Alpha HPA
ABN 79 106 879 690

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ASX Announcement
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The Manager Companies - ASX Limited
20 Bridge Street
Sydney NSW 2000

SUCCESSFUL MANUFACTURE OF 5N (99.999%) PURITY, ALUMINA COATING PRE-CURSOR FOR LITHIUM-ION CATHODE AND ANODE MATERIALS

- **Alpha HPA's demonstration-scale plant operation has successfully manufactured a high-purity (5N) pre-cursor product for the particle level alumina coating of cathode and anode particles inside lithium-ion cells.**
- **Particle scale alumina coating of cathode active materials is now being more widely employed inside lithium-ion cells to stabilise increasingly nickel-rich cathode chemistries.**
- **Alpha HPA's Market outreach program extended to include this pre-cursor product.**
- **The pre-cursor material is readily produced within the HPA First flow sheet.**

The Board of Alpha HPA Limited ('Alpha HPA' or 'the Company') is pleased to provide an update on activities for its HPA First Project, representing the evaluation and intended commercialisation of the production of ~10,000tpa equivalent of high purity alumina (HPA) and related products using the Company's proprietary licenced solvent extraction (SX) and HPA refining technology.

HIGH-PURITY PRE-CURSORS

As part of its extended market outreach program in co-operation with marketing/offtake partner Traxys, Alpha HPA has recognised a key market opportunity to utilise the HPA First Process to manufacture high-purity lithium-ion battery pre-cursor materials for application in:

1. The particle scale alumina (Al_2O_3) coating of high-nickel cathode active material (e.g.: 8:1:1 NCM), and
2. The synthesis of aluminium bearing cathode active materials (e.g.: NCA and NCMA)

Successful production high-purity pre-cursor material for particle scale alumina coating

As Part 1 of the development of high-purity pre-cursors, Alpha HPA has now successfully manufactured >20kg of high purity alumina coating pre-cursor material at 5N purity (99.999%). Alpha HPA has confirmed through its German research collaborations that this pre-cursor material is already in commercial application for particle scale alumina coating of anode materials and NCM cathode active materials.

The cathode coating application in particular, is considered a significant growth opportunity, as the cathode material manufacturers look to stabilise high nickel cathode chemistries (e.g. 8:1:1 NCM).

The pre-cursor material is readily produced within the existing HPA First Process flow sheet with no significant alterations, and no interruption to current demonstration plant activities. In addition, the product is produced at the highest purity point in the process, generating 5N (99.999%) purity (refer Appendix 1). Of note is that Phosphorus (P) represents approximately 90% of impurities, and that Phosphorous significantly volatilises (gasifies) in the calcination step for the cathode active material, rendering close to an effective 6N (99.9999%) purity.

In response to this development, and co-operation with Traxys, Alpha HPA has expanded its market outreach with pre-cursor material available for immediate shipment from its Brisbane demonstration-scale Pilot Plant.

A centrifuge batch of high-purity pre-cursor product (approx. 2kg) produced at Alpha HPA's demonstration facility

Managing Director, Rimas Kairaitis, commented; "*Our ability to manufacture increasingly sought-after pre-cursor product is a particularly exciting development. The recognition of the flexibility of our process to deliver a number of ultra-high purity products into the lithium-ion value chain is a key opportunity we are looking to rapidly capitalise upon".*

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About the HPA First Project

The Company's HPA First Project represents the evaluation and intended commercialisation of the production of ~10,000tpa equivalent of high purity alumina (HPA) and related products using the Company's proprietary licenced solvent extraction and HPA refining technology. The technology provides for the extraction and purification of aluminium from an industrial feedstock to produce 4N (>99.99% purity) alumina for the intended use within the lithium ion battery and LED lighting industry. Following a successful testwork program and completion of a Pre-Feasibility Study (PFS), updated in March 2019, Alpha HPA has now completed Definitive Feasibility Study (DFS) based on the successful completion of its Pilot Plant program at its dedicated laboratory facility in Brisbane.

The Company has commenced full permitting, market outreach and project financing processes, with the expectation of positioning the HPA First Project to Final investment Decision.

