Progress in Understanding and Scaling Up the Lattice Energy Converter (LEC)

Frank Gordon*
and
Harper Whitehouse

***feg@inovl.com**

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Due to the limited time to give this presentation, I assumed that you were aware of the surprising and unique capabilities of the Lattice Energy Converter, (LEC) including the ability to spontaneously self-initiate and self-sustain the production of voltage and current through a load. Multiple scientists throughout the world have replicated these results. If this is your first exposure to the Lattice Energy Converter, I have included several links to previous presentations and videos.

A good place to start is this "seeing is believing" video that includes the assembly of a Lattice Energy Converter that spontaneously self-initiates and self-sustains the production of a voltage and current through a load https://www.youtube.com/watch?v=yO-KIGKVHkI

ICCF-24 July, 2023 Mountain View, CA USA Links to videos of presentations related to the Lattice Energy Converter:

Frank Gordon: Evolution of the Lattice Energy Converter
https://www.youtube.com/watch?v=MPquGUXvZ1g

Antonio Di Stefano: Replication report of the Lattice Energy Converter
https://www.youtube.com/watch?v=hjkNBxzRYUE

Jean-Paul Biberian: Replication report of the Lattice Energy Converter followed by a presentation and Q&A by Frank Gordon on Scaling up the Lattice Energy Converter output power.

https://www.youtube.com/watch?v=pjbt0EP5oHw

Summary of the LEC ICCF 24 presentation

A Lattice Energy Converter (LEC) spontaneously self-initiates and self-sustains the production of a voltage and current through an electrical load.

- ✓ **Repeatable**
- ✓ **Multiple Independent Replications**
- ✓ **Peer-Reviewed Publications**
- ✓ **Naturally Radioactive Materials Not Required**

Can output be scaled up 6 to 10 orders of magnitude?

The Lattice Energy Converter presentation at the ICCF 24, Solid-State Energy conference reported and demonstrated the surprising ability of a LEC to spontaneously self-initiate and self-sustain the production of a voltage and current through an electrical load. These experimental results are repeatable and have been replicated by multiple scientists throughout the world. No naturally radioactive materials are required. Three 3 peer-reviewed papers have been published. These facts address the issues that the scientific community raised after the 1989 announcement by Fleischmann and Pons.

The big challenge remaining is: How to scale up a LEC to become a useful green energy solution? Experimental LEC results have shown that the power output scales up with increased area. Thus, increasing the electrode area from 1 square centimeter to 1 square meter would produce 4 orders of magnitude. As reported at ICCF 24, scaling up the LEC by 6 orders of magnitude would produce approximately 0.1 watts per square centimeter while 10 orders of magnitude would produce approximately 1 kilowatt.

Summary of Progress Since ICCF-24

- **Better understanding of the gas-ion dynamics of a LEC cell**
  - **A continuous supply of ions is required to produce and sustain a current and the energy required to produce the ions is the source of the power produced**
  - **Recombination reduces the current collected by at least 2 orders of magnitude and it could be much more**
  - **Current experiments are producing 1-2 orders of magnitude more power per square cm than a year ago**
  - **There are many opportunities to scale up the power produced**
- **Switched to flat electrode cell configurations rather than cylinder pipes which are easier to scale up in area**
- **The supporting analysis will be posted on LENR Forum and the cmns googlegroups email**

In responding to the challenge to scale up LEC cell power output, we have focused on developing a better understanding of the gas-ion dynamics within a LEC and have changed the cell configuration from concentric tubes to flat plate electrodes. By studying the literature of gas-ion dynamics, we have learned/confirmed that a continuous supply of ions is necessary to produce a sustained current and that recombination of the ions between the electrodes consumes at least 2 orders of magnitude of the ions being produced and the number being recombined could be several orders of magnitude higher.

Another focus was to change the concentric cell LEC design to a design that uses flat electrodes. This change not only makes it easier to scale up the area, other cell parameters such as the electrode separation distance, are also easier to control in the flat geometry.

Approximately 1 to 2 orders of magnitude increase in LEC power output per square centimeter has been achieved since ICCF 24 and, increasing electrode area to 1 square meter would increase total power output from approximately 20 microwatts to approximately 0.2 watts. Additionally, the increased understanding of the gas-ion dynamics has identified several opportunities to target for future improvements.

Flat Cell Examples

Easier to Construct
Easier to Scale Up Area

This slide illustrates the new flat electrode cell configurations. The two cells in the picture on the right utilize Nickel and Aluminum electrode with different separation materials between the electrodes and the picture on the left is a cell in a glass jar that is filled with hydrogen glass. The middle picture shows the electrodes in the glass jar. It's obvious that the flat cells can not only be relatively thin, stacking them together to increase the voltage is also much easier.

