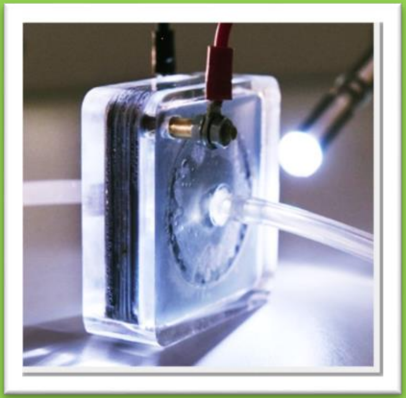
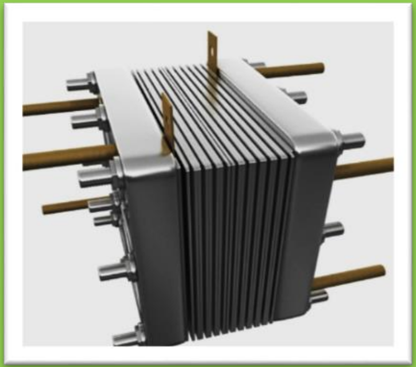
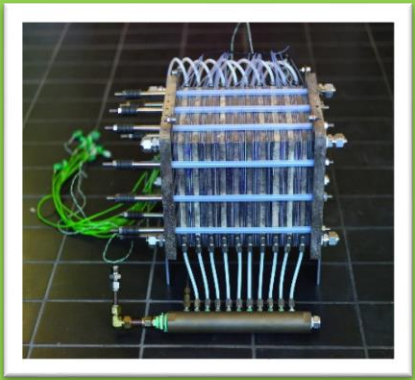
Fuel Cells

Graphite's role in the Fuel Cell Market







Forward Looking Statement

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Cautionary Note Regarding Forward-Looking Information

This presentation contains "forward-looking information" within the meaning of applicable Canadian securities legislation and United States federal securities laws. Forward-looking statements include, but are not limited to, estimates and statements with respect to Zenyatta's future exploration and development plans, objectives or goals, to the effect that Zenyatta or management expects a stated condition or result to occur, including the expected timing for release of sample analyses and a resource estimate, the expected uses for graphite in the future, and the future uses of the graphite from Zenyatta's Albany deposit, the adequacy of Zenyatta's financial resources, business plans and strategy, and other events or conditions that may occur in the future. Generally, forward-looking information can be identified by the use of forward- looking terminology such as "plans", "expects", or "does not expect", "is expected", "budget", "scheduled", "estimates", "forecasts", "intends", "anticipates", or "does not anticipate", or "believes" or variations of such words and phrases or state that certain actions, events or results "may", "could", "would", "might", or "will be taken", "occur", or "be achieved". The following table outlines certain significant forward-looking information contained on this website provides the material assumptions used to develop such forward-looking statements and material risk factors that could cause actual results to differ materially from the forward looking statements.

