

BKT Battery Anode Pre-Cursor Production Trial Delivers Industry Leading Results

HIGHLIGHTS

- Spheronising yields of up to 53% achieved, significantly exceed industry standard for battery anode materials
- 99.98% TGC* purity delivered with simple acid leaching, exceeding industry standard for battery anode materials
- Large scale Spherical Purified Graphite (SPG) production trial of 400kg is 100 times larger than Black Rock's previous laboratory experiments
- Proposed Mahenge concentrator flowsheet demonstrated no damage to flake
- Chinese industrial trial replicated strong results previously achieved in Western laboratories

Tanzanian graphite developer Black Rock Mining Limited (BKT: ASX) ("Black Rock" or the "Company") is pleased to announce it has completed a large-scale spheronising and purification trial using 400kg of sub 80 mesh concentrate generated during the March 2019 Pilot Plant run (refer ASX release 3 April 2019). The trial has demonstrated a yield to final product of 48% and 53%, and final purity of 99.98% TGC* using commercial scale equipment in commercial processing and in dedicated research facilities. These outcomes significantly exceed Chinese Industry Benchmark yields of 35-45% and purity of 99.95% while using standard equipment and techniques. Spherical Purified Graphite (SPG) produced from the trials has been sent to interested parties for further testing.

Table 1 | Summary Trial Data

		Yantai Pilot Plant Enhanced Definitive Feasibility Study (eDFS) (2019)		
		Chinese Industry Benchmark	Inner Mongolia Ruisheng Graphite New Material Co - Acid Purified + Thermal & Reshaped	Wuhan University of Technology
Purification Process		Acid	Acid/Thermal	Thermal
Process yield to SPG	%	35% - 45%	53%^	48%
Final purity	%	99.95%	99.98%	99.98%

^ 53% achieved after Acid Bath, but before Thermal

* Total Graphitic Carbon as reported by Loss on Ignition

Commenting on the spheronising results, Black Rock's CEO, John de Vries, said

"The best way to think of the bulk spheronising trial is that it is the equivalent of our pilot plant strategy, but in this case, done downstream. The fundamental objectives of the pilot plant approach remain the same and that is to improve our attractiveness to financiers and investors by demonstrating and de-risking Mahenge's superior performance in our potential customers' business.

In completing this round of work, we had two key objectives. Firstly, to ensure that the flow sheet developed for the Mahenge concentrator preserves the integrity of the flake and does not impair spheronising performance. Secondly, to demonstrate that offtake partners can achieve industry leading performance using our flake in their existing facilities. This underpins our price point and volumes in our pricing framework agreements (refer to ASX release 8 May 2019).

Conducting a large-scale spheronising trial using industry standard equipment allows us to assess how initial laboratory results obtained during the Pre-Feasibility Study in 2017 (refer to ASX release 7 June 2017) scale up in the industrial context that our customers operate in. For our customers to be able to replicate the best-in-class spheronising results, that are up to a 50% improvement on current yields, while able to replicate results obtained in highly controlled laboratory conditions by skilled researchers, with no modifications to their processes, is simply stunning.

Concentrate used for these trials was produced at the Chinese pilot plant (refer to ASX release 23 April 2019) where the design flowsheet intended for the Mahenge Graphite Project was demonstrated. The exceptional spheronising yields obtained in the trial show that the planned flowsheet does not damage our flake. This talks to the unique geological advantage of Mahenge graphite, and the diligence applied to design and trials to optimise and de-risk our flowsheet before construction.

With the completion of this technical work, we can confidently focus on completing our financing discussions and documenting the shareholder agreement with the Tanzanian Government."

Trial Context

As part of the Chinese pilot plant operations run in March 2019, 400kg of sub 80 mesh concentrate was processed through to Spherical Purified Graphite. The trial was originally contemplated to support the marketing objectives of the pilot plant process relative to the energy storage market as well as demonstrate performance at scale for potential offtake customers and potential funders.