Competent Persons Statement (Process Development Testwork)

Information in this announcement that relates to metallurgical results is based on information compiled by or under the supervision of Dr Stuart Leary, an Independent Consultant trading as Delta Consulting Group. Dr Leary is a Member of The Australasian Institute of Mining and Metallurgy (AusIMM). Dr Leary has sufficient experience to the activity which he is undertaking to qualify as a Competent Persons under the 2012 Edition of the 'Australasian Code for reporting of Exploration Results, Mineral Resources and Ore Reserves'. Dr Leary consents to the inclusion of the technical data in the form and context in which it appears.

For further information on testwork results and processes see ASX announcements dated 28 July 2020, 19 June 2020, 21 May 2020, 23 April 2020, 25 March 2020, 17 March 2020, 10 December 2019, 21 November 2019, 10 October 2019, 23 September 2019, 28 August 2019, 5 August 2019, 25 July 2019, 2 July 2019, 3 June 2019, 17 April 2019, 7 March 2019, 4 December 2018, 20 November 2018, 6 September 2018, 31 August 2018, 9 July 2018, 30 April 2018, 26 April 2018, 21 March 2018, 6 March 2018, 21 February 2018, 8 December 2017, 30 November 2017, 29 November 2017, 24 November 2017 and 13 November 2017.

Appendix 1-Impurity Assays: Individual batch assays of alumina coating pre-cursor material