Attempts to Replicate Kramer's Results

- **J. B. Kramer reported in a speech "If a thick layer of monazite sand or r.a. ilmenite or similar radio- active material is spread over the surface of the carbon the zinc may be laid direct on the top, and a steady deflection is still obtained on an electrometer ; the e.m.f. is about 1 volt , and current obtained with a small area cell about 3 x 10^{-4} amps."***
- **We conducted tests with ThO_2, monazite sand**, and decorative sand. If adsorbed moisture was present, a voltage and current was produced, however, at temperatures above 100 °C, voltage and current went below our measurement sensitivity.**
- **Our calculations based on the radioactivity of ThO_2 and monazite sand concluded that any voltage and current produced would be below the sensitivity of our instrumentation.**
- **Our conclusion: Kramer was measuring an electrochemical reaction between the carbon and zinc electrodes. We suspect that Kramer also came to this conclusion since other than his speech, we haven't found any published record of these tests.**
- **Of note: Volta's tests using zinc as one of his electrodes also produced a larger current most likely due to electrochemical reactions.**

*A New Electronic Battery. Anonymous, The Electrician , 93., Oct. 31 , 1924, p. 497
** Thanks to Bob Greenyer for supplying the monazite sand for out tests

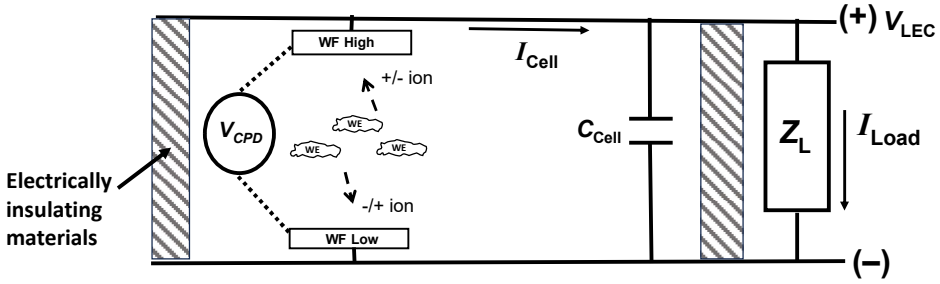
As reported by The Electrician, 93., Oct.31,1934, page 497, in a speech, J. B. Kramer described experiments where he used a thick layer of monazite sand between and in contact with two electrodes of carbon and zinc that produced a steady voltage of about 1 volt and a current of about 300 microamps through a small area of the cell.

Bob Greenyer offered to send us some monazite sand if we wanted to replicate Kramer's reported results. In addition to the monazite sand, we purchased some 99.9 % Thorium dioxide, which is the active radioactive component in monazite sand, and some decorative sand. All three produced similar results when initially placed between and in contact with electrodes of carbon and zinc. However, when we increased the temperature to above 100 °C, the voltage and current went below instrumentation sensitivity. Furthermore, when we calculated the amount of current that would be expected, even the voltage and current produced by the ThO_2 was below the detection sensitivity of our instrumentation.

It is our conclusion that the voltage and current that Kramer observed and the voltage and current that we observed before heating the cells up to over 100 °C was the result of adsorbed moisture on the surface of the materials. We suspect that Kramer came to the same conclusion because the report in The Electrician is the only reference to these tests.

Of note, in circa 1800, Alexandro Volta conducted contact potential difference (CPD) tests and reported the production of a voltage and current when one of his electrodes was zinc which most likely the result of electrochemical reactions rather than CPD reactions.

Characterizing the Electrical Insulating Materials



- **High temperature epoxy insulating materials have very high resistance at low temperatures**
- **At approximately 110 °C, the resistance began to changes as a function of increased temperature and it acts like a solid-state electrolyte *i.e.*, it developed mobile ions**
- **Tests were conducted with two high temperature epoxies, glass, silicone rubber, and PTFE**
- **PTFE and silicone rubber were the best insulation materials throughout temperature range**
- **The tests opened the possibility of using a solid-state or gel as the electrolyte BUT, the possibility of an electrochemical reaction must be considered and avoided**

Several electrically insulating materials, have been used in LEC cells to separate the working electrode from the counter electrode. While they all had 'infinite' electrical resistance at room temperature A series of tests were conducted to determine if the resistivity of electrically insulating materials decreased as temperatures increased This would provide another path for negative charge to migrate between the electrodes, thereby decrease the measured voltage and calculated current through the load impedance (Z_L). In general, the properties of none of the tested materials changed at temperatures below approximately 110 °C. However, above that temperature, the high temperature epoxies and glass began to change and in fact, they exhibited properties of mobile ions, similar to electrolytes. Both PTFE (Teflon) and silicone rubber maintained their resistivity throughout the increased temperature ranges of approximately 200 °C that we were using.

