

Alpha HPA

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ASX: **A4N**  
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(5 pages)

## EXPANSION OF SYNTHETIC SAPPHIRE GLASS AGREEMENTS WITH THE EBNER GROUP TO INCLUDE FURTHER SCALE-UP AND JOINT MARKETING

- Expansion of existing Letter of Intent ('LOI') with global industrial furnace company Ebner Industrieofenbau GmbH ('Ebner') and Ebner subsidiary Fametec GmbH ('Fametec') to include a larger scale roll-out of synthetic sapphire glass production and joint marketing.
- Alpha and Ebner-Fametec to now consider a larger scale deployment of synthetic sapphire growth units from 100 units (Phases B and C) up to an additional 1,000 units (Nova Phase)
- Alpha and Ebner-Fametec have also agreed to a global joint marketing strategy for the sale of synthetic sapphire products
- The expanded agreements follows positive feedback from potential customers and renewable energy providers

### Agreements Summary

In March 2023, Alpha HPA ('Alpha' or 'the Company') announced agreements with Ebner Industrieofenbau GmbH ('Ebner') and Ebner subsidiary Fametec GmbH ('Fametec'), to provide for the staged entry by Alpha into the production and sale of synthetic sapphire glass utilising Ebner-Fametec sapphire growth technology and utilising Alpha's custom high purity alumina (HPA) tablets as feedstock.

The agreements include the following:

- Commercial and Technical proposals
- Technology Licence Agreement
- Letter of Intent (LOI)

The staged entry under these agreements included:

- Phase A- Purchase and installation of an initial 2 synthetic sapphire growth units: *Now Underway*
- Phase B- Purchase and installation of a further 48 synthetic sapphire growth units: *Total 50*
- Phase C- Purchase and installation of a further 50 synthetic sapphire growth units: *Total 100*

Following expanded engineering and commercial interaction between Alpha and Ebner-Fametec, as well as broader engagement with potential customers, Government, potential strategic investors, and renewable energy providers, Alpha and Ebner-Fametec have elected to expand the existing LOI to include:

- an agreement to work co-operatively on an additional, large-scale expansion of the Australia based sapphire growth installation, to be referred to as the '**Nova Phase**'. The Nova Phase will contemplate the purchase, construction, installation and operation of up to an additional 1,000 synthetic sapphire growth units;
- the commercial premise for the addition of the Nova Phase being that once an expansion from Phase B to C (50 to 100) has been elected, the essential components of a successful business are established and would be readily expandable;

*and:*

- agreement to work co-operatively on the research and market outreach activities related to expanding the customer base for sapphire products, including;
  - cost sharing of market research;
  - provision of market intelligence;
  - co-ordinated identification of potential end-users and customers;
  - co-ordinated market outreach; and
  - potential establishment of a dedicated marketing entity.

The joint marketing arrangements will operate between the following counterparties:

- **Alpha Sapphire Pty Ltd** (a wholly owned subsidiary of Alpha) as a special purpose, Australian domiciled company, dedicated to the growth, processing and sale of Net-Zero CO<sub>2</sub> synthetic sapphire, and
- **Arctic Sapphire AS**, a wholly owned subsidiary of Fametec, as a special purpose, Norway domiciled company, dedicated to the growth, processing and sale of Net-Zero CO<sub>2</sub> synthetic sapphire.

## Synthetic Sapphire Growth and Markets

Sapphire glass is the crystalline form of high purity alumina (HPA or Al<sub>2</sub>O<sub>3</sub>). It is grown in specialised growth units, which melts raw material (HPA) at +2000°C and then crystallises the melt as a single crystal known as a sapphire 'boule'. The process is highly specialised, but also highly repeatable.

The process is energy intensive, so access to a low-cost, firm-supply of renewable Net-Zero CO<sub>2</sub> electricity is a key consideration.

Major synthetic sapphire applications include:

**'Optics'** – Optics is a group term including watch faces, sapphire windows, phone lens covers, specialised medical applications and also defence applications.

**'LED/Semiconductor'** - Sapphire wafers are cut along the c-axis plane from a c-axis grown ingot where they are polished, patterned and ultimately presented to LED manufacturers for 'epitaxy', being the growth of the LED circuitry onto the wafer substrate.

**'Power Electronics /Semiconductor'** - Sapphire wafers are cut along the c-axis plane from a c-axis grown ingot where they are polished, patterned and ultimately presented to PE manufacturers for 'epitaxy', being the growth of the PE chips onto the wafer substrate.

## Sapphire Industry Dynamics and Investment Rationale

Synthetic sapphire glass is produced from premium purity HPA feedstock in bespoke, high technology growth furnaces.

After an extended period of investigation into the sapphire glass market and manufacturing process, Alpha has identified this as a unique opportunity to partner with a world class company and innovator and capitalise on a significant value adding downstream use of its HPA product.