The objectives of this trial were to:

- Validate Black Rock's Mahenge graphite product in the Chinese market
- Replicate industry leading spheronising yields achieved previously in Western laboratory trials (refer to ASX release 7 June 2017) conducted as part of the Pre-Feasibility Study
- Ensure that industry leading results obtained in the laboratory were achievable at scale in standard industrial processes
- Demonstrate that the proposed mill flowsheet tested in the Chinese Pilot Plant (refer to ASX release 3 April 2019) does not damage the flake

Trial details

The 400kg of concentrate was split into two 200kg batches. Each batch was processed through two alternative processes commonly used in the Chinese battery pre-cursor industry. The trials were conducted at the following locations:

- Inner Mongolia Ruisheng New Material Co Ltd (a commercial producer)
- Wuhan University of Technology (a Chinese research facility)

The objective of using both a commercial producer and a Chinese research facility was to ensure comparability between Western and Chinese laboratory results, and to understand how the product would perform when scaled up in a commercial facility typical of Black Rock's potential customer base.

Two target sizes were produced. The first was a 18um sizing, which is typical for consumer devices. A second sizing of 12um is typical for lower performance EV batteries.

Two routes were trialled for purification, acid bath and thermal. Both routes demonstrated capacity to deliver well above the minimum purity threshold for batteries of 99.95% TGC. Thermal purification achieved 99.98% TGC purity in one hour at 3,000 degrees in a halogen inert furnace.

Trial Site 1 - Inner Mongolia Ruisheng New Material Co Ltd

Inner Mongolia Ruisheng New Material Co Ltd (IMRG) is a large commercial producer of spherical anode materials in the Chinese market. In FY 2018, total production exceeded 20,000 tonnes of finished product. IMRG process involves spheronisation, followed by acid leaching to produce a target purity of 99.95% TGC.

The experimental process involved micronizing the flakes to 150um, followed by spheronisation. The spheronising process involved blanking off a single air turbine mill and recirculating the micronized graphite in a closed loop to simulate a typical cascade mill arrangement. Productivity was high and achieved over 200kg/hr to final sizing of 18.8um with a yield of 53% to SPG. Following spheronisation, the feedstock was leached in a single acid bath using a standard leach process and formulation. The acid bath was not optimised for Mahenge's signature.

After sampling, final SPG was then sent to Wuhan University of Technology for reprocessing using thermal purification. The objective of this step was to allow further comparison between the increasingly regulated acid bath purification route and the more costly but environmentally benign thermal process route.



Figures 1 & 2 | Airflow turbine crushing and shaping system

Trial Site 2 - Wuhan University of Technology

Wuhan University of Technology is a leading Chinese research facility with a significant skills base in battery development and graphite processing. The processing of the 200kg dedicated thermal batch, and subsequent thermal upgrading of the IMRG material, was done under the supervision of Professor Yangshuai Qiu.

Figures 3,4 & 5 | QWJ airflow turbine pulverizing system



Wuhan University material was processed in a dedicated machine specifically designed for research. Micronized graphite was processed 17 times before target sizing was achieved. This compares well to industry standards of 25 to 30 stages to produce final sizing. Size reduction is illustrated in Chart 1 below.

Yields of 48% exceeded the Chinese Industry Benchmark of 35-45%, but were not as high as the 53% achieved at IMRG. This difference is attributed to some loss of material due to thermal upgrading.

Trial results

A summary of the 400kg trial results data is presented below in Tables 2 and 3, as well as Charts 1 and 2.

Table 2 | Trial data compared to PFS samples

		BKT Battery Development Program - Pre Feasibility* (2017)		Yantai Pilot Plant Enhanced Definitive Feasibility Study (eDFS) (2019)			
		Dorfner Anzaplan*	Chinese Control Sample	Chinese Industry Benchmark	Inner Mongolia Ruisheng New Material Co - Acid Purified	Inner Mongolia Ruisheng Graphite New Material Co - Acid Purified + Thermal & Reshaped	Wuhan University of Technology
Purification Process		Two Stage Acid Leach	Two Stage Acid Leach	Acid	One Stage Acid Leach	Acid/Thermal	Thermal
Spheronising Process		Lab Air Turbine	Lab Air Turbine	Cascade Mill	Cascade Mill	Cascade Mill	Cascade Mill
Process yield to SPG	%	60%	35%	35% - 45%	53%	48%	48%
TAP Density final product	g/cm ³	0.93	0.88	0.88	0.92	0.95	0.83
Specific Surface Area (BET)	m ² /g	5.9	3.8	7.0	4.8	5.9	5.1
D ₉₀		22.5	39.0		29.1	30.3	21.2
D ₅₀		16.3	23.4		18.8	17.2	12.2
D ₉₀ /D ₅₀		1.4	1.7		1.5	1.8	1.7
Final purity		99.98%	99.60%	99.95%	99.96%	99.98%	99.98%

