

IMPROVING THE PERFORMANCE OF ANODE MATERIALS WITH NOVACIUM'S PATENTED SURFACE TREATMENT PROCESSES

MONTREAL, Canada, October 25th, 2023 — [HPQ Silicon Inc.](#) (“HPQ” or the “Company”) ([TSX-V: HPQ](#)) ([OTCQB: HPQFF](#)) ([FRA: O08](#)), a technology company specializing in green engineering of silica and silicon-based materials is pleased to inform its shareholders that its affiliate Company based in Lyon, France, NOVACIUM SAS (“Novacium”) has acquired a family of patents [1] related to the surface treatment of carbon base materials from [Dr. Alexander Zaderko](#) [2].

Dr. Zaderko is a world-renowned researcher from the University of Kyiv in Ukraine with more than 20 years of experience in carbon functionalization for various applications, including energy and supercapacitors.

IMPROVING BATTERY PERFORMANCE OF SILICON-BASED ANODE MATERIALS

Silicon-based anodes have up to 10 times the energy density of a graphite-based anode, which is why Porsche, Mercedes and GM are betting on silicon-anode batteries [3].

While silicon-based anode materials hold great promise for batteries, they are known to suffer from significant degradation during charging and discharging cycles. To address this issue, a common approach is the application of a carbon coating. This carbon coating is widely used to mitigate some of the degradation, improving the overall performance and durability of silicon-based anodes [4].

In collaboration with Dr. Zaderko, Novacium's team of researchers have adapted and validated the substantial potential of Novacium surface treatments for carbon-based materials in battery applications.

Initial tests have shown significant performance improvements in silicon-based Li-ion batteries. These results indicate that the new surface treatment has a dual effect on battery properties: it reduces degradation by improving the interface with the electrolyte, enhancing cyclability (battery lifespan), and also reduces charging time.

POTENTIAL PERFORMANCE IMPROVEMENT FOR A WIDE RANGE OF LITHIUM-ION BATTERIES

Furthermore, initial test results with graphite anode materials alone (without silicon) suggest that the new surface treatment positively impacts the performance of graphite-based Li-ion batteries by enhancing the graphite-electrolyte interface.

“Our innovative approach aims to significantly improve the operation of lithium batteries,” said Mr. Oleksiy NICHIPORUK, Novacium's Chief Technical Officer (“CTO”). “We believe that the application of Novacium's patented surface treatments has the potential to transform and enhance the performance of Li-ion batteries, benefiting not only silicon-based anode materials but the entire battery market.”

NOVACIUM'S SURFACE TREATMENT PROCESS AND HPQ'S BATTERY STRATEGY

HPQ is committed to providing custom silicon (Si)-based anode materials solutions to industry players. Our exclusive access to Novacium's new surface treatment further enhances our appeal to industry players.

THE MARKET FOR SILICON-BASED MATERIALS FOR LITHIUM BATTERIES IS EXPANDING

A major trend in the lithium battery industry is the introduction of small amounts (between 5% and 10%) of silicon oxide (SiOx) into graphite composite electrodes. This is due to the fact that pure graphite anodes have essentially achieved their maximum performance in terms of energy density [5].

This new reality is driving a surge in demand for silicon anode materials. As of 2023, this market is valued between US\$1.1 billion [6] and US\$2.7 billion [7]. Its growth prospects indicate a potential demand of

300,000 tons by 2030, estimated at US\$15 billion [8], according to one source, and US\$ 131.6 billion in 2033 according to another source [9].

It's important to highlight that silicon-based materials for Li-ion batteries currently make up a relatively small portion, accounting for less than 10%, of the global demand for graphite, which is primarily used in the manufacture of anode materials for Li-ion batteries. This graphite market is estimated to be worth US\$25 billion in 2023 [10].

“Novacium's new patented surface treatment, which also improves the performance of graphite-based Li-ion batteries commonly used in the industry, provides HPQ and Novacium with a unique opportunity to offer solutions tailored to both the short- and long-term needs of the battery industry,” said Mr. Bernard Tourillon, President and CEO of HPQ Silicon Inc. and NOVACIUM SAS. “Promising preliminary discussions have already started to take place with entities already under non-disclosure agreements (NDAs) with HPQ on the potential of this technology.”

REFERENCE SOURCES

- [1] Under the terms of the Novacium SAS incorporation agreement, HPQ holds a worldwide license to commercialize Novacium SAS's inventions and IP.
- [2] Patents (US 10000382 et UA 110301) associated with the family WO 2016/072959, (METHOD FOR CARBON MATERIALS SURFACE MODIFICATION BY THE FLUOROCARBONS AND DERIVATIVES), held by Alexander ZADERKO, Vasyl PRUSOV et Vitaliy DIYUK, are in the process of being registered in the name of Novacium SAS.