Forward-looking information	Assumptions	Risk factors
Zenyatta's properties may contain economic deposits of graphite and/or other metals	Financing will be available for future exploration and development of Zenyatta's properties; the actual results of Zenyatta's exploration and development activities will be favourable; operating, exploration and development costs will not exceed Zenyatta's expectations; the Company will be able to retain and attract skilled staff; all requisite regulatory and governmental approvals for exploration projects and other operations will be received on a timely basis upon terms acceptable to Zenyatta, and applicable political and economic conditions are favourable to Zenyatta; the price of graphite and/or other applicable metals and applicable interest and exchange rates will be favourable to Zenyatta; no title disputes exist with respect to its properties	Graphite price volatility; uncertainties involved in interpreting geological data and confirming title to acquired properties; the possibility that future exploration & processing results will not be consistent with Zenyatta's expectations; availability of financing for and actual results of Zenyatta's exploration and development activities; increases in costs; environmental compliance and changes in environmental and other local legislation and regulation; interest rate and exchange rate fluctuations; changes in economic and political conditions; Zenyatta's ability to retain and attract skilled staff
Zenyatta will be able to carry out anticipated business plans, including costs and timing for future exploration on its property interests	Zenyatta's exploration activities, and the costs associated therewith, will be consistent with Zenyatta's current expectations; debt and equity markets, exchange and interest rates and other applicable economic conditions are favourable to Zenyatta; Financing will be available for Zenyatta's exploration and development activities and the results thereof will be favourable; the Company will be able to retain and attract skilled staff; all applicable regulatory and governmental approvals for exploration projects and other operations will be received on a timely basis upon terms acceptable to Zenyatta; Zenyatta will not be adversely affected by market competition; the price of graphite and/or other applicable metals will be favourable to Zenyatta; no title disputes exist with respect to Zenyatta's properties	Graphite price volatility, changes in debt and equity markets; timing and availability of external financing on acceptable terms; the uncertainties involved in interpreting geological data and confirming title to acquired properties; the possibility that future exploration & processing results will not be consistent with Zenyatta's expectations; increases in costs; environmental compliance and changes in environmental and other local legislation and regulation; interest rate and exchange rate fluctuations; changes in economic and political conditions; Zenyatta may be unable to retain and attract skilled staff; receipt of applicable permits
Management's outlook regarding future trends	Financing will be available for Zenyatta's exploration and operating activities; global demand for the use and application of graphite will increase; the price of graphite and/or other applicable metals will be favourable to Zenyatta;	Graphite price volatility; changes in debt and equity markets; interest rate and exchange rate fluctuations; changes in economic and political conditions

Forward Looking Statement

Statements relating to "reserves" or "resources" in this Presentation are deemed to be forward-looking statements, as they involve the implied assessment, based on certain estimates and assumptions that the resources and reserves described can be profitably produced in the future. Inherent in forward-looking statements are risks, uncertainties and other factors beyond Zenyatta's ability to predict or control. Readers are cautioned that the above chart does not contain an exhaustive list of the factors or assumptions that may affect the forward-looking statements, and that the assumptions underlying such statements may prove to be incorrect. Actual results and developments are likely to differ, and may differ materially, from those expressed or implied by the forward-looking statements contained in this Presentation. Forward-looking statements involve known and unknown risks, uncertainties and other factors that may cause Zenyatta's actual results, performance or achievements to be materially different from any of its future results, performance or achievements expressed or implied by forward-looking statements. All forward-looking statements herein are qualified by this cautionary statement. Zenyatta disclaims any intention or obligation to withdraw, update or revise any forward-looking statements whether as a result of new information, future events or otherwise, except to the extent required by applicable laws. If the Zenyatta does update one or more forward-looking statements, no inference should be drawn that it will make additional updates with respect to those or other forward-looking statements, unless required by law. An additional cautionary note to readers - no part of this Zenyatta presentation is intended to be deemed as an offering of its securities to investors outside of Canada or is to be relied on by residents of the United States of America or other jurisdictions outside of Canada. Certain terms such as "resource", "measured resource", "indicated resource" and "inferred resource" are recognized under Canadian securities laws, however, the United States Securities and Exchange Commission may not recognize such terms. All maps, information, data, diagrams etc. obtained from internet are believed to be reasonably accurate but can not be guaranteed.