* refer to ASX release 7 June 2017

Table 3 | Mahenge Bulk Spheronising Trail - Purified Residual Chemistry

		Ash	Al	Fe	Si	S	Ca	Cl	Br	Zr	B
Test Site	Route	%	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
Inner Mongolia Ruisheng New Material Co	Acid	0.033	9.6	18.1	5.7	27.1	18.7	208.4	14.0	2.5	8.5
Inner Mongolia Ruisheng New Material Co	Acid + Thermal	0.020	8.3	16.4	15.5	0.0	9.7	11.7	8.7	0.0	6.5
Wuhan University of Technology	Thermal	0.020	9.6	12.4	8.4	0.0	12.4	10.1	5.5	1.7	7.8



Chart 1 | Spheronisation Property Development

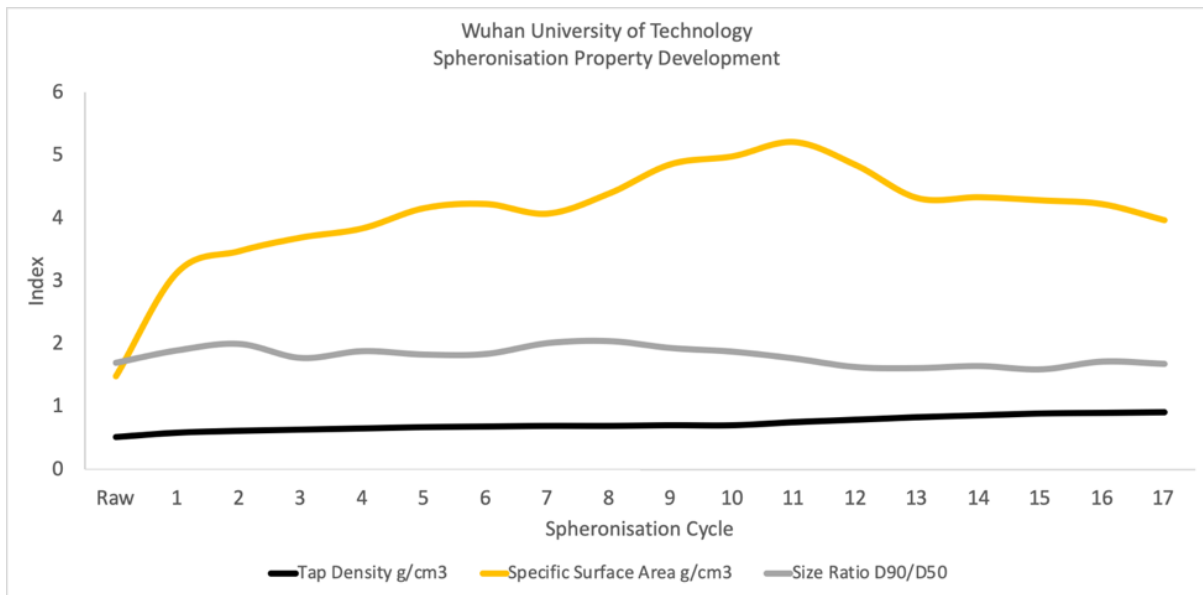
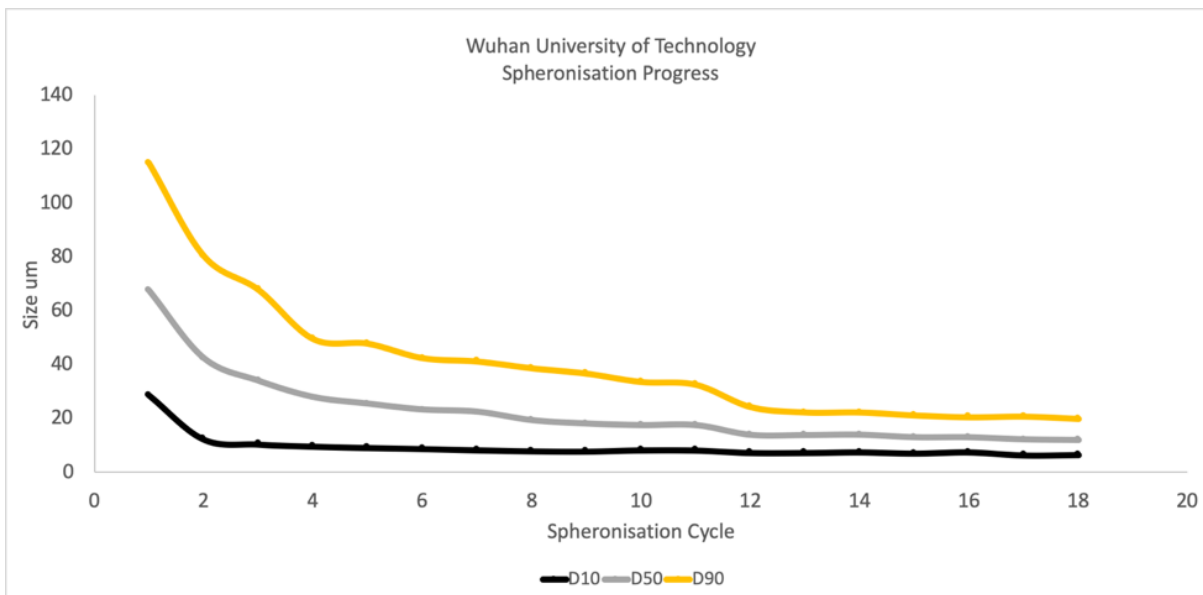