Method	UHP	ME-ICP02	UHP	UHP	UHP	UHP	UHP	UHP	ME-ICP02	UHP	ME-ICP02	UHP	ME-ICP02	UHP				
Analyte	Ca	Co	Cr	Cu	Fe	Ga	K	Mg	Mn	Na	Ni	P	Si	Zn				
Pre-Cursor Batch	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	Impurity (ppm)	Purity (%)	Impurity Ex P (ppm)	Ex P Purity (%)
CR C6B1	<0.05	1.82	0.27	<0.01	0.18	<0.05	<0.2	<0.01	<0.1	<0.1	<0.1	10.03	<1	<0.05	12.31	99.9988%	2.28	99.9998%
CR C6B2	<0.05	<0.1	0.22	<0.01	0.18	0.45	<0.3	<0.01	<0.1	<0.1	<0.1	9.81	<1	<0.05	10.65	99.9989%	0.85	99.9999%
CR C6B3	<0.05	<0.1	0.20	<0.01	<0.01	<0.05	<0.4	<0.01	<0.1	<0.1	<0.1	9.92	<1	<0.05	10.12	99.9990%	0.20	100.0000%
CR C6B4	<0.05	<0.1	0.15	<0.01	<0.01	<0.05	<0.5	<0.01	<0.1	<0.1	1.01	9.11	<1	<0.05	10.27	99.9990%	1.16	99.9999%
CR C6B5	<0.05	<0.1	0.22	<0.01	<0.01	<0.05	<0.6	<0.01	<0.1	<0.1	<0.1	8.84	<1	<0.05	9.06	99.9991%	0.22	100.0000%
CR C6B6	<0.05	0.98	0.15	<0.01	<0.01	<0.05	<0.7	<0.01	<0.1	<0.1	<0.1	9.77	<1	<0.05	10.89	99.9989%	1.12	99.9999%
CR C6B7	<0.05	<0.1	0.19	<0.01	<0.01	<0.05	<0.8	<0.01	<0.1	<0.1	<0.1	11.37	<1	<0.05	11.56	99.9988%	0.19	100.0000%
CR C6B8	<0.05	0.96	0.14	<0.01	0.10	<0.05	<0.9	<0.01	<0.1	<0.1	<0.1	9.60	<1	<0.05	10.79	99.9989%	1.20	99.9999%
CR C6B9	<0.05	<0.1	0.14	<0.01	<0.01	<0.05	<0.10	<0.01	<0.1	<0.1	<0.1	9.45	<1	<0.05	9.59	99.9990%	0.14	100.0000%
CR C6B10	<0.05	<0.1	0.21	<0.01	<0.01	<0.05	<0.11	<0.01	<0.1	<0.1	1.07	9.64	<1	<0.05	10.92	99.9989%	1.28	99.9999%
CR C6B11	0.79	0.79	0.16	<0.01	<0.01	<0.05	<0.12	<0.01	<0.1	<0.1	<0.1	9.54	<1	<0.05	11.29	99.9989%	1.75	99.9998%
CR C6B12	<0.05	<0.1	0.16	<0.01	<0.01	<0.05	<0.13	<0.01	<0.1	<0.1	<0.1	10.69	<1	<0.05	10.85	99.9989%	0.16	100.0000%
CR C6B13	<0.05	1.04	0.16	<0.01	0.21	<0.05	<0.14	<0.01	<0.1	<0.1	<0.1	9.36	<1	<0.05	10.76	99.9989%	1.40	99.9999%
CR C6B14	<0.05	<0.1	0.15	<0.01	<0.01	<0.05	<0.15	<0.01	<0.1	<0.1	<0.1	8.91	<1	<0.05	9.06	99.9991%	0.15	100.0000%
CR C6B15	<0.05	<0.1	0.14	<0.01	<0.01	<0.05	<0.16	<0.01	<0.1	<0.1	<0.1	9.38	<1	<0.05	9.52	99.9990%	0.14	100.0000%
CR C6B16	<0.05	1.00	0.15	<0.01	<0.01	<0.05	<0.17	<0.01	<0.1	<0.1	<0.1	10.01	<1	<0.05	11.16	99.9989%	1.15	99.9999%
CR C6B17	<0.05	<0.1	0.13	<0.01	<0.01	<0.05	<0.18	<0.01	<0.1	<0.1	<0.1	9.67	<1	<0.05	9.80	99.9990%	0.13	100.0000%
CR C6B18	<0.05	<0.1	0.09	<0.01	<0.01	<0.05	<0.19	<0.01	<0.1	<0.1	<0.1	10.23	<1	<0.05	10.32	99.9990%	0.09	100.0000%
CR C6B19	<0.05	1.06	0.11	<0.01	<0.01	<0.05	<0.20	<0.01	<0.1	<0.1	<0.1	9.51	<1	<0.05	10.67	99.9989%	1.16	99.9999%
CR C6B20	<0.05	<0.1	0.16	<0.01	<0.01	1.06	<0.21	<0.01	<0.1	<0.1	1.06	7.42	<1	<0.05	9.70	99.9990%	2.28	99.9998%
CR C6B21	<0.05	<0.1	0.11	<0.01	<0.01	0.53	<0.22	<0.01	<0.1	<0.1	<0.1	9.50	<1	<0.05	10.13	99.9990%	0.63	99.9999%
CR C6B22	<0.05	<0.1	0.09	<0.01	<0.01	<0.05	<0.23	<0.01	<0.1	<0.1	0.91	7.30	<1	<0.05	8.30	99.9992%	1.00	99.9999%
CR C6B23	<0.05	<0.1	0.10	<0.01	<0.01	<0.05	<0.24	<0.01	<0.1	<0.1	1.02	9.21	<1	<0.05	10.33	99.9990%	1.13	99.9999%
