

# HPQ Silicon: a Project for the Development of Silicon-based Anode Materials for Lithium-ion Batteries

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- With a budget of \$500,000, the project is jointly funded by the Ministère de l'économie et de l'Innovation via PRIMA Québec (40%), the Natural Sciences and Engineering Research Council of Canada (NSERC) (40%), [HPQ Silicon Resources Inc.](#) (10%) and PyroGenesis Canada Inc. (10%)
- The research project is directed by Professor Lionel Roux of the Institut national de la recherche scientifique (INRS).
- HPQ Silicon is poised to become the anode silicon material supplier of choice for the battery industry.

MONTREAL, May 26, 2021 -- Innovative Silicon Solutions company [HPQ Silicon Resources Inc.](#) ("HPQ" or the "Company") (TSX-V: HPQ) (OTCQX: HPQFF) (FWB: UGE), is pleased to announce that HPQ, PyroGenesis Canada Inc. (TSX: PYR) (NASDAQ: PYR) (FRA: 8PY), and the Énergie Matériaux Technologies communications Centre (ETM) of the Institut national de recherche scientifique (INRS) and the National Research Council of Canada (NRC) have set up a research project focused on the development of silicon (Si)-based materials as active anode materials for Lithium-ion batteries ("Li-ion").

## A HIGHLY QUALIFIED MULTIDISCIPLINARY TEAM TO MEET THE CHALLENGE

HPQ and PyroGenesis will be responsible for the production of silicon materials from the PUREVAP™ Quartz Reduction Reactor (QRR) and the PUREVAP™ Nano Silicon Reactor (NSiR). The INRS-EMT will be responsible for the characterization of the materials and the optimization of the electrode formulations at laboratory scale.

## SILICON, A PROMISING ANODE MATERIAL, BUT

Despite intensive research efforts and significant investments in silicon battery materials, current manufacturing processes remain unscalable or even commercially unviable. This explains why even though silicon (Si) is theoretically a superior anode material for Li-ion batteries than graphite, it is currently included in less than 5%<sup>1</sup> of commercial battery anodes and its use is limited to a few advanced Li-ion battery manufacturers. The NSiR PUREVAP™ developed by PyroGenesis is a game-changer and solves the scalability and commercial viability issues of silicon (Si) for the Li-ion battery market.

## THE PRESENCE OF SILICON AS AN ANODE MATERIAL IN LI-ION BATTERIES WILL INCREASE

Advances made in research on the use of silicon (Si) in Li-ion battery anodes indicate that by 2030, up to 30% of the active anode materials for Li-ion batteries used in electric vehicles could be silicon<sup>2</sup>. This increase, combined with the expected exponential growth in demand for electric vehicles, will create a very high demand for the battery-grade silicon (Si) that HPQ and PyroGenesis are developing, with an estimated market of over 200,000 MT per year by 2030.

*"This research project, funded in large part by government grants, will provide us with independent validation of our silicon battery products, while providing us with us quick and comprehensive feedback on the potential of our materials. Since we will own the data we collect, it will be very useful when we present our products to a multitude of potential buyers," said Bernard Tourillon, President and CEO HPQ Silicon. "HPQ's Silicon R&D Consortium has the depth and flexibility to meet the challenges, as we strive to produce products for renewable energy storage participants and electric vehicle manufacturers, each of which is searching for cost-effective ways to increase the Silicon content of their batteries."*

## About the professor Lionel ROUX

Professor Lionel ROUX of INRS-EMT has developed a scientific program focused on the study of new electrode materials for various applications of industrial interest (batteries, aluminum production...). In the last few years, an important part of his research activities has been devoted to the study of Si anodes for Li-ion batteries and to the development of in-situ characterization methods applied to batteries. He is the

author of more than 150 publications, including about 20 papers and 2 patents on Si anodes for Li-ion batteries. He received the Energia award from the Association Qu?b?coise pour la Ma?trise de l'?nergie for his work in this field.

About the ?nergie Mat?riaux T?l?communications Research Centre (EMT) and the Institut national de la recherche scientifique (INRS)

The ?nergie Mat?riaux T?l?communications Centre (EMT) of l'INRS is a centre of excellence in research, innovation and graduate education in the fields of advanced materials, nanotechnology, photonics, telecommunications and sustainable energy. The EMT Centre brings together approximately 40 professors.

