

FOUNDATION RESEARCH · 5 AUGUST 2026

Alpha HPA Limited

ASX:A4N · Materials

Zero Alpha HPA - not all 9s are created equal

Alpha HPA Limited (ASX:A4N) is focused on high-purity alumina (HPA) production. Their proprietary process is proven at a commercial scale to produce Super Ultra Low Alpha HPA, which is required for next-generation semiconductor production.

Zero-Alpha HPA is a key next generation material for advanced packaging and power-semiconductor markets. This is a new and rapidly evolving development with customer demand for A4N's technology only outstripping future capacity (LOIs surpassing Stage 2 capacity) as of June 2026 (Fig 1). If Stage 2 is successfully delivered, A4N could emerge as the world's largest single-site supplier of specialised HPA.

- ♦ **Material Science is the next evolution in Moore's Law:** From our semiconductor industry expert discussion ([video link](#)) we have learnt that the next iteration of chip improvements driving [Moore's Law](#) is likely to come from material science, rather than shrinking geometries, which have historically been the key driver (Fig 4). In order to achieve this A4N's Zero Alpha HPA is required.
- ♦ **Zero Alpha HPA - not all 9s are created equal:** As A4N's name suggests, the company is capable of producing HPA with 4Ns (99.99%) or greater purity. What differentiates Alpha from other HPA is what remains. A4N's unique purification process eliminates detectable Uranium and Thorium (alpha emitters). This is critical for semiconductor production as alpha particles generate a charge that changes a stored bit value from 1 to 0 resulting in errors (bit flip). To our knowledge other HPA producers currently cannot eliminate alpha emitters from their remaining impurities, which make them less suitable for use in semiconductors.
- ♦ **Orica partnership a vertically integrated moat:** In our view A4N's moat extends beyond IP. Their Solvent Extraction (SX) process uses reagents from Orica's (ASX:ORI) neighbouring site, and returns them as upcycled chemicals, resulting in a waste-free process allowing A4N to produce HPA at lower cost relative to peers.

In our view A4N presents unique exposure not only to AI but also to semiconductor evolution. The company's unique zero alpha process combined with vertically integrated feedstock and reagents provide further barriers to entry beyond their proprietary IP.

COMPANY AT A GLANCE

ASX code	A4N
Share price (4 August 2026)	A\$0.52
Market capitalisation	A\$725.9M
Shares on issue	1,451.9M
52-week high / low	\$1.010 / \$0.475
Avg. daily volume (12M)	4.842M
GICS sector	Materials
Country of listing	Australia

Foundation Research (Non-Rated)

- ♦ Factual briefing only
- ♦ No valuation or price target
- ♦ No financial forecasts
- ♦ Not a recommendation
- ♦ Commissioned by Homodeus Research

HISTORICAL BUSINESS RISK/REWARD



*Relative to the market. Source: Homodeus Research, 5 August 2026.

STYLE

THEMATIC	GROWTH
VALUE	EVENT

ANALYSTS

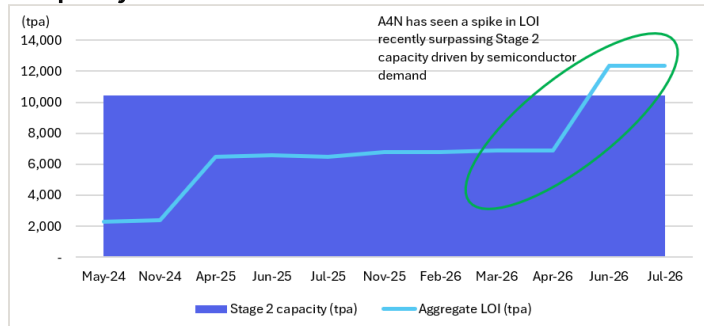
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Future capacity already pre-filled driven by semi demand