CR C6B24	<0.05	<0.1	0.10	<0.01	<0.01	<0.05	<0.25	<0.01	<0.1	<0.1	0.96	6.71	<1	<0.05	7.76	99.9992%	1.05	99.9999%
CR C6B25	<0.05	<0.1	0.09	<0.01	<0.01	<0.05	<0.26	<0.01	<0.1	<0.1	<0.1	7.59	<1	<0.05	7.69	99.9992%	0.09	100.0000%
CR C6B26	<0.05	<0.1	0.11	<0.01	<0.01	<0.05	<0.27	<0.01	<0.1	<0.1	<0.1	7.56	<1	<0.05	7.66	99.9992%	0.11	100.0000%
CR C6B27	0.42	<0.1	0.13	<0.01	<0.01	<0.05	<0.28	<0.01	<0.1	<0.1	<0.1	7.51	<1	<0.05	8.06	99.9992%	0.54	99.9999%
CR C6B28	<0.05	<0.1	0.12	<0.01	<0.01	<0.05	<0.29	<0.01	0.82	<0.1	1.64	8.19	<1	<0.05	10.77	99.9989%	2.58	99.9997%
CR C6B29	<0.05	<0.1	0.13	<0.01	<0.01	<0.05	<0.30	<0.01	<0.1	<0.1	0.87	7.83	<1	<0.05	8.83	99.9991%	1.00	99.9999%
CR C6B30	<0.05	<0.1	0.13	<0.01	<0.01	<0.05	<0.31	<0.01	<0.1	<0.1	<0.1	8.88	<1	<0.05	9.01	99.9991%	0.13	100.0000%
CR C6B31	<0.05	<0.1	0.13	<0.01	<0.01	0.42	<0.32	<0.01	<0.1	<0.1	<0.1	7.61	<1	<0.05	8.16	99.9992%	0.55	99.9999%
CR C6B32	<0.05	<0.1	0.09	<0.01	<0.01	<0.05	<0.33	<0.01	<0.1	<0.1	0.91	8.17	<1	<0.05	9.17	99.9991%	1.00	99.9999%
CR C6B33	<0.05	<0.1	0.14	<0.01	<0.01	0.48	<0.34	<0.01	<0.1	<0.1	0.96	7.71	<1	<0.05	9.30	99.9991%	1.59	99.9998%
CR C6B34	<0.05	<0.1	<0.005	<0.01	<0.01	0.53	<0.35	<0.01	<0.1	<0.1	1.07	8.56	<1	<0.05	10.16	99.9990%	1.60	99.9998%
CR C6B35	<0.05	<0.1	0.10	<0.01	<0.01	<0.05	<0.36	<0.01	<0.1	<0.1	1.01	7.10	<1	<0.05	8.22	99.9992%	1.12	99.9999%
CR C6B36	1.07	<0.1	0.16	<0.01	<0.01	<0.05	<0.37	0.11	<0.1	1.07	1.07	8.53	<1	<0.05	11.99	99.9988%	3.46	99.9997%
CR C6B37	<0.05	<0.1	0.15	<0.01	<0.01	0.50	3.97	<0.01	<0.1	<0.1	<0.1	9.91	<1	<0.05	14.52	99.9985%	4.61	99.9995%
CR C6B38	<0.05	<0.1	0.13	<0.01	<0.01	<0.05	1.70	<0.01	<0.1	<0.1	<0.1	11.03	<1	<0.05	12.86	99.9987%	1.82	99.9998%
CR C6B39	<0.05	<0.1	0.12	<0.01	<0.01	<0.05	3.24	<0.01	<0.1	<0.1	<0.1	10.54	<1	<0.05	13.91	99.9986%	3.37	99.9997%
CR C6B40	<0.05	<0.1	0.10	<0.01	<0.01	<0.05	2.06	<0.01	<0.1	<0.1	<0.1	11.31	<1	<0.05	13.46	99.9987%	2.16	99.9998%
CR C6B41	0.42	<0.1	0.13	<0.01	<0.01	<0.05	1.68	<0.01	<0.1	<0.1	<0.1	10.93	<1	<0.05	13.16	99.9987%	2.23	99.9998%
CR C6B42	<0.05	<0.1	0.12	<0.01	<0.01	0.40	3.24	<0.01	<0.1	<0.1	<0.1	9.71	<1	<0.05	13.48	99.9987%	3.76	99.9996%
CR C6B43	<0.05	<0.1	0.16	<0.01	<0.01	<0.05	4.31	0.11	<0.1	<0.1	1.08	11.86	<1	<0.05	17.52	99.9982%	5.66	99.9994%
CR C6B44	<0.05	<0.1	0.11	<0.01	<0.01	<0.05	4.29	<0.01	<0.1	<0.1	<0.1	11.80	<1	<0.05	16.20	99.9984%	4.40	99.9996%
CR C6B45	<0.05	<0.1	0.14	<0.01	<0.01	<0.05	3.83	<0.01	<0.1	<0.1	<0.1	10.54	<1	<0.05	14.52	99.9985%	3.98	99.9996%
CR C6B46-A	<0.05	<0.1	0.17	<0.01	<0.01	<0.05	3.30	<0.01	<0.1	<0.1	<0.1	11.56	<1	<0.05	15.03	99.9985%	3.47	99.9997%
CR C6B46-B	<0.05	<0.1	0.10	<0.01	<0.01	<0.05	2.00	<0.01	<0.1	<0.1	1.00	11.01	<1	<0.05	14.11	99.9986%	3.10	99.9997%
														AVERAGE	10.93	99.999%	1.56	99.9998%