Cautionary Note Regarding Mineral Reserve and Resource Estimates

See "Technical Report on the Albany Graphite Deposit, Northern Ontario, Canada", authored by David Ross, P.Geo., and Katharine M. Masun, P.Geo., of Roscoe Postle Associates Inc., who are independent "qualified persons" as defined by National Instrument 43-101. The Technical Report was issued on January 16, 2014 and may be found under the Company's profile on SEDAR at www.sedar.com and at www.zenyatta.ca. This presentation has been prepared in accordance with the requirements of Canadian securities laws in effect in Canada, which differ from the requirements of United States securities laws. Unless otherwise indicated, all mineral resource and reserve estimates included in this presentation have been prepared in accordance with NI 43-101 and the Canadian Institute of Mining and Metallurgy Classification System. NI 43-101 is a rule developed by the Canadian securities regulatory authorities that establishes standards for all public disclosure an issuer makes of scientific and technical information concerning mineral projects. Canadian standards, including NI 43-101, differ significantly from the requirements of the U.S. Securities and Exchange Commission (the "SEC"), and resource and reserve information contained herein may not be comparable to similar information disclosed by U.S. companies. In particular, and without limiting the generality of the foregoing, the term "resource" does not equate to the term "reserves." Under U.S. standards, mineralization may not be classified as a "reserve" unless the determination has been made that the mineralization could be economically and legally produced or extracted at the time the reserve determination is made. The SEC's disclosure standards normally do not permit the inclusion of information concerning "measured mineral resources," "indicated mineral resources," or "inferred mineral resources" or other descriptions of the amount of mineralization in mineral deposits that do not constitute "reserves" by U.S. standards in documents filed with the SEC. U.S. investors should also understand that "inferred mineral resources" have a great amount of uncertainty as to their existence and great uncertainty as to their economic and legal feasibility. It cannot be assumed that all or any part of an "inferred mineral resource" will ever be upgraded to a higher category. Mr. Peter Wood, P.Geo., VP Exploration for Zenyatta Ventures Ltd., is the "Qualified Person" under National Instrument 43-101 – Standards of Disclosure for Mineral Projects and has reviewed and approved the technical information contained in this presentation.

Introduction

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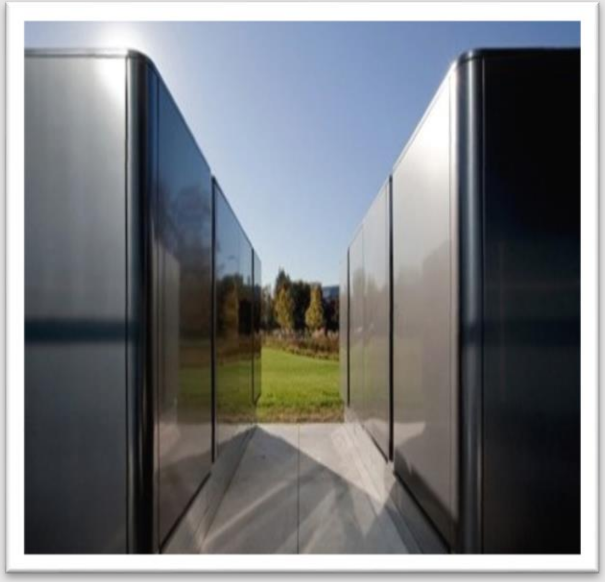
- The fuel cell industry is experiencing tremendous growth. It potentially offers an alternative source for energy storage and generation that is more efficient and less polluting than existing technologies.

- The fuel cell is an energy conversion device to produce electrical energy from a fuel and the oxidant that are fed to the electrodes of the device.

- Global stationary fuel cell market will be expected to grow to $14.3 billion in 2020. (Acute Market Reports, July 2015)

- Market is seeing global growth led by Japan and South Korea.