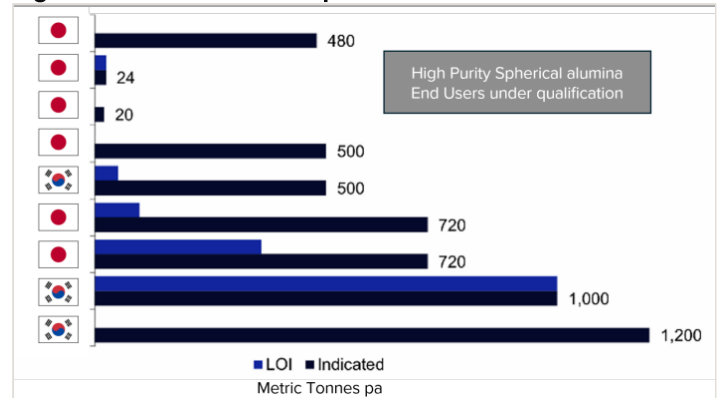
A4Ns LOIs (letters of intent) are already at 118% of plant capacity, and conversion to binding contracts is expected over the next 6–12 months. The spike in demand has been apparent in recent months with LOI exceeding capacity only since June 2026 (Fig 1).

Fig 1: A4N LOI demand has spiked in CY26 surpassing Stage 2 capacity



Notes: Stage 1 has been omitted from the analysis
Source: Company data

Fig 2: Demand breakdown profile



Source: Alpha HPA Jun-26 Quarterly 4C

WHAT ABOUT STAGE 1?

Stage 1 is a small-scale commercial plant used to prove the process at commercial scale, manufacture the full product range, refine products with customers, supply qualification samples and fulfil smaller commercial orders. That said, Alpha has reiterated that **Stage 1 is a commercial scale plant** - not a pilot plant, and materials from the plant are being supplied to end customers. Stage 1 has been omitted from the above analysis because it has no single comparable capacity figure—it has separate, evolving production rates for HPA, ATH, boehmite, tablets and aluminium nitrate that share infrastructure and cannot be added together. The approximate capacity, however has been stated at ~350tpa. Adding this to the above estimates, aggregate LOI still exceeds the capacity of Stage 1 and Stage 2 combined (~115%).

Fig 3: Alpha Plants, Status & Use Case

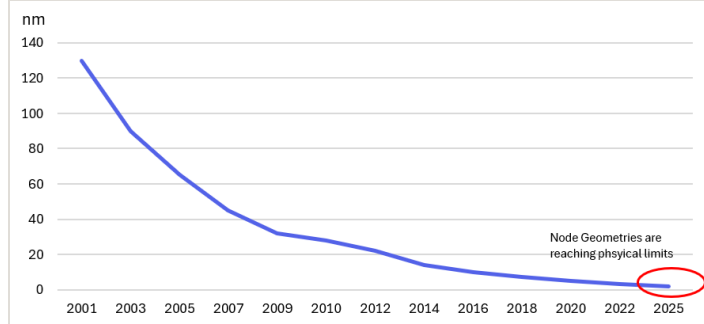
Stage	Status	Capacity (tpa)	Use case
Stage 1	Operational	~350	Qualify, customise, demonstrate and seed the market.
Stage 2	Under construction. First production expected 2H 2027	10,430	Manufacture the qualified products at industrial volume.
Stage 3	Study work underway.	n/a	Likely for low-alpha HPA for semiconductors, HPA for CMP and semiconductor tooling, ATH for direct lithium extraction, plus other HPA and battery applications.

Source: Homodeus research

Material Science is the next evolution in Moore's Law:

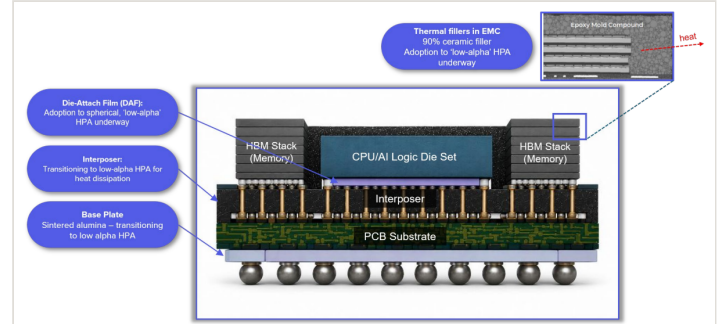
Our discussions with semi-conductor experts have revealed that the next iteration of chip improvements driving [Moore's Law](#) is likely to come from materials science, rather than shrinking geometries, which have historically been the key driver ([Fig 4](#)).