Patents applications (DE 112017007450 et US 2020/198971) associated with the family WO 2018/194533, (METHOD FOR CHEMICAL MODIFICATION OF FLUORINATED CARBONS WITH SULFUR-CONTAINING SUBSTANCE) held by Alexander ZADERKO, Vasyl PRUSOV et Vitaliy DIYUK, are in the process of being registered in the name of Novacium SAS.

Patents applications (CA 3 123 354, EP 198 365 16.5, JP 2021-534281, KR 10-2021-7021938, US 17/413,591, UA 123512)) associated with the family WO 2020/121119, (THE PROCESS FOR OBTAINING OF FLUORALKYLATED CARBON QUANTUM DOTS), held by Alexander ZADERKO, are in the process of being registered in the name of Novacium SAS.
- [3] CNBC web article dated April 22 2023, entitled “Why Porsche, Mercedes and GM are betting on silicon-anode batteries”. [Link to source](#)
- [4] “SiOx as a Potential Anode Material for Li-Ion Batteries: Role of Carbon Coating, Doping, and Structural Modifications” by Hyeon-Woo Yang and Sun-Jae Kim. [Link to source](#)
- [5] The Royal Society of Chemistry 2020 Sustainable Energy Fuels, 2020, 4, 5387–5416
- [6] QY Research, SNE Research, Shinhan Securities / NBM June 2023 Deck page 11
- [7] The [global silicon anode battery market](#) is likely to be valued at US\$ 2.7 billion in 2023. From [Future Market Insights Global and Consulting Pvt. Ltd.](#)
- [8] QY Research, SNE Research, Shinhan Securities / NBM June 2023 Deck page 11
- [9] According to Future Market Insights, the [global silicon anode battery market](#) is Estimated to Reach US\$ 131.6 Billion by 2033.

[10] Based on the analysis by Fact.MR, the global graphite market is valued to be US\$ 25.9 billion in 2023 and it is expected to grow at a CAGR of 8,5% to reach US\$ 58,6 billion by the end of 2023.

[Link to source](#)

About NOVACIUM SAS

Novacium is green technology startup based in Lyon, France started in Q3 2022. It is the result of a partnership between three of France's leading research engineers, Mr. Jed KRAIEM PhD, Novacium's Chief Operating Officer ("COO"), Mr. Oleksiy NICHIPORUK PhD, Novacium's Chief Technical Officer ("CTO"), and Mr. Julien DEGOULANGE PhD, Novacium's Chief Innovation Officer ("CIO"), who wanted to start a new Research and Development company to develop their own technology in high added value fields connected to renewable energy, and HPQ Silicon Inc, a Canadian company, looking to expand the depth and reach of technical team in order to 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 providers [PyroGenesis Canada Inc.](#) (TSX: PYR) (NASDAQ: PYR) 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 being developed for HPQ by PyroGenesis.
- 2) 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.
- 3) Becoming a producer of silicon-based anode materials for battery applications with the assistance of NOVACIUM SAS.
- 4) HPQ SILICON affiliate NOVACIUM SAS is developing a low carbon, chemical base on demand and high-pressure autonomous hydrogen production system.
- 5) Working to become the first producer of nano silicon materials from High Purity Silicon chunks using our proprietary **PUREVAP™ Nano Silicon Reactor (NSiR)**, a technology owned by HPQ being developed for HPQ by PyroGenesis.

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

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This press release contains certain forward-looking statements, including, without limitation, statements containing the words "may", "plan", "will", "estimate", "continue", "anticipate", "intend", "expect", "in the process" and other similar expressions which constitute "forward-looking information" within the meaning of applicable securities laws. Forward-looking statements reflect the Company's current expectation and assumptions and are subject to a number of risks and uncertainties that could cause actual results to differ materially from those anticipated. These forward-looking statements involve risks and uncertainties including, but not limited to, our expectations regarding the acceptance of our products by the market, our strategy to develop new products and enhance the capabilities of existing products, our strategy with respect to research and development, the impact of competitive products and pricing, new product development, and uncertainties related to the regulatory approval process. Such statements reflect the current views of the Company with respect to future events and are subject to certain risks and uncertainties and other risks detailed from time-to-time in the Company's ongoing filings with the

security's regulatory authorities, which filings can be found at www.sedar.com. Actual results, events, and performance may differ materially. Readers are cautioned not to place undue reliance on these forward-looking statements. The Company undertakes no obligation to publicly update or revise any forward-looking statements either as a result of new information, future events or otherwise, except as required by applicable securities laws.

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Source: HPQ Silicon Inc.

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