While these changes in conductivity might have corrupted some of the high-temperature data, they would have had minimal effect on tests below 110 °C and we now take care in designing and assembling LEC cells by using either PTFE or silicone rubber as the insulating material.

These tests demonstrated the possibility of using a solid-state electrolyte but care must be taken to eliminate electrochemical reactions.

Tests Using Solid-State Polymer and Gel electrolytes

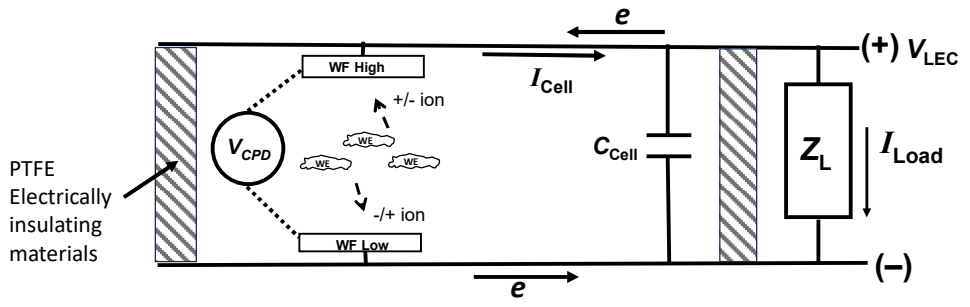
- **By conducting tests using solid-state polymer and gel electrolytes which contain mobile ions, we eliminate the variability of the LENR working electrode produced ions and focus on the other parameter variables.**
- **Tests included**
  - **High temperature epoxy using Ni and Al wires and two Ni wires**
  - **Poled high temperature epoxies**
  - **High Temperature Epoxy with Pd particulate mixed in**
  - **Electrode Gel electrolyte**
  - **Electrode Gel electrolyte with Pd particulate mixed in**
  - **"Deionized water" between two Ni plates**
- **Test results confirmed statements by Darrow and helped in understanding the diffusion based LEC physics**
- **Material selection is important due to potential chemical reactions**

The knowledge that some materials can produce mobile ions opened the possibility that there might be other electrolyte materials rather than ionized gas and some of them might produce ions at lower ionization energies than that which is typical for gases of approximately 35 eV per ion pair. Testing was conducted on a variety of materials, including the use of electrode gel which is used in attaching electrodes to the skin for medical testing.

Darrow stated that diffusion would produce a voltage in the absence of an electric current. By using the same materials for both electrodes, so there is no work function difference, it was possible to confirm Darrow's statement and study the effect of diffusion on LEC results in the absence of the electric field produced by the difference of work functions of the electrodes.

These tests also emphasized the need to select materials and LEC cell designs that eliminated the oxidation/reduction reactions used in electrochemical batteries. They also demonstrated the importance of a difference of diffusivity of the positive and negative ions. The important observation is that a LEC is a diffusion driven device and the inclusion in diffusivity should be accounted for in LEC design and implementation.

The LEC electrical circuit – Gas Ion Dynamics



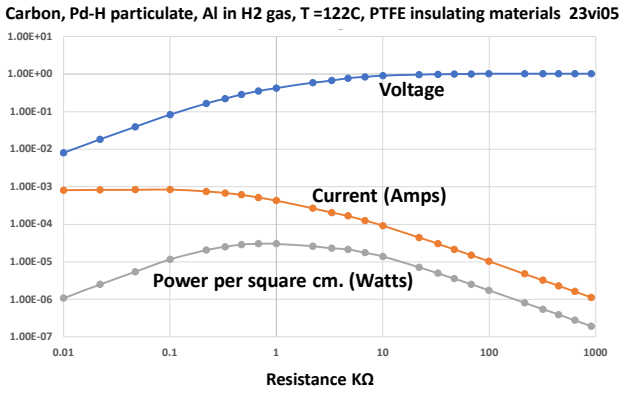
- **Electrons flow from the low work function through the external Load to the high work function electrode.**
- **To complete the circuit, negative ions must "flow" from the high work function to the low work function electrode. This is counter intuitive but can be explained by ion diffusion**
- **If the load resistance is high, the voltage difference between the electrodes is high**
- **As the load resistance is reduced, more current flows which reduces the voltage difference**
- **As the voltage reduces, drift velocities reduce and recombination increases**