Fig 4: Semiconductor Process Node Geometry Timeline



Source: Homodeus research

Fig 5: HPA key adoption points in Advanced AI Accelerator package



Source: Alpha HPA Jun-26 Quarterly 4C

Key takeaways from semiconductor industry expert call

In recent weeks we have conducted two calls on Alpha HPA including one with a semi-conductor expert.

- [The \\$1B ASX Stock Nvidia Doesn't Know It Needs — Alpha HPA \(A4N\) Deep Dive](#)
- [Semiconductor Deep Dive with YT Boon & Alpha HPA \(ASX:A4N\): Inside the AI Chip Supercycle](#)

Below are the key takeaways from the call with the semi-conductor expert.

MACRO THESIS:

- **2025 was consumed by tariff-driven supply chain reconfiguration;** from late 2025/early 2026 the industry refocused on core technology innovation. Top-4 US hyperscaler AI infrastructure capex is up ~70%+.
- **Moore's Law is stalling on physical limits,** and EUV is hitting economic limits too. So the **next leg of innovation shifts to equipment and materials rather than geometry shrinks** — driving demand for far higher purity inputs (even the cleaning water is a spec problem at sub-atomic tolerances).
- **This is structural, not purely an AI story** — automotive, space, and on-device AI push the same way. AI just compresses the timeline.

WHY ALUMINA, WHY NOW

- **Advanced packaging (CoWoS, HBM stacking) traps heat.** GPUs have gone from ~300W five years ago to ~1,000W. External cooling only solves part of it; the package materials themselves have to conduct heat.
- **Incumbent thermal filler is silica** — mechanically stable, mediocre thermally, semi-commoditised over 30–40 years. **High-purity alumina has similar mechanical properties but 3–4x the thermal conductivity.** Nitrides are more conductive still but react with epoxy resins, so they're not an option.
- **Zero/low alpha emission is the gating spec,** set by TSMC, and applies to anything in proximity to the package (even the solder tin). Rob claims Alpha is ~10x better than the best alternative (Sumitomo Chemical).

COMMERCIAL POSITION

- **Customers convert existing spheroidising equipment from silica to HPA**, so it's not a hard sell — Alpha sits inside a chain running up to TSMC, SK Hynix, Samsung, Micron via Japanese/Korean intermediaries (Nagase, Namics, Resonac, Sumitomo Bakelite).
- **Qualification** is 12–18 months per layer and there are 3–4 layers, so years end-to-end — but **once qualified, extremely sticky** (switching costs run to tens of millions).
- **Two Japanese LOI upgrades last quarter**; the **first customer (engaged Dec 2023) has tripled volume** with another doubling expected. A large Korean player is fast-tracking qualification and building 1,200t capacity.
- **Input economics**: alumina hydrate from Rio at ~US\$400/t versus a product sold at ~US\$29–30k/t. Orica supplies chemicals by pipeline (~200kt/yr) and holds 5%; no commodity index exposure.
- **Expert could not identify a credible competitor** matching the purity spec at planned scale; midstream players report difficulty securing supply.

