Zenyatta co-operates with global leader in fuel cell technology

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News Release

Dr. Bharat Chahar reports

ZENYATTA; Initial screening shows Albany graphite material to be suitable for hydrogen fuel cell components, company collaborates with a global leader in fuel cell technology, supported by the Government of Canada.

A first-step screening has occurred on Zenyatta Ventures Ltd.’s Albany graphite with positive results for use in multiple components for fuel cells. As a second step, the company now plans to work further with a global leader in fuel cell technology to build actual components from high-purity Albany graphite. This research into fuel cell innovation is supported by technical and advisory services, and a financial contribution from the National Research Council – Industrial Research Assistance Program (NRC-IRAP).

The initial screening by a global leader, which is under a confidentiality agreement, was conducted for purity, particle size, corrosion resistance and other desirable properties for

use in fuel cells. These tests showed Zenyatta's graphite material to be suitable for use in hydrogen fuel cells with further advanced testing planned. Testing results were obtained from a lab-scale sample provided by SGS Canada Inc. solely for the purpose of providing early evaluation on the suitability and effectiveness of Albany graphite in various applications.

Highlights:

- Early testing shows Albany graphite to be suitable for hydrogen fuel cell components;
- Company plans to build and test fuel cell components in the near future;
- Collaboration with a major fuel cell provider was assisted by funding provided by the government of Canada.

Dr. Bharat Chahar, vice-president of market development for Zenyatta, stated: "Purity and particle size of the material provided by SGS processing was already in the range needed for fuel cell applications; therefore, no further milling or purification was needed. Due to simple mineralogy, high crystallinity and desirable particle size distribution, Zenyatta graphite has shown first screening specification ranges needed for the hydrogen fuel cell components. While further tests are ongoing to verify other performance characteristics, this initial feedback on results is extremely encouraging and quite promising for our upcoming advanced testing."

Based on research and dialogue with end-users, at this point in time, Zenyatta expects to have a targeted market application segmentation which includes 20 to 25 per cent for high-purity graphite in fuel cell products, 25 to 30 per cent in lithium-ion batteries and 25 to 30 per cent in powder metallurgy. Powder metallurgy and the remaining 15 to 30 per cent in target applications will be discussed in upcoming news

releases.

Zenyatta commenced a market development program several months ago to initiate validation of Albany graphite in high-purity graphite applications. Since the start of this program, the company has had detailed conversations with more than 35 graphite end-users, academic labs and third party testing facilities in Europe, North America and Asia under confidentiality agreements. Many of these organizations requested a specified amount of purified Albany graphite produced at the SGS Lakefield site during the development of a process flow sheet pursuant to a preliminary economic assessment, which is currently being completed. The samples produced at SGS are experimental in nature and may differ slightly from batch to batch, and may also differ from the final product in the future. However, these samples are representative of the product that could be processed, and provide a good initial assessment and guidance for the potential of Albany graphite for various applications.

The goal of these initial samples was to screen Albany graphite for suitable applications while gathering feedback from the end-users and testing facilities to improve the overall properties for high-value applications. The company is now starting to receive feedback from several end-users and independent labs, some of which received repeat samples. Information from this initial test program will be used to further define the company’s product and market strategy, and set the stage for next steps in development. Zenyatta plans to provide its stakeholders with brief, periodic updates on the progress, as meaningful information becomes available. This is the second in a series of updates on the market and business developments.

A battery is an energy storage device and will stop producing electrical energy when the chemical reactants are consumed or it needs to be recharged. The fuel cell is an energy conversion device and will produce electrical energy as long

as the fuel and the oxidant are fed to the electrodes. There are many types of fuel cells used in various end-use applications including transportation, industrial equipment, stationary power generation, backup power, aerospace and defence. Various fuel cell technologies have been developed to convert many different fuels to electricity at high efficiencies. While fuel cells were first developed in 1960s for niche applications such as generation of power for space vehicles, a large amount of research and development has been conducted over the last 50 years and resulted in much wider use of this technology. It is now considered a green technology for use in many applications. Since the fuel cells can be designed to use different forms of fuel, this is one of the leading technologies for sustainable generation of power in small to medium-sized industrial applications.

Fuel cell market and hydrogen fuel cells

The fuel cell market is relatively large and shows high growth potential. Proton exchange membrane or polymer electrolyte membrane fuel cells converting hydrogen and oxygen to electricity and water command a near-majority market share in the fuel cell market. Since hydrogen can be produced from various sources, and the hydrogen fuel cells only produce water and electricity, this technology has the best potential for finding widespread usage in many sectors, including transportation. Honda and Toyota are already making fuel-cell-powered test vehicles available in limited markets. Fuel cell companies are continuously improving technologies to provide a more cost-effective catalyst, which in turn helps them to commercialize and launch products in the market. Significant efforts are also being made to develop hydrogen storage and distribution infrastructure. Due to all these efforts, the fuel cell market is likely to experience a tremendous increase in demand in the years to come.

High-efficiency conversion

Fuel cells convert chemical energy directly into electricity without the combustion process. Fuel cells can achieve high efficiencies in energy conversion terms, especially where the waste heat from the cell is utilized for cogeneration.

High power density

A high power dens**i**ty allows fuel cells to be relatively compact sources of electric power, which is beneficial in applications with space constraints. In a fuel cell system, the fuel cell itself is nearly dwarfed by other components of the system, such as the fuel reformer and power inverter.

Quiet operation

Fuel cells, due to their nature of operation, are extremely quiet in operation. This allows fuel cells to be used in residential or built-up areas where the noise pollution is undesirable.

Graphite for this market has to meet many challenging performance characteristics before it can be used in a fuel cell. The traditional graphite material used in bipolar plates is usually purified using expensive hydrofluoric chemical or thermal processes. Zenyatta continues to develop an innovative purification system on its unique graphite material that does not require use of these traditional and environmentally damaging processes.

Graphite is used in the bipolar plate as an electrically and thermally conductive additive. Bipolar plates, which are a major component of fuel cells, are made from high-purity

graphite. These plates need to be impermeable to gases; have good electrical conductivity, high strength, low weight and good resistance to corrosion; and be easy to manufacture in large quantities.

Graphite must be high grade (greater than 99.9 per cent carbon) with low impurities, with a viable, low-cost purification process. Smaller amounts of graphite or carbon materials can be used in the gas diffusion layers and the membrane electrode assembly of fuel cells, as a catalyst support, as coatings for the bipolar plates, and in solid oxide fuel cell (SOFC) components. Gas diffusion layers use high-purity, fine graphite powders for controlled porosity and low electrical resistance.

Dr. Bharat Chahar, PE, VP, market development, for Zenyatta, is a qualified person for the purposes of National Instrument 43-101 and has reviewed the technical information in this news release. This testing does not represent a statistically large sample size. Furthermore, these positive results do not mean that Zenyatta can extract and process Albany graphite for high-purity graphite applications on an economic basis. Without a formal independent feasibility study, there is no assurance that the operation will be economic.

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