



INDEPENDENT ANALYSIS CONFIRMS HPQ FUMED SILICA REACTOR MATERIAL’S COMMERCIAL-QUALITY

Compared to conventional processes, HPQ commercial Fumed Silica can be made:

- **Using 87% less energy, and**
- **Releasing 84% less CO₂ eq emissions**

MONTREAL, Canada, November 8th, 2023 — [HPQ Silicon Inc.](#) (“HPQ” or the “Company”) ([TSX-V: HPQ](#)) ([OTCQB: HPQFF](#)) ([FRA: O08](#)), a technology company specializing in green engineering processes for silica and silicon material production is pleased to update shareholders on the most recent developments on its Fumed Silica Initiative, led by its wholly owned subsidiary, HPQ Silica Polvere Inc. (HPQ Polvere).

Independent analysis done at McGill University confirms that HPQ Polvere's Fumed Silica Reactor produces commercial-quality hydrophilic material with a high surface area and excellent thickening efficiency.

INDEPENDENT ANALYSIS CONFIRMS HPQ FUMED SILICA MEETS ALL COMMERCIAL CRITERIA

Technology provider PyroGenesis Canada Inc. [PyroGenesis Canada Inc.](#) ([TSX: PYR](#)) ([NASDAQ: PYR](#)) ([FRA: 8PY](#)) (Pyrogenesis) sent material made using the lab-scaled model of HPQ Polvere’s proprietary Fumed Silica Reactor (“FSR”) and two different grades of commercially available Fumed Silica materials to an independent third party laboratory (McGill University) for an analysis of their structural and chemical characteristics. The information obtained allowed the production of the Technical Data Sheet (TDS) [1].

The salient point of the analysis is that it confirms that the HPQ-produced Fumed Silica material, made under less-than-optimal operating parameters, is of commercial quality with the following key characteristics [1]:

- It is Hydrophilic,
- It possesses High Surface Area (135-185 m²/g), and
- It has Excellent Thickening Efficiency.

“This is a major milestone for HPQ,” said Mr. Bernard Tourillon, President and CEO of HPQ Silica Polvere Inc. and HPQ Silicon Inc. “The results not only validate that we can make commercial grade Hydrophilic Fumed Silica directly from Quartz in one step using only the power of plasma, but also represent a clear indication of the test results we expect from the numerous parties who have requested samples under NDA.”

LAB SCALE TESTING VALIDATES THE DISRUPTIVE NATURE OF HPQ FUMED SILICA REACTOR

In addition to making commercial-grade Fumed Silica directly from quartz, a substantial disruptive advantage, the lab-scale testing of HPQ Polvere's proprietary FSR process provided PyroGenesis with the necessary operational data to create the following table. The table below showcases the significant advantages of the FSR compared to conventional processes.

	Commercial Fumed Silica	Fumed Silica Polvere	Polvere FRS Advantage
Energy Consumption (kWh / Kg Fumed Silica)	100 – 120 ^[2]	10 – 15 ^[3]	-87.5 to -90%
GHG Impact (Kg CO₂ eq / Kg Fumed Silica)	8 – 17 ^[2]	1 – 2.5 ^[5]	-84 to -88%
HCl Production (Kg / Kg Fumed Silica)	2.4 ^[4]	0	NO HCl

Table 1, HPQ disruptive advantages versus conventional processes



Data from the latest tests show an expected reduction in energy consumption for Fumed Silica production using the FSR, theoretical estimations show that we can expect a reduction in energy consumption by 87.5% to 90% versus conventional processes. As energy represents one of the largest variable costs in traditional Fumed Silica production processes, HPQ Polvere, with its proprietary Fumed Silica Reactor, gains a substantial economic advantage over traditional manufacturers.

Furthermore, modelization indicate that by using our process, CO₂ eq. emissions can be reduced by 84% to 88%, versus traditional processes, surpassing the 50% reduction potential we first mentioned in our [July 2023 release](#).

This unique capability can help substantially minimize the environmental impact associated with Fumed Silica manufacturing and the carbon taxes associated which represents another substantial economic advantage for HPQ Polvere. In Europe, where the current price per tonne of CO₂ emissions for manufactured and imported goods is approximately 90 euros [6], traditional producers of fumed silica could potentially reduce their carbon tax cost by around 630 euros per tonne [7] simply by upgrading to the HPQ Polvere process.