RISKS AND WATCH ITEMS

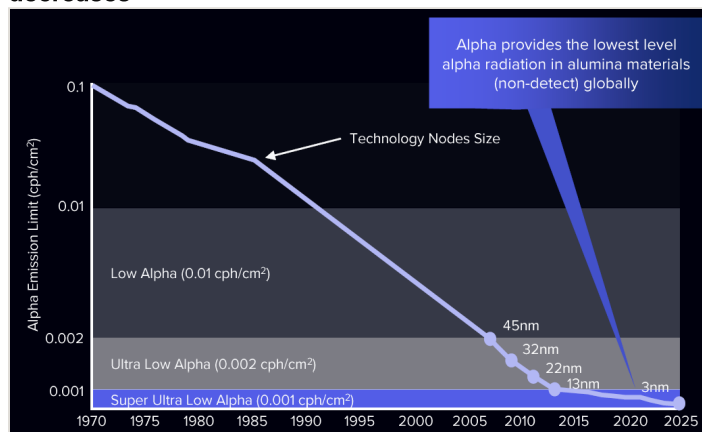
- **Localisation** — **sovereign supply pressure** is focused on the midstream (spheroidising in-country), not back to the raw material, so Australian supply is arguably advantaged. Alpha deliberately avoids Chinese counterparties reselling into Japan/Korea.
- **AI capex moderation** — **The expert doesn't expect it in 2027**; if anything the **industry is capacity-bottlenecked and new fabs are 2–3 years out**, which is when HPA demand lands. Rob's analogy is broadband buildout: hyperscalers have no alternative but to spend.

Zero Alpha HPA - not all 9s are equal:

As A4N's name suggests, the company is capable of producing HPA with 4N's (99.99%) or greater purity. What differentiates Alpha from other HPA is what remains. A4N's unique purification process eliminates detectable Uranium and Thorium (alpha emitters). This is critical for semiconductor production as alpha particles generate a charge that changes a stored bit value from 1 to 0 resulting in errors (bit flip).

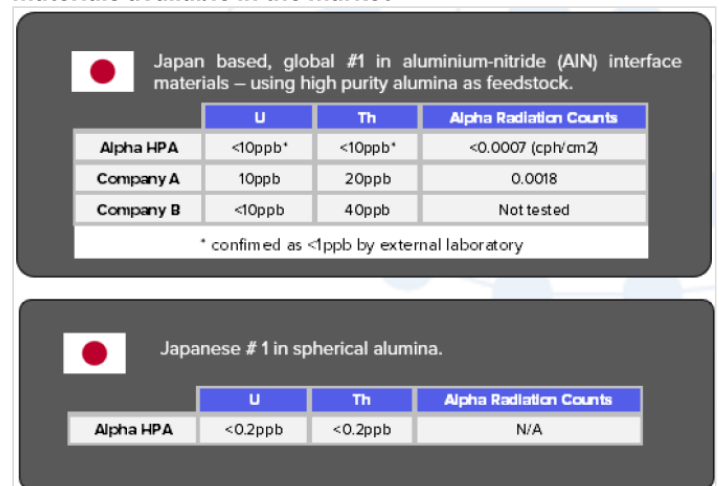
The requirement for 'low alpha' emission packaging materials increase as the semiconductor node size decreases. At current geometries (~2nm) Super Ultra Low Alpha emissions of 0.001cph/cm² (counts per hour per square centimeter) are required. To our knowledge other HPA producers currently cannot eliminate alpha emitters from their remaining impurities, which make them less suitable for use in semiconductors.

Fig 6: Requirements for 'low alpha' emission packaging materials increases as the semiconductor node size decreases



Source: Honeywell Advanced Materials

Fig 7: A4N's materials confirmed as lowest alpha emission materials available in the market



Source: A4N 1H26 report

Fig 8: Alpha HPA relation to competition/downstream

Company	Relationship to Alpha HPA
Sumitomo Chemical	Direct competitor in high-purity alumina, particularly semiconductor thermal fillers
Nippon Light Metal	Direct, established HPA competitor
Sumitomo Bakelite	Downstream semiconductor packaging/materials company; not a direct producer-level HPA competitor
Samsung Electronics	Potential semiconductor end-user, not an HPA competitor

