

Novacium Files a Provisional Patent Application for A New Process to Transform Black Aluminum Dross into a Valuable Resource

- **Novacium's Proprietary Waste to Energy (W2E) Technology**, an innovative solution that can transform **Black Aluminum Dross**, a toxic waste byproduct of aluminum recycling typically sent to landfills, into valuable resources
- This groundbreaking technology has the potential to reduce costs while making aluminum recycling **a 100% circular process**, maximizing sustainability and resource efficiency
- Lab-scale pilot test results have successfully validated the potential of the proprietary technology
- Technology potential has attracted interest from top-tier European aluminum recyclers, several of whom have already signed Non-Disclosure Agreements (NDAs) to explore the technology further
- In addition to being a Novacium shareholder, HPQ holds an exclusive North American (Canada, USA and Mexico) licence on **Novacium's Proprietary Waste to Energy (W2E) Technology**

Montreal, Canada, January 28th, 2025 — [HPQ Silicon Inc.](#) (“HPQ” or the “Company”) ([TSX-V: HPQ](#), [OTCQB: HPQFF](#), [FRA: O08](#)), a technology company specializing in green engineering of processes, is pleased to update shareholders on the new hydrogen-based technology developed by its France-based affiliate, NOVACIUM SAS (Novacium).

Aluminum is one of the most versatile metals, valued for its light weight, strength, flexibility, and corrosion resistance. Its infinite recyclability makes it an essential material in industries such as construction, transportation, and packaging. Unfortunately, Secondary Aluminum manufacturing (remelting scrap aluminum) produces significant waste, and one of its most troublesome byproducts, **Black Aluminum Dross**, poses serious environmental and safety challenges with limited viable solutions to date.

Novacium innovative process uses **Black Aluminum Dross** as a feedstock to produce green hydrogen and transform the remaining material into a valuable solid by-product. The main advantages of this process include:

- Production of green hydrogen.
- Heat generation.
- Waste neutralization and valorization of the solid by-products.
- On-site treatment, avoiding supplementary costs of outsourcing or landfilling.

“A year ago, Novacium initiated a collaborative PhD project with the [Laboratory of Automation, Process and Pharmaceutical Engineering \(LAGEPP\)](#), under the supervision of the [University of Lyon 1](#) and the [French National Center for Scientific Research \(CNRS\)](#), to investigate the use of alternative additives to boost hydrogen yield from black aluminum dross recycling,” said Dr. Jed Kraiem, Chief Operating Officer of Novacium. *“The project has progressed rapidly, yielding highly encouraging results. These promising findings have captured the attention of several aluminum industry players, from recycler to equipment suppliers, as this waste presents a significant economic and environmental challenge for the aluminum industry.”*

In this regard, an industry expert with more than 40 years of experience, Dr. Oliver Moos, the Managing Director of [Casthouse Engineering and Technology AG](#) (CETAG) of Switzerland, stated this about Novacium's innovative solution: *“Black dross has been a historic challenge for the aluminum industry, and for the first time, I am seeing an innovative and promising approach developed to address this critical issue.”*

The Challenge of Black Aluminum Dross waste generated during the recycling

Despite its many advantages, aluminum recycling is not yet a completely circular process. A significant hurdle is the generation of **Black Aluminum Dross (BAD)**, a toxic waste byproduct of the recycling process. Unlike white dross, a by-product when making primary Aluminum, which contains mostly recoverable aluminum, **BAD** has a lower aluminum content and is contaminated with salts, nitrides, carbides, and other compounds ^[1].

- **Environmental Impact:** **BAD** is hazardous and must be carefully managed to avoid the following environmental issues:
 - **Gas Emissions:** When exposed to water, **BAD** can release flammable hydrogen gas and toxic substances like ammonia, hydrogen sulfide, and phosphine ^[1].
 - **Water Pollution:** The soluble salts in black dross can leach into groundwater, creating long-term pollution risks ^[1].
- **Costly Disposal:** Landfilling **BAD** cost about €600 per tonne in Europe ^[2] and environmentally problematic, due to the strict environmental regulations on the storage and neutralization condition, making it a major challenge for recyclers.



Figure 1. Black dross granules obtained from an aluminum recycler in Austria

The recycled Aluminum market and the Black Aluminum Dross problem

In 2023, the Global Secondary Aluminum Market size totaled 26 million tonnes ^[3] valued at US \$98.87 billion, predicted to reach US \$150.53 billion by 2030 with a CAGR of 6.8% from 2024 – 2030 ^[4].

On average, about 100 kg of aluminum alloy slag is produced per ton of recovered aluminum. However, this can be as high as 200 kg depending on the contamination of the Aluminum processed (paint, plastic coating, ...). Aluminum alloy slag contains a relatively high amount of aluminum metal, of which about 70% is recovered by secondary aluminum companies using different technological methods. The black aluminum dross waste generated from this process, which still contains significant quantities of aluminum, amounts to 4–5 million tons globally each year. Of this, 95% is not valorized and is instead disposed of as hazardous waste in landfills ^[5].

