



**PYROGENESIS DEMONSTRATES THAT THE PUREVAP™ PROCESS TRANSFORMS  
LOW PURITY QUARTZ (97.5%) TO HIGH PURITY SILICON METAL POWDER;  
DEFYING STANDARD METHODS**

**MONTREAL, QUEBEC--(Marketwired – November 2, 2016) - PyroGenesis Canada Inc.** (<http://pyrogenesis.com>) (TSX-V: PYR) (OTCQB: PYRNF), a clean-tech company (the “Company” or “PyroGenesis”) that designs, develops, manufactures and commercializes plasma waste-to-energy systems and plasma torch products, announces today that the PUREVAP™ process can not only transform high purity quartz to high purity silicon metal, but the process can also transform low purity quartz (97.5%) to high purity silicon metal.

“These results are significant as the prevailing proposition suggests that the quartz purity level required to make high purity silicon metal is over 99.5%<sup>1</sup>,” said P. Peter Pascali, President and CEO of PyroGenesis. “The PUREVAP™ has proven that to no longer be the case. We have demonstrated that the process can produce quartz of a significantly lower purity level (97.5%) as feedstock, and still produce high purity silicon metal. The implications of this are enormous when considering the potential commercial applications of the process. Conceivably, we can now take a cheap and abundant low purity quartz feedstock and transform it into a high value end product.”

“We are extremely pleased with the progress to date,” said Pierre Carabin, CTO of PyroGenesis. “Particularly, when one considers today’s results in light of our press release dated September 29, 2016, wherein we announced, amongst other things, that the PUREVAP™ process can remove one of the toughest impurities on the road to solar grade silicon, namely boron, from the final material produced. It seems that we are truly on to something unique.”

In addition, Mr. Pascali provides a background/update in the following Q&A format:

*Q. What is the PUREVAP™ process?*

A. The PUREVAP™ process is a process being developed by PyroGenesis which is targeting the transformation of quartz, in one-step, into a solar grade metal suitable for solar panel

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<sup>1</sup> NI 43-101 Preliminary Economic Assessment on the Langis Silica Deposit and a Metallurgical Silicon Processing Plant in the Matapedia Region, Province of Québec, Canada. PEA study prepared by Viridis.iQ, GmbH in accordance with the requirements of National Instrument 43-101; “Exploring for silica in Quebec”, SIDEX, Online report, <http://www.sidex.ca/wp-content/uploads/2015/02/Exploring-for-Silica-in-Quebec.pdf>, February 2015, Accessed on November 1<sup>st</sup> 2016.

applications. This effectively eliminates significant overheads thereby creating a simple, pure and cheap alternate to that currently available. If successful, this process could have a significant impact on the solar panel industry. Of note, however, there are significant additional commercial applications at lower silicon purity levels as reflected in Table 1 below<sup>2</sup>:

<b>Categories of Silicon</b>	<b>Silicon Purity</b>	<b>Applications</b>
Metallurgical Grade Silicon (MG-Si)	~ 98-99.5%	Casting & Chemical Industry (e.g. silicones)
Chemical Grade Polysilicon	3N-5N	Chemical Industry
Solar Grade Polysilicon (SOG-Si)	6N-9N	Photovoltaic Industry, Solar Industry
Electronic Grade Polysilicon	9N-11N	Semi-Conductor Industry (e.g. microchips in computers, tablets and cell phones)

Figure 1

*Q. What is PyroGenesis currently contracted for with HPQ Silicon Resources Inc. (“HPQ”)?*

A. As previously disclosed, PyroGenesis was first engaged by HPQ in February 2015 to demonstrate, on a laboratory scale, that the PUREVAP™ process could produce high purity silicon metal from quartz in just one step. It was based on the successful results of this testing that an \$8.3MM contract was signed with HPQ to design, fabricate, assemble, commission and test a 200 metric tonne (MT) per year PUREVAP™ pilot system to produce silicon metal directly from quartz.

PyroGenesis is also engaged by HPQ in a second testing phase (“Phase 2”), geared towards generating and collecting data which can be used for the scale-up of the PUREVAP™ process. It is within this Phase 2 testing that the current results were demonstrated.

<sup>2</sup> Odden, J. O., Halvorsen, G., Rong, H., Glockner, R., Comparison of the energy consumption in different production processes for solar grade silicon, Conference: Silicon for the Chemical and Solar Industry IX, Oslo, Norway, June 23-26, 2008; “Value Chain Activity: Producing Polysilicon”, Green Rhino Energy, [http://www.greenrhinoenergy.com/solar/industry/ind\\_01\\_silicon.php](http://www.greenrhinoenergy.com/solar/industry/ind_01_silicon.php), Accessed on November 1<sup>st</sup> 2016.

*Q. ...and what has recently been demonstrated?*

A. As mentioned, the goal of the Phase 2 was to collect data for the design of the PUREVAP™ pilot system. In so doing, we decided to test the limits of the system by introducing low quality quartz as feedstock (97.5%). The results are compelling as they demonstrate that the PUREVAP™ system can produce a high quality silicon metal from a low purity feedstock.

*Q. Can you briefly explain the difference between the PUREVAP™ process, the conventional processes used, and any that may have recently failed at trying to process solar grade silicon from quartz?*

A. Of course. Figure 2 reflects the fundamental steps used in the conventional process of transforming quartz into a solar grade silicon as compared to the PUREVAP™ process.

As you may note, in the conventional process, an electric arc furnace is used to transform the quartz into metallurgical grade silicon (“MGS”), which is then dissolved in hydrochloric acid and then, after several additional steps, solar grade silicon is formed. Separately, the now defunct Timminco Ltd., attempted to replace the hydrochloric acid step with a rotary furnace and thereby, in theory, form solar grade silicon without the additional steps required in the conventional process. The significant difference between both these processes and the PUREVAP™ process is that the PUREVAP™ process starts directly with quartz which is introduced into a vacuum arc furnace with no additional steps required. The PUREVAP™ process does not have to create a MGS; it is all done in one step, creating significant advantages.



Figure 2

## **About PyroGenesis Canada Inc.**

PyroGenesis Canada Inc. is the world leader in the design, development, manufacture and commercialization of advanced plasma processes. We provide engineering and manufacturing expertise, cutting-edge contract research, as well as turnkey process equipment packages to the defense, metallurgical, mining, advanced materials (including 3D printing), oil & gas, and environmental industries. With a team of experienced engineers, scientists and technicians working out of our Montreal office and our 3,800 m<sup>2</sup> manufacturing facility, PyroGenesis maintains its competitive advantage by remaining at the forefront of technology development and commercialization. Our core competencies allow PyroGenesis to lead the way in providing innovative plasma torches, plasma waste processes, high-temperature metallurgical processes, and engineering services to the global marketplace. Our operations are ISO 9001:2008 certified, and have been since 1997. PyroGenesis is a publicly-traded Canadian company on the TSX Venture Exchange (Ticker Symbol: PYR) and on the OTCQB Marketplace (Ticker Symbol: PYRNF). For more information, please visit [www.pyrogenesis.com](http://www.pyrogenesis.com)

*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 securities regulatory authorities, which filings can be found at [www.sedar.com](http://www.sedar.com), or at [www.otcmartets.com](http://www.otcmartets.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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For further information: P. Peter Pascali, Chief Executive Officer, Phone: (514) 937-0002, E-mail: [ir@pyrogenesis.com](mailto:ir@pyrogenesis.com).