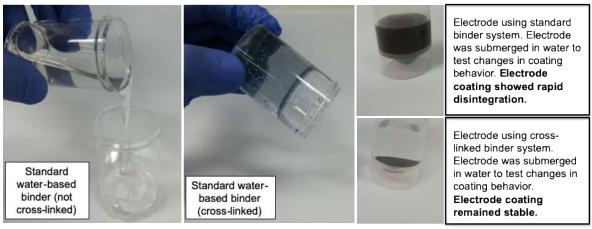
The Cross Linked Binder program is looking to enhance electrode coating cohesion and connectivity by improving on the properties of conventional binders used in the industry. Binders are used to glue the active materials and conductive agent together with the current collector to allow electrons to flow from/to the outside circuit through the active materials—conductive agent—current collector chain.

Binders make up only a small part of the electrode composition, but they play an important role in ensuring the long-term cycling stability and rate capability of electrodes used in Li Ion batteries. The industry's focus on the use of silicon in anodes, which expands and contracts during charge and discharge, creates an urgent need for advanced binder systems that are cost-effective and work with current industry processes.

AnteoTech has been working to produce a water-based binder system that will enable low cost industrial scaled usage and create improved electrode cohesion for application in anodes containing active materials such as graphite and silicon.



## Cross-linked water-based binders for silicon containing anodes



In future development work, the Cross Linked Binder system will be used to interact with AnteoTech's silicon composites to tightly link the composite particles to the electrode structure.

In our development work we have been able to:

- Achieve control over cross-linking behavior for standard water-based battery binders
- Demonstrate battery slurry processability and electrode coating
- Demonstrate improved electrode coating integrity when submerged in water

In recent dialogue with Collaborator 1, it became apparent that our Cross Linked Binder could possibly be applied to the production of current Li Ion battery technology. Collaborator 1 has agreed to undertake further discussions on joint development of the AnteoTech binder system in current production scenarios. These discussions commenced during December 2019 and we expect them to continue with face to face dialogue in January 2020.

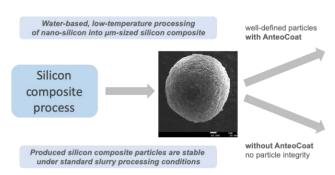
Our objective is to work with Collaborator 1 to understand the production scenarios where AnteoTech's Cross Linked Binder system will add value and work with them to optimise the binder for those scenarios. If successful, AnteoTech will have a proof point for the Cross Linked Binder system in current production scenarios that could be leveraged across the industry.

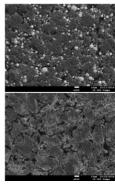
We will be presenting the Cross Linked Binder development and value proposition to Collaborator 3 in January 2020. We expect similar interest from them in terms of potential application to current production of anodes.



# Silicon Composite Development

### **Silicon Composite Development**





#### Collaborator 1

In late November
AnteoTech received
a substantial
shipment of nano
silicon to enable
continued
development of
AnteoTech silicon
composite using
Collaborator 1
industrial materials.

Work is complete on producing 2 of the 3 composite variations agreed with Collaborator 1. The production of the third composite variation will be completed in January 2020. The aim is to assess the impact on performance of AnteoCoat across the three composite variations.

Following rigorous internal electrochemical testing to verify increased energy density that has been proven in AnteoTech composites, the first 2 samples will be shipped to Collaborator 1 in early January and the third will follow closely thereafter. Collaborator 1 will commence assessment of the composites immediately upon receipt and we expect to receive updates as results are developed. Collaborator 1 has indicated their end to end assessment process will take up to 4 months.

AnteoTech will discuss testing techniques with Collaborator 1 during meetings in early January 2020.

### Collaborator 2

Collaborator 2 - Silicio FerroSolar is a silicon producer based in Europe. AnteoTech has had ongoing development activity with this collaborator's material.

Recently we have received a new batch of silicon material from Collaborator 2 and we will begin testing it with our silicon composite to understand its properties in these scenarios.

We expect the development and testing to take 2 months.

#### Collaborator 3

AnteoTech has produced a new set of Silicon Composites, fabricated the composites into anodes using Collaborator 3's commercial graphite and completed electrochemical testing to prove energy density enhancement. The composite sample has been sent to Collaborator 3 and they will begin testing very shortly.

We expect results to be released to AnteoTech by Collaborator 3 as they come to hand and testing to be completed over a 4-month timeframe.

In January AnteoTech will visit Collaborator 3's facilities to share development and testing procedures to ensure the collaboration process between the two organisations is in alignment.



Agreement to share processes between the two organisations by visiting facilities is a significant step in the relationship with Collaborator 3.

## **Battery Product Commercialisation**

The level of activity across our collaboration initiatives has intensified in the last 2 months due to production of first sets of composite samples for external evaluation, the successful development of a Cross Linked Binder prototype using a modified version of AnteoCoat and completion of the upgrade to our facilities allowing faster development.

We have been able to produce composites that will provide a firm platform for moving to the next stage of optimisation development and we seek commercial frameworks with our collaborators to do this.

Discussions on the next evolution of development including commercial agreements are underway. Each collaborator has indicated that the commercial finalisation of these discussions is dependent on verification of value which will be realised and understood during the testing period of these existing samples.

We are encouraged by the current dialogue with Collaborator 1 regarding potential leverage of AnteoTech's Cross Linked Binder in their existing battery production process and will update as these discussions progress.

During 2020 our interaction with existing collaborators will intensify further as we move to finalise arrangements for optimisation development work. In addition, we will seek new collaborations across the Li lon battery value chain in Asia, the U.S. and Europe.

Our business development activity for 2020 will begin with the next scheduled set of meetings with collaborators and battery industry participants in January 2020 in Japan. This will be followed by meetings to be held with industry participants in Europe in the second week of February 2020 and attendance at the Japan Battery Show and associated meetings in Japan at the end of February 2020.

Further business development activities will be detailed in future announcements.

ABOUT ANTEO GROUP - AnteoTech Ltd (ASX:ADO)



Anteo is a surface chemistry company with Intellectual Property ("IP") in its core technology product groups AnteoCoat<sup>™</sup>, AnteoBind<sup>™</sup> and AnteoRelease<sup>™</sup>. The Company's purpose is to create shareholder value by identifying and solving important global industry problems by providing unique value-add solutions for its customers. Customers operate in the life sciences, diagnostics, energy and medical devices markets.

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