Fuel Cell Basics

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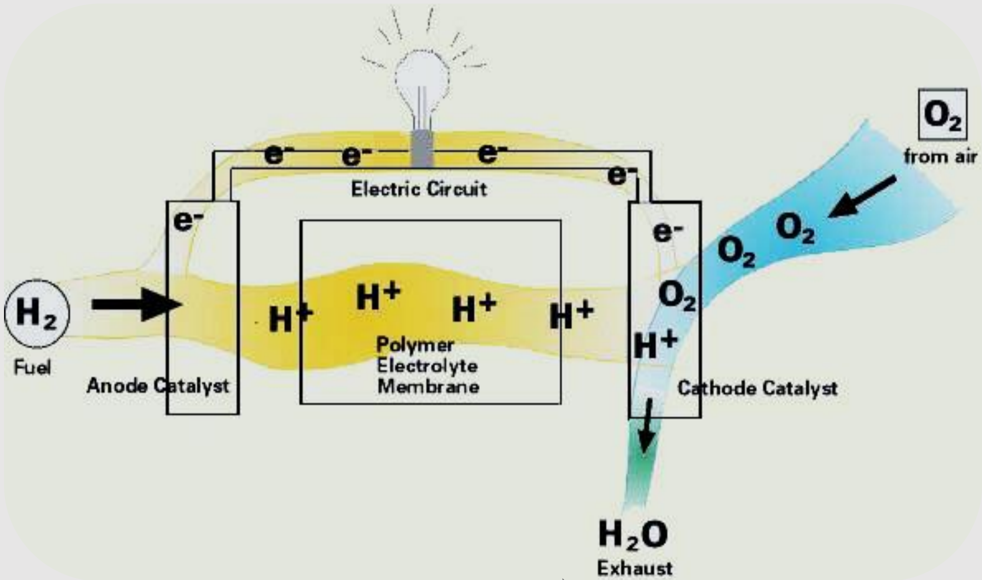
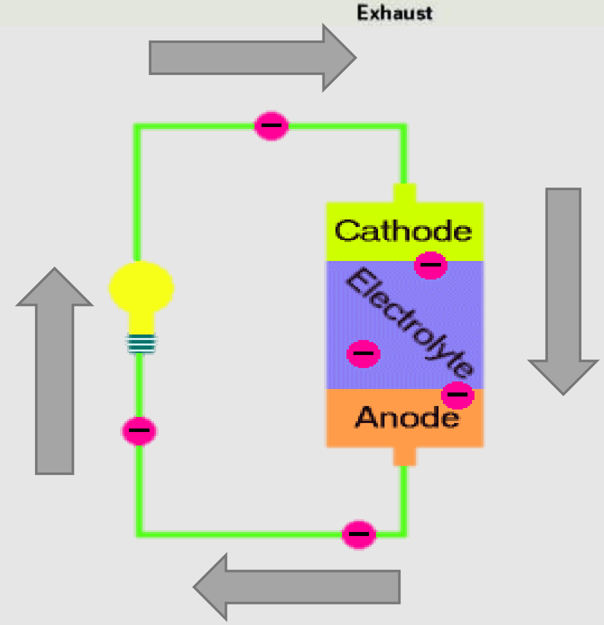
Anode: fuel reacts or "oxidizes", and releases electrons. The fuel can be hydrogen, a hydrocarbon or even carbon. The anode is usually coated with a catalyst to expedite the reaction.

Cathode: Source of oxygen (usually from the air) is fed to the cathode "reduction" occurs. Often made up of nickel but it can also be a nanomaterial-based catalyst.

Electrolyte: A chemical compound that conducts ions from one electrode to the other inside a fuel cell.





Fuel Cell Types

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Comparison of Fuel Cell Technologies

Fuel Cell Type	Common Electrolyte	Operating Temperature	Typical Stack Size	Efficiency	Applications	Advantages	Disadvantages
Polymer Electrolyte Membrane (PEM)	Perfluoro sulfonic acid	50-100°C 122-212° typically 80°C	<1kW-100kW	60% transportation 35% stationary	• Backup power • Portable power • Distributed generation • Transporation • Specialty vehicles	• Solid electrolyte reduces corrosion & electrolyte management problems • Low temperature • Quick start-up	• Expensive catalysts • Sensitive to fuel impurities • Low temperature waste heat
Alkaline (AFC)	Aqueous solution of potassium hydroxide soaked in a matrix	90-100°C 194-212°F	10-100 kW	60%	• Military • Space	• Cathode reaction faster in alkaline electrolyte, leads to high performance • Low cost components	• Sensitive to CO_2 in fuel and air • Electrolyte management
Phosphoric Acid (PAFC)	Phosphoric acid soaked in a matrix	150-200°C 302-392°F	400 kW 100 kW module	40%	• Distributed generation	• Higher temperature enables CHP • Increased tolerance to fuel impurities	• Pt catalyst • Long start up time • Low current and power
Molten Carbonate (MCFC)	Solution of lithium, sodium, and/ or potassium carbonates, soaked in a matrix	600-700°C 1112-1292°F	300 kW-3 MW 300 kW module	45-50%	• Electric utility • Distributed generation	• High efficiency • Fuel flexibility • Can use a variety of catalysts • Suitable for CHP	• High temperature corrosion and breakdown of cell components • Long start up time • Low power density
Solid Oxide (SOFC)	Yttria stabilized zirconia	700-1000°C 1202-1832°F	1 kW-2 MW	60%	• Auxiliary power • Electric utility • Distributed generation	• High efficiency • Fuel flexibility • Can use a variety of catalysts • Solid electrolyte • Suitable for CHP & CHHP • Hybrid/GT cycle	• High temperature corrosion and breakdown of cell components • High temperature operation requires long start up time and limits

- PEM is the most popular type of Fuel Cell in North America and has seen the largest increase in revenue generation in recent years.
- The US Department of Energy suggests that PEM cells are the most likely to be developed for use in light vehicles, buildings & smaller applications.