About PRIMA Qu?bec

The advanced materials research and innovation hub PRIMA Qu?bec supports and facilitates the advanced materials ecosystem and acts as an engine of innovation and growth in Quebec. Through support and funding, it stimulates the competitiveness of Quebec companies by helping them benefit from research expertise. As a Sectoral Industrial Research Group (SIRG), PRIMA Qu?bec relies on financial support from both the Quebec government and the private sector when promoting research-industry relations.

About the Natural Sciences and Engineering Research Council of Canada (NSERC)

NSERC invests more than \$1.2 billion annually in research on the natural sciences and engineering in Canada. With this funding, more than 11,000 world-class researchers are making discoveries and scientific breakthroughs. It also fosters partnerships and collaborations that bring discoverers and users closer together. The research partnerships that NSERC enables between researchers and companies help guide R&D and address the challenges of moving from the lab to the marketplace. NSERC also provides scholarships, fellowships and practical training opportunities to more than 30,000 post-secondary students and postdoctoral fellows. These young researchers are the next generation of Canada's science and engineering leaders.

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 products. The Company provides its engineering and manufacturing expertise and its turnkey process equipment packages to customers in the defense, metallurgical, mining, advanced materials (including 3D printing), and environmental industries. With a team of experienced engineers, scientists and technicians working out of its Montreal office and its 3,800 m<sup>2</sup> and 2,940 m<sup>2</sup> manufacturing facilities, PyroGenesis maintains its competitive advantage by remaining at the forefront of technology development and commercialization. The Company's core competencies allow PyroGenesis to provide innovative plasma torches, plasma waste processes, high-temperature metallurgical processes, and engineering services to the global marketplace. PyroGenesis' operations are ISO 9001:2015 and AS9100D certified. For more information, please visit [www.pyrogenesis.com](http://www.pyrogenesis.com).

About HPQ Silicon Resources

[HPQ Silicon Resources Inc.](#) (TSX-V: HPQ) is a Quebec-based innovative silicon solutions company that offers innovative silica (SiO<sub>2</sub>), silicon (Si) based solutions and is developing a unique portfolio of high value added silicon (Si) products sought after by battery and electric vehicle manufacturers.

Silicon (Si), also known as silicon metal, is one of today's key strategic materials needed for the decarbonization of the economy and the Renewable Energy Revolution ("RER"). However, silicon does not exist in its pure state and must be extracted from quartz (SiO<sub>2</sub>) in what has historically been a capital and energy-intensive process.

With PyroGenesis Canada Inc. (TSX: PYR), a high-tech company that designs, develops, manufactures and commercializes plasma - based processes, HPQ is developing the *PUREVAP™ "Quartz Reduction Reactors"* (QRR), an innovative process (patent pending), which will permit the one-step transformation of quartz (SiO<sub>2</sub>) into high purity silicon (Si) at reduced costs, energy input, and carbon footprint that will propagate its considerable renewable energy potential. Through its 100% owned subsidiary, HPQ NANO Silicon Powders Inc., the *PUREVAP™ Nano Silicon Reactor (NSiR)* is a new proprietary process that can use different purities of silicon (Si) as feedstock, to make a wide range of nano/micro spherical powders of different sizes and nanowires. For more information, please visit HPQ Silicon web site.

Disclaimers:

*The Corporation's interest in developing the PUREVAP<sup>®</sup> QRR and any projected capital or operating cost savings associated with its development should not be construed as being related to the establishing the economic viability or technical feasibility of any of the Company's Quartz Projects.*

*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 on-going filings with the security's regulatory authorities, which filings can be found at [www.sedar.com](http://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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This News Release is available on the company's CEO Verified Discussion Forum, a moderated social media platform that enables civilized discussion and Q&A between Management and Shareholders.

Source: HPQ Silicon

For further information contact:

Bernard J. Tourillon, Chairman, President and CEO, Tel: (514) 907-1011  
Patrick Levasseur, Vice-President and COO, Tel: (514) 262-9239  
<http://www.hpqsilicon.com> Email: [Info@hpqsilicon.com](mailto:Info@hpqsilicon.com)

<sup>1</sup> Source: Pallinghurst-Traxys battery analysis (Pr<sup>e</sup>sentation NOU)

<sup>2</sup> Source : Roskill

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