Addressing the Problem

Various companies have already tackled the issue of black dross; most, if not all, processes used need an alkaline reactive solution to induce the reaction of hydrogen production [6].

While using a highly alkaline environment to treat black dross effectively removes the passive oxide layer on aluminum and enables hydrogen generation, it presents significant challenges. The corrosive nature of the process requires specialized equipment and handling to prevent damage, increasing operational complexity and costs. Additionally, the formation of insoluble aluminum hydroxides limits reaction efficiency, necessitating excess alkaline reagents, which further raise costs and generate secondary waste that must be managed [7]. These factors contribute to the low recycling rate of black aluminum dross, with only 5% being recycled while 95% remains landfilled as hazardous waste [5].

Novacium Innovative Solution

Novacium's groundbreaking innovation lies in identifying a new, inexpensive, and readily available additive—another industrial waste material—that significantly increases hydrogen yield. This combined approach offers dual advantages: eliminating the need for a highly corrosive environment and substantially accelerating reaction kinetics.

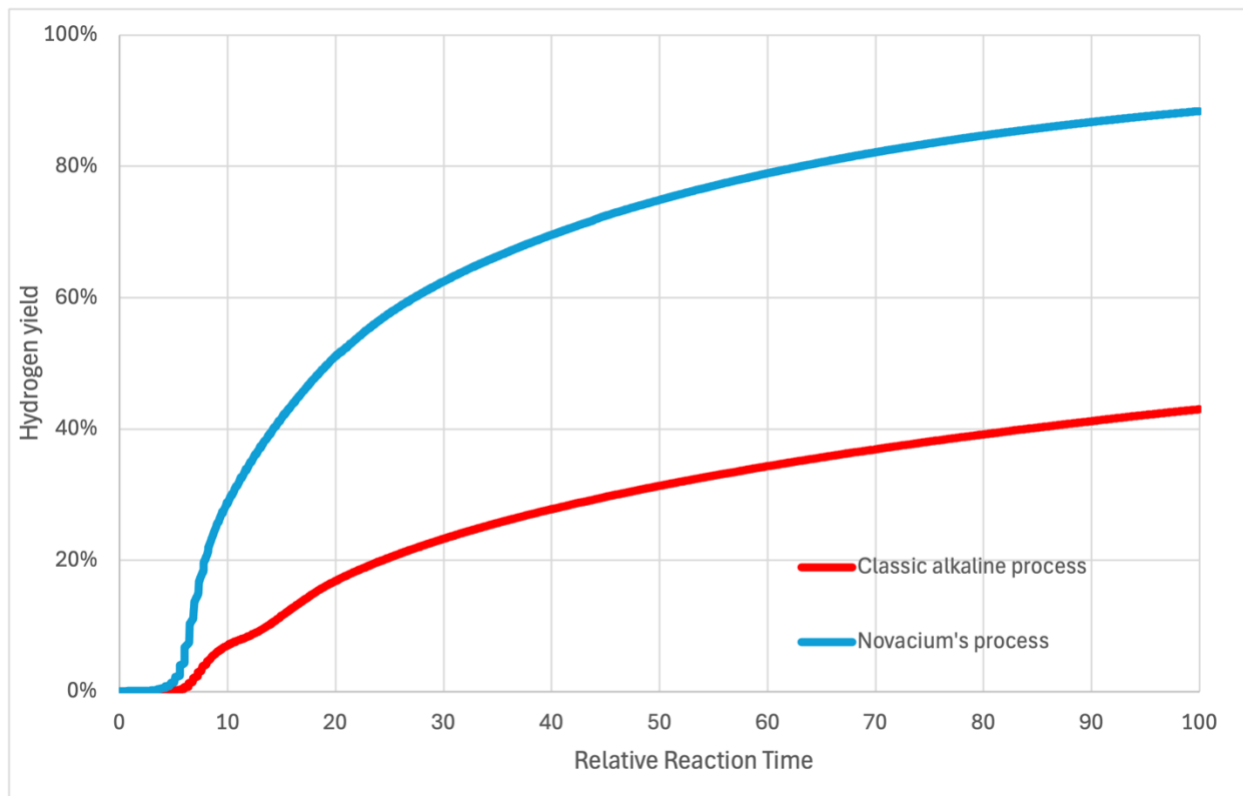


Figure 2. Comparison of hydrogen production between the classic alkaline process and the new additive used in Novacium's process, using the same operating conditions.