Fuel Cell Advantages

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1) **High Efficiency Conversion**
   - Fuel cells convert chemical energy directly into electricity without the combustion process. As a result, a fuel cell is not governed by thermodynamic laws.
   - Fuel cells can achieve high efficiencies in energy conversion terms.

2) **High Power Density**
   - Allows fuel cells to be relatively compact source of electric power, beneficial in application with space constraints.

1) **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.

- Fuel Flexible – operation conventional or renewable fuels
- High quality, reliable power – increased productivity
- Exceptionally low – zero emissions
- Modularity – scalability – flexible installation
- Not dependent on the power grid
- Lightweight - rugged
- Can be used with or instead of batteries and diesel generators
- Can partner with solar, wind and other renewable productivity
- Cost savings via high electrical and overall efficiency

http://www.ballard.com/files/PDF/Media/FINAL_FUEL_CELL_CHFC_Sector_Profile_2012_EN.pdf

Fuel Cell Applications

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- There are many types of fuel cells used in various end-use applications including:

Buses, Boats, Trains, Planes, Scooters, Forklifts & Bicycles	Submarines, and Defence Applications
Off-Grid Power Supply	Vending Machines, Vacuum cleaners and Highway Road Signs
Cellular Phones, Laptop Computers and Portable Electronics	Provide Emergency and Back-Up Power to Facilities, especially in Developing Countries

- 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.

Top 3 Fuel Cell Markets

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Transport

- Transport sector is very diverse, and there are mobile applications other than cars being developed around the world.
- FCEVs such as the Toyota Mirai made its debut in 2014. Since then, Toyota announced they will invest approximately ¥20 billion to triple production capacity due to the strong demand from corporate and the publics sector.
- Utility vehicles, buses, scooters, vans, planes and go-carts are all other mobile applications that are being developed with fuel cell capabilities.

http://www.hydrogenlondon.org/wp-content/uploads/2013/03/Fuel-Cell-and-Hydrogen-International-Markets-2014.pdf

Stationary

- Residential units have continued to grow in 2014, mainly due to government incentives.
- Stationary backup power continues to be a key market where fuel cells can be cost-competitive with incumbent technology.
- Several thousand units have been shipped globally. 21 fuel cell sites have been installed in South Korea since 2008.
- Fuel cells are increasingly of interest to improve resilience in operations where continuous power is critical.

Portable

- Strong growth due to the large numbers in the consumer products segment.
- The application for fuel cells for portable uses, generally for off-grid and on-the-move requirements of one or two to hundreds of watts.
- Fuel cells for portable devices include: charging consumer electronics, mainly phones, for auxiliary power units in leisure applications (camper vans), military use for soldier power and other small power uses such as certain unmanned aerial vehicles.

http://www.fuelcells.org/pdfs/TheFuelCellIndustryReview2014.pdf

Hydrogen or PEM Fuel Cell

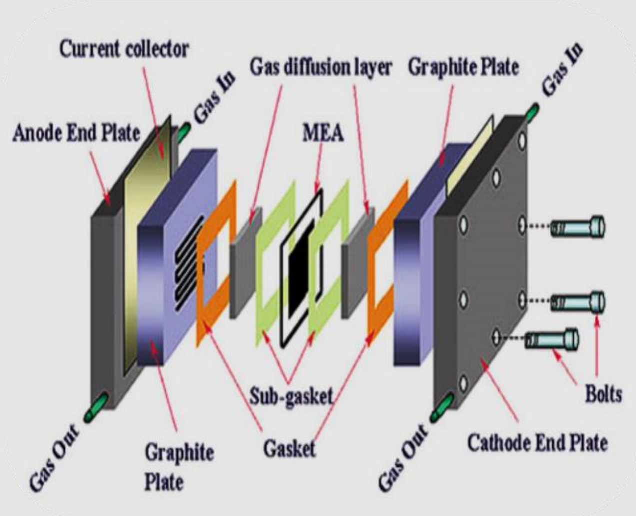
- Hydrogen fuel cells generate electricity by an electrochemical reaction in which oxygen and a hydrogen-rich fuel combine to form water.