**Alpha estimates the adoption of the Ebner-Fametec technology for the conversion of HPA to sapphire glass represents a net revenue uplift of ~10x per unit of alumina**

Alpha's view is that there are three key disruptions within the synthetic sapphire market which combined provide a unique opportunity to enter the synthetic sapphire market, being:

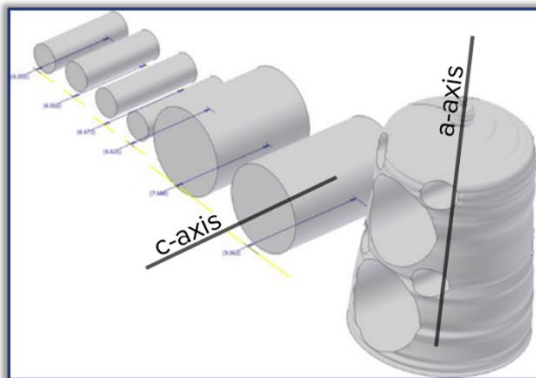
### 1. TECHNOLOGICAL DISRUPTION: THE FAMETEC McSAP TECHNOLOGY

To date, the most proven and reliable growth method for high quality synthetic sapphire growth has been the Kyropoulos or KY method.

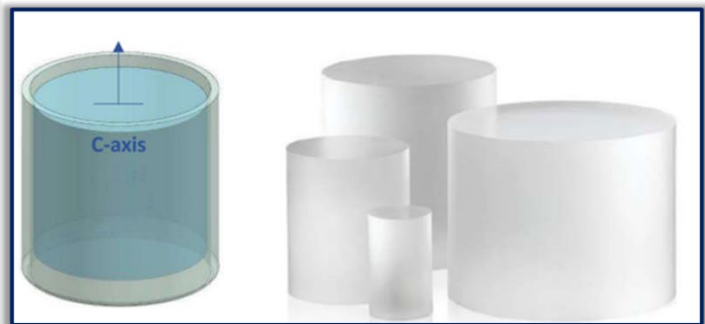
The KY method grows large boules (90-120kg), however the KY method is only proven for a-axis growth, which provides low utilisation rates of ~35-40% of sapphire per boule and high rates of energy consumed per kg of usable sapphire. The remaining ('crackle') is recycled or sold.

Fametec's crystal growth process, known as the McSAP (Multi c-Axis Sapphire) method has been developed over 10 years and with estimated R&D expenditure of over €20M.

C-axis sapphire crystal growth achieves +60% utilisation of the crystal boule (compared to ~35-40% for current industry standard a-axis crystals) with ~50% power saving (per kilogram of grown crystal) realised through greater utilisation per crystal boule and growth of multiple boules per production run, realising a significantly lower energy production. This combines to realise a materially lower carbon footprint than other crystal growth processes. The McSAP process is accordingly considered a well-suited complement to Alpha's low carbon HPA feedstock.



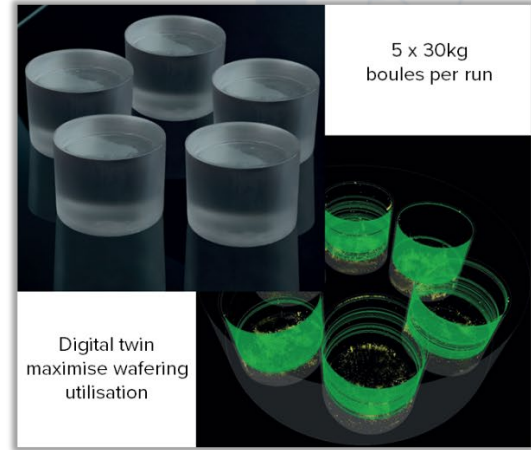
*C-axis ingots produced from an a-axis Kyropoulos sapphire boule showing low utilisation*



*C-axis ingots produced from an c-axis grown McSAP sapphire boule showing high utilisation*

**Alpha estimates each growth unit will be capable of circa 4,000 kg (4 metric tonnes) of synthetic sapphire per annum.**

In addition to higher utilisation rates in the production of sapphire ingots, Ebner-Fametec technology employs optical scanning to produce a unique 'digital twin' of each sapphire boule to ensure maximised utilisation during wafering (see below).