Chart 2 | Spheronisation Progress Against Fraction Sizing*



*D₁₀, D₅₀ and D₉₀ nomenclature represent to percentage size fraction passing

Ends

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About Black Rock Mining

Black Rock Mining Limited is an Australian based company listed on the Australian Securities Exchange (ASX:BKT). The Company has a 100% interest in the Mahenge Graphite Project (the "Project") located in Tanzania. The Project has a JORC compliant Mineral Resource Estimate of 212m tonnes at 7.8% TGC. It also has Ore Reserves of 70m tonnes at 8.5% TGC. The Ore Reserves support a mine life of up to 350k tonnes of graphite per annum for a reserve life of 16 years. Since the release of the Mineral Resource Estimate, the Company confirms that it is not aware of any new information or data that materially affects the mineral resources estimate.

In October 2018, the Company released a Definitive Feasibility Study (DFS) for the Project, which was based on strong customer demand. This was enhanced in July 2019 (refer to ASX release 25 July 2019), and demonstrates exceptional financial metrics including:

- *Low Capex:* Lowest peak capital expenditure of US\$116M for phase one*;
- *High Margin:* AISC margin of 63.1%;
- *Low Technical Risk:* Substantial pilot plant operations run of 110 tonnes; and
- *Superior Economics:* IRR of 44.8% with NPV₁₀ of US\$1.16bn (A\$1.65bn**)

In February 2019, the Company announced receipt of its mining licence for the DFS project.

In May 2019, the Company announced it had substantially allocated planned production with up to 255k tonnes per annum of graphite committed to sale by year three of production, through Pricing Framework Agreements (refer to ASX release 8 May 2019). The Company is progressing these agreements into binding offtake commitments.

Following release of the enhanced DFS (eDFS) in July 2019, the Company confirms that it is not aware of any new data or information that materially affects the results of the eDFS and that all material assumptions and, in the case of estimates of Mineral Resources or Ore Reserves, technical parameters underpinning the estimates in the relevant market announcements continue to apply and have not materially changed.

The estimated Ore Reserves and Mineral Resources underpinning the production target has been prepared by competent persons in accordance with the requirements in Appendix 5A (JORC Code).

The Company is currently progressing financing discussions and detailed engineering with a view to commencing construction of the mine.

JORC Compliant Mineral Resource Estimate and Ore Reserve***

Ore Reserves	Tonnes (Mt)	Grade (% TGC)	Contained Graphite (Mt)
- Proven	0	0.0	0.0
- Probable	69.6	8.5	6.0
Total Ore Reserves	69.6	8.5	6.0
Mineral Resources			
- Measured	25.5	8.6	2.2
- Indicated	88.1	7.9	6.9
Total M&I	113.6	8.1	9.1
- Inferred	98.3	7.6	7.4
Total M, I&I	211.9	7.8	16.6



For further information on Black Rock Mining Ltd, please visit www.blackrockmining.com.au

* Forecast Capex has been classified as a Class 3 estimate with accuracy of ±10% as defined by AACE

** \$AUD/\$USD 0.70

*** Resource and Ore Reserve Estimates as released to ASX on 8 August 2017 Optimised PFS