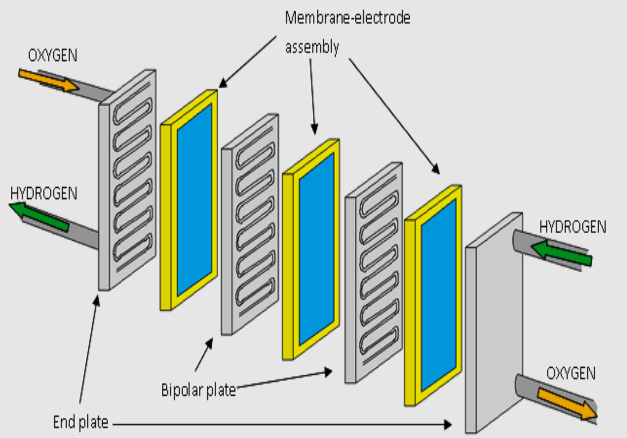
- A hydrogen fuel cell is a zero-emission source of power, and the only by-product of a fuel cell is water.

- The rapid growth of this market is largely due to the recent technological advancements. These include:

  - New catalysts
  - Less expensive components
  - More efficient ways to produce hydrogen fuel

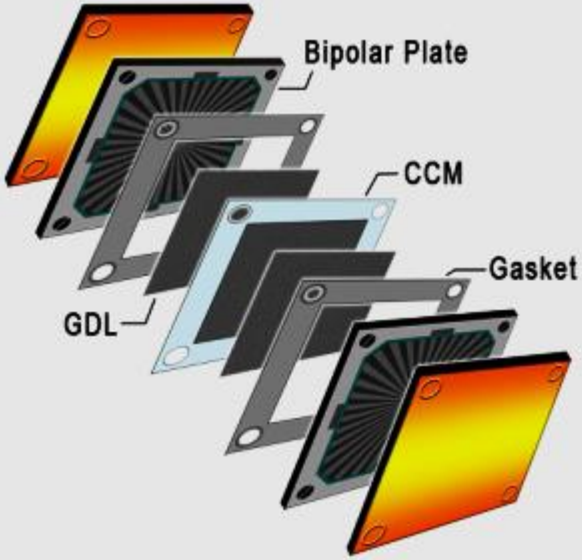
- This has made hydrogen fuel cells more popular for various applications. Due to their prevalence and popularity most of this presentation focuses on hydrogen fuel cells only.





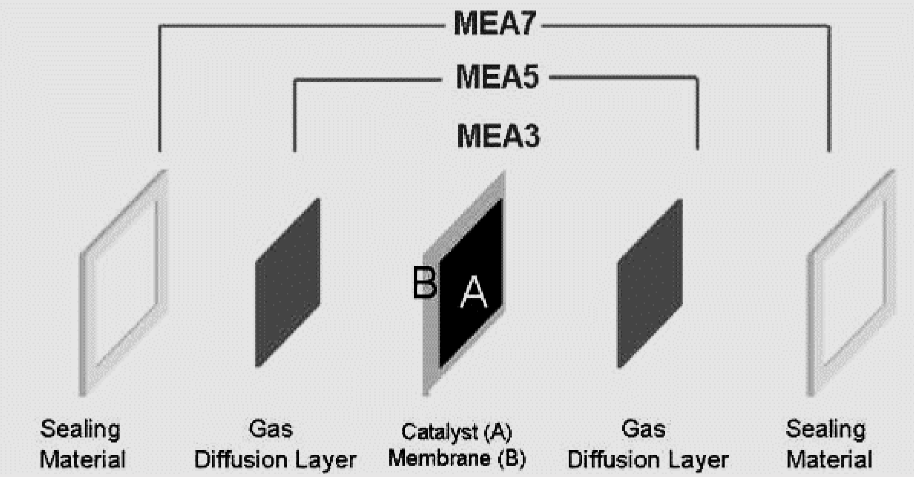
Membrane Electrode Assembly (MEA)

- The Membrane Electrode Assembly (MEA) is the core component of a fuel cell.