1. JORC CODE, 2012 EDITION – TABLE 1

1.1 Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	JORC Code explanation	Commentary
Sampling techniques	• *Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.* • *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.* • *Aspects of the determination of mineralisation that are Material to the Public Report.* • *In cases where 'industry standard' work has been done this would be relatively simple (eg 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (eg submarine nodules) may warrant disclosure of detailed information.*	• Samples of high purity aluminium bearing precursor were taken as ~10g splits of homogonised, crystalline powder
Drilling techniques	• *Drill type (eg core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).*	• Not Applicable. The samples were generated from a feedstock of industrial chemicals.
Drill sample recovery	• *Method of recording and assessing core and chip sample recoveries and results assessed.* • *Measures taken to maximise sample recovery and ensure representative nature of the samples.* • *Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.*	• Not Applicable
Logging	• *Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.* • *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.* • *The total length and percentage of the relevant intersections logged.*	• Not Applicable
Sub-sampling techniques and Sample Preparation	• *If core, whether cut or sawn and whether quarter, half or all core taken.* • *If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.* • *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* • *Quality control procedures adopted for all sub-sampling stages to maximise representivity of*	• Samples were presented as a homogonised, crystalline aluminium bearing pre-cursor generated from a crystallisation and centrifuge process

Criteria	JORC Code explanation	Commentary
	samples. • *Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.* • *Whether sample sizes are appropriate to the grain size of the material being sampled.*	
Quality of assay data and laboratory tests	• *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* • *For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.* • *Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established.*	• The purity analysis of the high-purity alumina (HPA) was determined by ALS (Brisbane) The samples are dissolved to make a dilute solution which is able to be directly read on an ICP-OES. The solution is analysed firstly, after further dilution, to report Aluminium and other elemental analysis. It is then directly read by ICP-OES, with no dilution, to lower detection limits for specific elements other than Aluminium.
Verification of sampling and assaying	• *The verification of significant intersections by either independent or alternative company personnel.* • *The use of twinned holes.* • *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* • *Discuss any adjustment to assay data.*	• Not Applicable
Location of data points	• *Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* • *Specification of the grid system used.* • *Quality and adequacy of topographic control.*	• Not Applicable
Data spacing and distribution	• *Data spacing for reporting of Exploration Results.* • *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.* • *Whether sample compositing has been applied.*	• Not Applicable
Orientation of data in relation to geological structure	• *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.* • *If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.*	• Not Applicable
Sample security	• *The measures taken to ensure sample security.*	• Duplicates of all samples submitted were retained at the Company's Brisbane laboratories to insure against any sample loss
Audits or reviews	• *The results of any audits or reviews of sampling techniques and data.*	• Not applicable

(Criteria listed in the preceding section also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	• *Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.* • *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.*	• Not Applicable
Exploration done by other parties	• *Acknowledgment and appraisal of exploration by other parties.*	• Not Applicable
Geology	• *Deposit type, geological setting and style of mineralisation.*	• Not Applicable
Drill hole Information	• *A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:* ○ *easting and northing of the drill hole collar* ○ *elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar* ○ *dip and azimuth of the hole* ○ *down hole length and interception depth* ○ *hole length.* • *If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.*	• Not Applicable
Data aggregation methods	• *In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (eg cutting of high grades) and cut-off grades are usually Material and should be stated.* • *Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.* • *The assumptions used for any reporting of metal equivalent values should be clearly stated.*	• Not Applicable
Relationship between mineralisation widths and intercept lengths	• *These relationships are particularly important in the reporting of Exploration Results.* • *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.* • *If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (eg 'down hole length, true width not known').*	• Not Applicable
Diagrams	• *Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.*	• Not Applicable

Criteria	JORC Code explanation	Commentary
Balanced reporting	• *Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.*	• Not Applicable
Other substantive exploration data	• *Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.*	• Not Applicable
Further work	• *The nature and scale of planned further work (eg tests for lateral extensions or depth extensions or large-scale step-out drilling).* • *Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.*	• The Company is continuing operations at its pilot/demonstration facility in Brisbane.