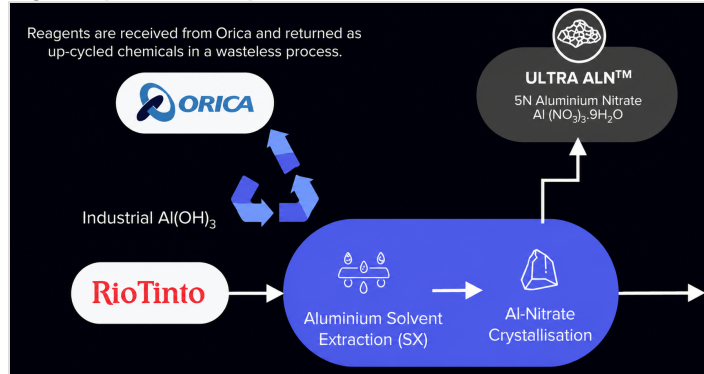
Source: Homodeus research

Rio Tinto–Orica partnership: a vertically integrated moat

In our view A4N's moat extends beyond IP. Their Solvent Extraction (SX) process uses aluminium hydroxide from **Rio Tinto (ASX: RIO)** and reagents from **Orica's (ASX:ORI)** neighbouring sites ([Fig 10](#)), and returns them as upcycled chemicals, resulting in a waste-free process allowing A4N to produce HPA at lower cost relative to peers.

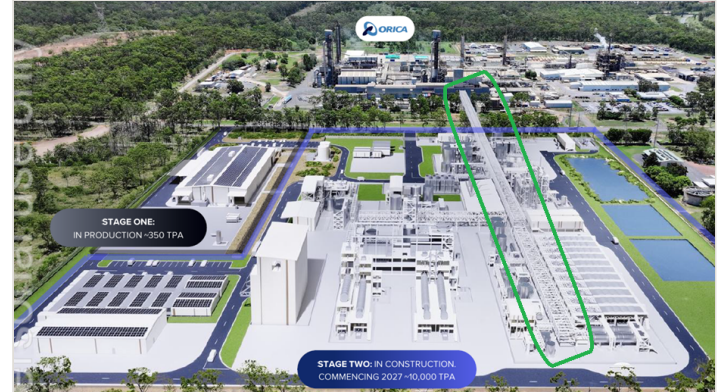
Orica owns approximately 5.02% of Alpha HPA and is A4N's fifth-largest registered shareholder and a strategic partner, but not a controlling shareholder.

Fig 9: Alpha HPA SX process with Orica



Source: Alpha HPA, February 2026 presentation

Fig 10: Spine connecting Orica & Alpha to transfer reagents & up-cycled chemicals



Source: Alpha HPA, February 2026 presentation

Alpha HPA site visit

On Wednesday, 22 July 2026, Alpha HPA held a site visit at its Gladstone, Queensland, facility.

Fig 11: Stage 1 Facility Site Tour



Source: Homodeus research

Fig 12: Rob and me in Alpha's R&D centre



Source: Homodeus research

Fig 13: Aluminium Hydroxide Feedstock from Rio



Source: Homodeus research

Fig 14: 5N Aluminium Nitrate



Source: Homodeus research

Fig 15: Stage 2 Site Tour (Orica facility in background)



Source: Homodeus research

Fig 16: Stage 2 Site Tour - SX (solvent extraction) tanks



Source: Homodeus research

Funding Risk

In December 2024, Alpha and the lenders executed a binding syndicated facility agreement for A\$400 million: A\$320 million construction debt plus an A\$80 million cost-overrun facility, split equally between EFA and NAIF. This contractually closed the loan; however drawdown remains conditional on remaining conditions precedent. The principal disclosed commercial condition is approximately 10,000 tpa of LOIs and product qualification.

Alpha recently announced a commercial win with 12,350 tonnes in aggregate LOIs as of June 2026. This result passes the key 10,000 tpa CP threshold, proving strong market demand and validating the project's economic viability. With additional marketing LOIs expected in the near term, strong commercial momentum continues to de-risk the project, even as formal sign-offs from government lenders NAIF and EFA remain pending.

In discussions, management said it was very confident that the conditions precedent will be met, and in their view the overhang from debt drawdown will be resolved before 4Q CY2026.

Institution	Instrument	Amount	Current status
NRFC	Ordinary equity	A\$75m	Invested and shares issued
EFA	Senior project debt	Up to A\$200m	Contractually committed but conditional before drawdown
NAIF	Senior project debt	Up to A\$200m	Contractually committed but conditional before drawdown
QIC/QCMBT F	Royalty financing	A\$30m	Drawn

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*Price as at 5 August 2026 (*not covered)*

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