- The MEA is the core component of a fuel cell that helps produce the electrochemical reaction needed to separate electrons.

- A MEA consists of seven layers: a proton exchange membrane, three-phase anode and cathode catalyst layers, two gas diffusion layers and two sets of sealing gaskets.



Gas Diffusion Layer (GDL)

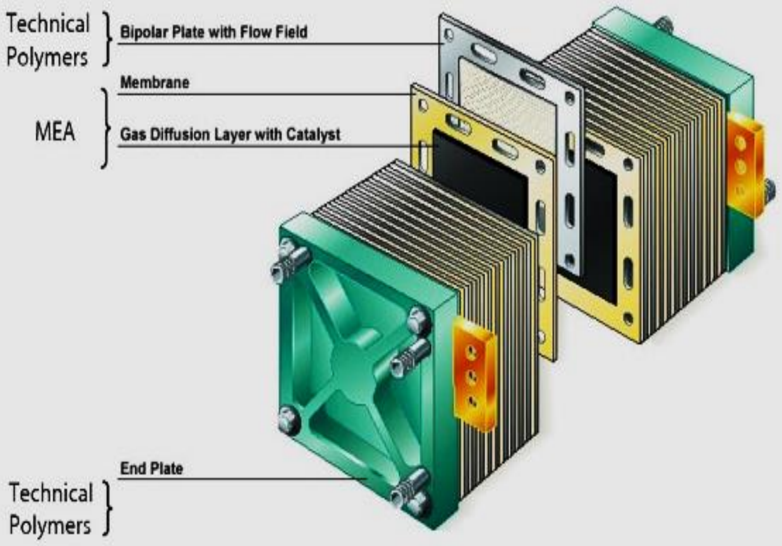
- The Gas Diffusion Layer plays the most critical role in the fuel cell application.

- The GDL has many main functions that include;

  1. Provides a pathway for gas to diffuse from flow channels to the catalyst layer.
  2. Helps remove water by-product outside of the catalyst layer and prevents flooding.
  3. It keeps some water on surface for conductivity through the membrane.
  4. Transfers heat during cell operation.
  5. It provides enough mechanical strength to hold the MEA from expansion caused by water absorbance.

- Graphite and carbon black powders are used in GDL for catalyst support.

- High purity, fine graphite powders are used in GDL's for controlled porosity and low electrical resistance.



Why Graphite in Fuel Cells?

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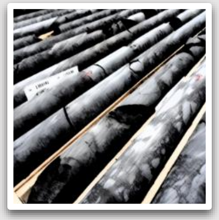
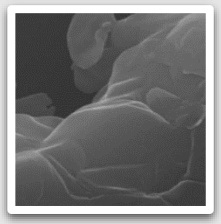
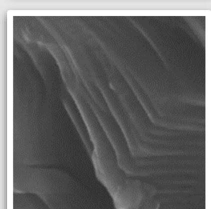


Highly Conductive

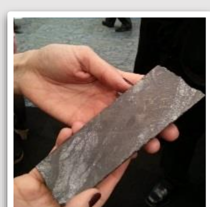


Low in Density

Electrically Conductive



Thermally Conductive



Chemically Inert and Cost Effective

http://asbury.com/pdf/FuelCellFlyerOverview.pdf

- ❑ In recent years much research has been performed and results show that graphite is the material of choice for cathode and anode plates in a PEM fuel cell stack.
- ❑ Formulators and fabricators have been very successful in forming plates from both natural and synthetic graphite using powders and particles ranging in size from micrometers to millimeters in dimension.