Finally, traditional processes to make Fumed silica produce an average of 2.4 Kg of Hydrogen chloride (HCl) per Kg of Fumed silica produced [4]. HCl, being a hazardous by-product, the Capex and Opex costs associated with its management can be substantial. As the FSR process does not produce any HCl, this represents an additional substantial economic advantage for HPQ Polvere.

REFERENCE SOURCES

[1] TECHNICAL DATA SHEET, prepared from the tests resulted from McGill University

Behavior in relation to water Hydrophilic				
Test Methods	Unit	Fumed Silica Commercial A	Fumed Silica Commercial B	Fumed Silica Polvere
BET Surface Area	m ² /g	125 – 175	175 – 225	135 – 185
Ignition Loss (LOI)	%	≤ 1.5	≤ 1.5	≤ 1.5
Moisture	%	≤ 1.5	≤ 1.0	≤ 1.0
pH Value		3.7 – 4.7	3.7 – 4.5	3.7 – 4.5
Al₂O₃	%	< 0.03	< 0.03	< 0.03
Fe₂O₃	%	< 0.003	< 0.003	< 0.003
TiO₂	%	< 0.03	< 0.03	< 0.03
HCl	%	< 0.020	< 0.020	0
SiO₂ Content	%	> 99.8	> 99.8	> 99.8
Thickening Efficiency	mPas	Good	Excellent	Excellent

Summary of Fumed Silica Polvere Product fabricated with Lab Scale Fumed Silica Reactor at PyroGenesis versus two different commercially available Fumed Silica Material

- [2] Frischknecht, Rolf, et al. "Life cycle inventories and life cycle assessment of photovoltaic systems." *International Energy Agency (IEA) PVPS Task 12* (2020).
- [3] PyroGenesis Canada Inc.
- [4] Cai, H., Wang, X., Kelly, J. C., & Wang, M. (2021). Building Life-Cycle Analysis with the GREET Building Module: Methodology, Data, and Case Studies (No. ANL/ESD-21/13). Argonne National Lab. (ANL), Argonne, IL (United States).
- [5] The 1 Kg eq of CO₂ per Kg of Fumed Silica is based on [Hydro Quebec data](#) that indicate in Quebec 1.3 g of CO₂ are generated eq per KWh. While the 2.5 is based on the Canadian average for electricity generation carbon intensity of 150 g per KWh.
- [6] The Wall Street Journal article, April 18, 2023, "[World's First Carbon Import Tax Approved by EU Lawmakers](#)"
- [7] The 630 euros per tonne carbon taxes reduction is estimated by taking the lowest CO₂ eq emission for conventional process (8) less the lowest CO₂ eq emission for the FRS (1) and multiplying the result by 90. $(8-1) = 7, 7*90 = 630$.

About PyroGenesis Canada Inc.

PyroGenesis Canada Inc., a high-tech company, is a leader in the design, development, manufacture and commercialization of advanced plasma processes and sustainable solutions which reduce greenhouse gases (GHG) and are economically attractive alternatives to conventional "dirty" processes. PyroGenesis has created proprietary, patented, and advanced plasma technologies that are being vetted and adopted by multiple multibillion dollar industry leaders in three massive markets: iron ore pelletization, aluminum, waste management, and additive manufacturing. With a team of experienced engineers, scientists and technicians working out of its Montreal office, and its 3,800 m² and 2,940 m² R&D and manufacturing facilities, PyroGenesis maintains its competitive advantage by remaining at the forefront of technology development and commercialization. The operations are ISO 9001:2015 and AS9100D certified, having been ISO certified since 1997. For more information, please visit: www.pyrogenesis.com

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.](#) (TSX: [PYP](#)) ([NASDAQ: \[PYP\]\(#\)](#)) 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 zero CO₂ low-cost (Capex and Opex) producer of High Purity Silicon (2N+ to 4N) using our proprietary **PUREVAP™ "Quartz Reduction Reactors" (QRR)** being developed for HPQ by PyroGenesis.
- 2) Becoming a producer of silicon-based anode materials for battery applications with the assistance of NOVACIUM SAS.
- 3) Becoming a green low-cost (Capex and Opex) producer of Fumed Silica using our proprietary **FUMED SILICA REACTOR** being developed by PyroGenesis.
- 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)** being developed by PyroGenesis.

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



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