As Figure 2 above indicates, compared to the traditional black Aluminum dross treatment process, (Dross A + NaOH) which relies on sodium or potassium hydroxide as additives to accelerate hydrolysis, Novacium's method (Dross A + Additive) demonstrates a significantly higher hydrogen yield. Multiples tests conducted using various dross samples from industrial partners revealed that Novacium's process more than doubles hydrogen production compared to the conventional alkaline approach.

“The patent represents just the first step in establishing the value of this innovative process and demonstrating its transformative potential for the aluminum recycling industry. The immediate challenge is refining the process and proving its scalability,” added Dr. Jed Kraiem. *“With the increasing pressure on aluminum recyclers worldwide to manage industrial waste responsibly, solutions like this—which deliver both significant economic benefits and a path toward a cleaner, greener future—are in high demand.”*

Novacium's innovation, thanks to its scalable and flexible design, offers a solution that could revolutionize waste management in the aluminum recycling industry while paving the way for on-site hydrogen production. By enabling on-site hydrogen production, the process could provide aluminum recyclers with two new potential sources of clean energy, reducing both energy, carbon footprint and operating costs.

Next Steps

Validating the scaling up of the process from lab scale to commercial scale

“With process development now advancing to the pilot stage, the benefits of this technology for industry participants are so significant that collaboration with industry players at this point in our development is a very real possibility,” said Bernard Tourillon, President and CEO of HPQ Silicon Inc. and NOVACIUM SAS. *“Although difficult to determine with precision at this stage, a rough estimate of potential savings from implementing Novacium’s technology suggests cost reductions ranging from C\$900 (€600) to C\$1,500 (€1,000) per tonne^[8] of Black Aluminum Dross processed.”*

REFERENCE SOURCES

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- [5] Resources, Conservation and Recycling, November 2021, A new approach to recover the valuable elements in black aluminum dross. [Link to Article](#)
- [6] Davis, J., & Reifscheider, R. (2023). Obtaining Valuable Solids and Combustible Gas from Aluminum Remelting Waste (WIPO Patent WO 2023/039490A1)
- [7] Srivastava, A., & Meshram, A. (2023). On trending technologies of aluminium dross recycling: A review. Process Safety and Environmental Protection, 171, 38 54. <https://doi.org/10.1016/j.psep.2023.01.010>
- [8] Management estimates that will be review regularly

Other news:

On January 27, 2025, HPQ Board of Directors granted incentive stock options under the company's 2021 Stock Option Plan of the company entitling the option holder to acquire 1,000,000 common shares of the company. These options are exercisable at a price of \$0.25 per share and will expire on January 27th, 2027. Each share issued pursuant to those grants will have a mandatory four (4) months and one (1) day holding period from the date of the grant of the options.

About NOVACIUM SAS

Novacium is an HPQ - affiliated company that started in Q3 2022. This green technology startup is based in Lyon, France and is a partnership with HPQ and three of France’s leading research engineers, Dr. Jed KRAIEM PhD, Novacium's Chief Operating Officer (“COO”), Dr. Oleksiy NICHIPORUK PhD, Novacium's Chief

Technical Officer (“CTO”), and Dr. Julien DEGOULANGE PhD, Novacium’s Chief Innovation Officer (“CIO”). Novacium is a new Research and Development company which allows researchers to develop their own technology in high-added-value fields connected to renewable energy and allows HPQ Silicon Inc. a Canadian company, to expand the depth and reach of its technical team to help develop its silicon and new renewable energy projects.

About HPQ Silicon

[HPQ Silicon Inc. \(TSX-V: HPQ\)](#) is a Quebec-based TSX Venture Exchange Tier 1 Industrial Issuer.

HPQ is developing, with the support of world-class technology partners [PyroGenesis Canada Inc.](#) and [NOVACIUM SAS](#), new green processes crucial to make the critical materials needed to reach net zero emissions.

HPQ activities are centred around the following five (5) pillars:

- 1) Becoming a green low-cost (Capex and Opex) manufacturer of Fumed Silica using the **FUMED SILICA REACTOR**, a proprietary technology owned by HPQ Silica Polvere Inc being developed for HSPI by PyroGenesis.
- 2) Becoming a producer of silicon-based anode materials for battery applications with the assistance of NOVACIUM SAS.
- 3) HPQ SILICON affiliate NOVACIUM SAS is developing a low carbon, chemical based on demand and high-pressure autonomous hydrogen production system.
- 4) HPQ SILICON affiliate NOVACIUM SAS is developing a new process to transform black aluminium dross into a valuable resource.
- 5) Becoming a zero CO₂ low-cost (Capex and Opex) producer of High Purity Silicon (2N+ to 4N) using our **PUREVAP™ “Quartz Reduction Reactors” (QRR)**, a proprietary technology owned by HPQ being developed for HPQ by PyroGenesis.

For more information, please visit [HPQ Silicon web site](#).

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