Graphite in Bi-polar Plates

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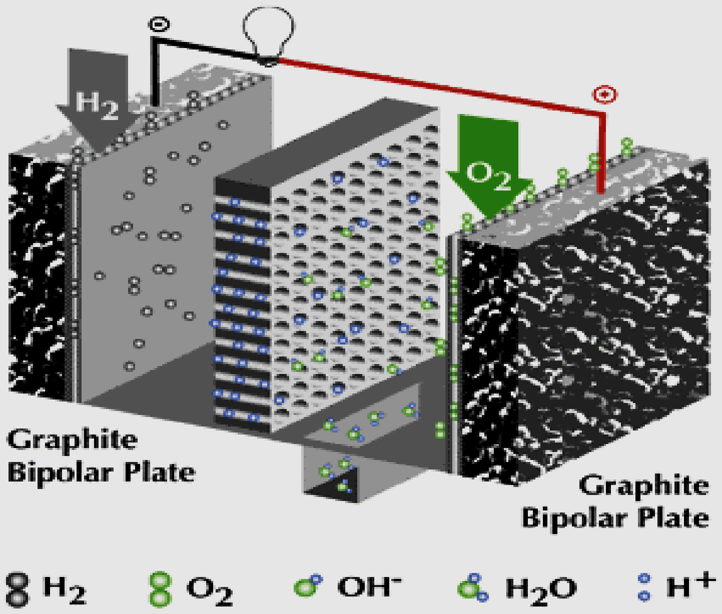
- Bi-polar plates, which are a major component of fuel cells, are made from medium to coarse, high purity graphite.
- Graphite is used in the bi-polar plate as an electrically and thermally conductive additive.
- Bi-polar plates separates gases between cells and provides a conductive medium between the anode and the cathode.



Zenyatta Ventures Ltd. – Albany Graphite Project

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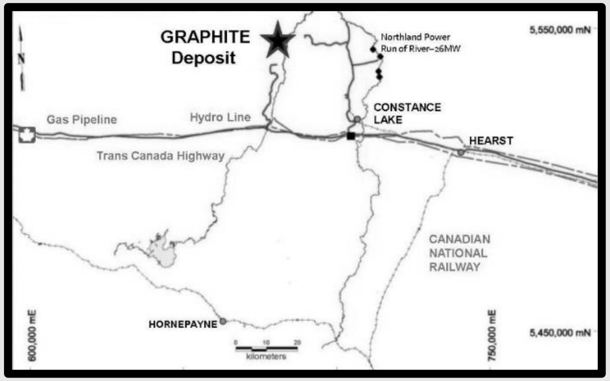
- the **largest** and only **rare**, igneous-related hydrothermal graphite deposit with the potential to produce a natural, high-purity graphite.

- Graphite Deposit located 30 km north of Trans-Canada Highway. Power line and natural gas pipeline near Constance Lake First Nation (CLFN) & Hearst. Rail line located 70 km away and all-weather road ~10km from deposit.

- Albany graphite achieved an 'extraordinary' carbon purity result of >99.9% in a bench-scale test using a proprietary and environmentally safe method of purification, which could compete in the diversified 'synthetic' graphite market.



Zenyatta's Market Role in Fuel Cells

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- Fuel cells are becoming well established in a number of markets where they are now recognised as a better technology option than conventional internal combustion engine generators or batteries.

- The global proton exchange membrane fuel cell (PEMFC) and membrane electrode assembly (MEA) market reached $444 million in 2012 and is expected to reach $1.2 billion in 2017 for a CAGR of 22.1%. (BCC Research LLC, 2013).

GLOBAL PEMFC MARKET BY REGION, THROUGH 2017 ($ MILLIONS)

Region	2007	2011	2012	2017	CAGR% 2012-2017
North America	43	131	150	389	21.0
Europe	40	120	133	355	21.7
Asia	49	147	164	443	22.0
ROW	7	19	21	59	22.9
Total	139	417	468	1,246	21.6

BCC Research

GLOBAL PEMFC MARKET BY APPLICATION, THROUGH 2017 ($ MILLIONS)

Application	2007	2011	2012	2017	CAGR% 2012-2017
Portable	38	172	190	382	15.0
Stationary	50	145	170	423	20.0
Transportation	15	40	48	258	40.0
Other	36	60	60	183	25.0
Total	139	417	468	1,246	21.6

Source: BCC Research

Thank you!

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