## 2. SUPPLY CONCERNS

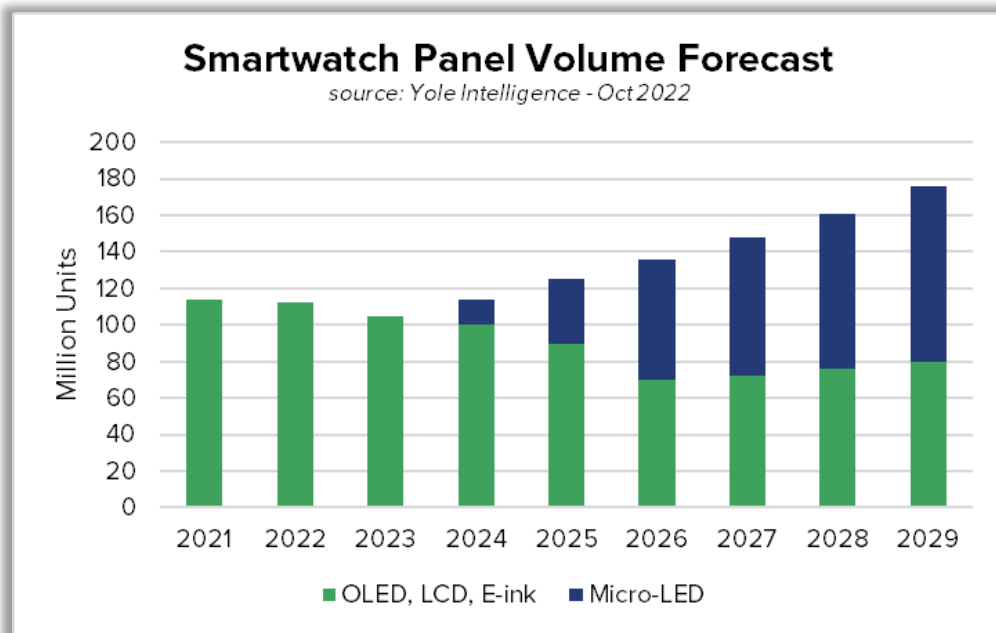
Globally, high technology sectors are experiencing an intensifying global trend towards de-risking/re-shoring and friend-shoring supply chains.

Traditionally, Russian and Chinese companies have dominated synthetics sapphire growth, accounting for >80% market share. However, there is now growing thematic amongst end-users to diversify supply to be sourced from preferred jurisdictions.

In addition, the end-user sectors are placing stronger emphasis to decarbonise supply chains to meet emission targets. With sapphire growth being an energy intensive process, the Ebner-Fametec lower energy technology, combined with Alpha's ability to access renewable energy provides an attractive alternative to the higher carbon intensity of the current global sapphire glass producers.

## 3. NEW DEMAND DRIVERS

Synthetic sapphire wafers are the dominant substrate in LED lighting. The increasing adoption of mini LEDs and micro LEDs, in particular within smartwatch displays is predicted to grow to US\$17 bn by 2026, with wafer demand for micro LEDs forecast to grow at a CAGR >500% between 2023-2027 (*source MarketWatch Inc*). The adoption is driven by significant reduction in power draw and an improved user experience. As an example, the forecast adoption of micro LEDs into smartwatch displays is presented below.



Forecast adoption of micro-LEDs into smartwatch panel displays  
(Source: Yole Intelligence – Oct 2022)

Commenting on the Company's expanding collaboration with Ebner-Fametec, Managing Director Rimas Kairaitis said:

*"Alpha is very pleased to expand its collaboration with Ebner-Fametec. Alpha and Ebner-Fametec recognise the unique opportunity to enter this market, with both parties committed to deploying new technology and renewable energy into a sapphire market looking for higher quality and sustainably sourced materials.*

*The combined product marketing effort together with co-operation on the large-scale Nova Phase expansion, sets a path for Alpha to become a significant global supplier to this expanding sector."*

#### **About Ebner-Fametec**

Fametec is a private Austrian based subsidiary of the Ebner Group that has developed a proprietary crystal growth technology to produce sapphire crystals in multiple shapes, with a special focus on larger sized sapphire crystals.

Fametec's crystal growth process, known as the McSAP (Multi c-Axis Sapphire) method has been developed over 10 years and with estimated R&D expenditure of over €20M. C-axis sapphire crystal growth is able to achieve ~60% utilisation of the crystal ingot (compared to ~35-40% for current industry standard A-axis crystals) with ~50% power saving (per kilogram of utilised crystal) realised through greater utilisation per crystal boule and growth of multiple boules per production run, realising a materially lower carbon footprint than other crystal growth processes.

Fametec's vision is to supply large-size sapphire substrates that are 'green' sapphire, grown using 100% sustainable energy sources. Fametec's 'green' sapphire is significantly more energy-efficient, of higher quality, and priced more competitively for use in micro-LED, power and optical applications.

Ebner Industrieofenbau GmbH ('Ebner') Group is a large family owned Austrian manufacturer with over 70 year history in the design and construction of industrial furnaces for the heat treatment of metals. Ebner is a global market leader in numerous application areas and has over 1400 employees with production sites in Europe, Asia and USA. Ebner has been active in R&D development and commercialisation activities in the field of LED's and semiconductor materials since 2005.

#### **About the HPA First Project**

The Company's HPA First Project represents the commercialisation of the production of high purity alumina (HPA) and related high purity aluminium precursor products using the Company's proprietary licenced solvent extraction and HPA refining technology. The disruptive, low-carbon process technology provides for the extraction and purification of aluminium from an industrial feedstock to produce 4N (>99.99% purity) alumina and 5N (>99.999% purity) for sale into high technology markets including semiconductors, lithium-ion battery and LED lighting.

Alpha completed a Definitive Feasibility Study in March 2020 following a successful pilot plant campaign in 2019.

Alpha is now in production at its Stage 1, Precursor Production Facility which has now completed a successful commissioning and entered production ramp-up phase. The Stage 1 facility is also now being expanded to produce the full range of Alpha's high-purity materials with \$15.5M grant funding from the Australian Government.

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