Shown is a possible phenomenological physical and electrical representation of the behavior of an experimental LEC Contact Potential Difference device. For this device to produce a voltage and current through the load impedance, Z_L mobile ions must be present between the electrodes. For this representation, the ionization source is Pd-H that may be codeposited on the high work function electrode, or Pd-H particulate that was not physical attached to or part of either the working electrode or the counter electrode. The contact potential difference voltage is due to the dissimilar work functions (WF) of the two electrodes and is represented by the voltage source V_{CPD}. The cell's capacitance is represented by C_{Cell}. The cells internal impedance is represented by Z_C and cell current I_{Cell} is connect the voltage source to the external load impedance Z_L. Thus, I_{Load} should be equal to I_{Cell}. The voltage source V_{CPD} is approximately equal to the difference in the work functions (WF) of the electrodes but diminished by the output voltage V_{LEC}. The amount of current that the LEC cell can deliver to the external load impedance Z_L is a somewhat complicated combination of the number and density of ions, the electric field within the gas, the surface area of the electrodes, the effective separation between the electrodes, as well as the magnitude of the load impedance Z_L.

As shown, electrons travel from the low work function electrode to the high work function electrode through the load impedance. To complete the circuit, negative charge must be transferred from the high work function to the low work function electrode. This is counter intuitive since it is well known that positive ions are assumed to be attracted to the low work function electrode. and negative ions will migrate to the high work function electrode. However, multiple parameters of LEC cell design are involved leading to the situation where positive ions will actually diffuse to the high work function electrode where they pick up an electron and negative ions diffuse toward the low work function electrode to deposit a charge. This behavior is essential for a LEC to produce a voltage and current and will be described in a later slide.

Typical Voltage – Current – Power Plot

At 'open circuit,' high load resistance, the voltage produced approaches the difference in work functions. At 'short circuit,' low load resistance, the voltage is reduced allowing more ions to overcome the electric field so that positive ions can diffuse close enough to the high work function electrode to neutralize an electron and a negative charge can diffuse to the low work function material. However, ion recombination increases.



The LEC is basically a diffusion driven device

As shown in this plot, when the load resistance (Z_L) is high, the voltage measured through the load is essentially the difference in work functions which in this case, is approximately 1 volt The current calculated using ohm's law is low due to the electric field that is produced which reduces the possibility that positive ions can diffuse to the high work function electrode and negative ions diffuse to the low work function to neutralize the charge resulting from the equilibration of the fermi levels of the electrodes. As the resistance is reduced, the electric field is also reduced and the current calculated increases. The power produced is calculated by multiplying the square of the voltage divided by the resistance and it is highest when the electric field matches the drift velocity of the ions due to diffusion. As the electric field is further reduced, diffusion becomes the dominate factor in the production of a voltage and current and the device operates as a current source.

I should be recognized that throughout this test, ion recombination was occurring. The current calculated at low resistance levels was approximately 1 milliamp which is 6.24 x 10^15 charge carriers recovered per second. According to JJ Thomson's test results and his explanation, the total number of ions produces can be several orders of magnitude more than those that are collected at the electrodes. Changing LEC designs to minimize recombination could potentially lead to a significant increase by several orders of magnitude in LEC power output.

1-Dimensional Charge Conservation Equations

Generation Recombination Ion Diffusion Ion Drift

$$q_{\pm} - \alpha n_{+} n_{-} + D_{\pm} d^2 n_{\pm}/dx^2 - \pm\mu_{\pm} d(E n_{\pm})/dx = 0$$

Subtract the two equations and integrate once with respect to x

$$i/e = (n_{+}\mu_{+} + n\mu_{-})E(x) + D_{-} dn_{-}/dx - D_{+} dn_{+}/dx \text{ where } V = \int E(x)\, dx$$

- **By observation, if $E = 0$, the diffusion terms still exist. If $D_{\pm} = 0$, the electric field terms still exist. At intermediate values of E and $dn_{\pm}/dx$ they can oppose each other.**
- **By examining the individual terms in the equations, it appears that there are significant opportunities to scale up the power produced by a LEC**
- **By plugging in experimental LEC data into these equations and varying some of the other parameters such as electrode separation distance, we get values for recombination that range from 2 to 6 orders of magnitude.**

The LEC is a simple device physically, but it is very complicated in operation. This slide shows the nonlinear differential equations involved in describing that gas-ion dynamics between the electrodes of the LEC. By observation, if the ion diffusion term is zero, the electric field term still produces ion drift. However, if the electric field term is zero, the diffusion terms remain. Also, note that the recombination term is subtracted from the total number of ions produced whenever ions are present. Another observation is that the electric field terms oppose the diffusion terms. In general, the options to increase power output are to increase ion generation, reduce ion recombination, increase diffusion, and minimize the electric field term which also depends upon the ion density.

Unfortunately, these equations do not have an analytic solution. In 1966, Tate used numerical techniques to analyze these equations but the boundary conditions he used were for ion chambers and not for a diffusion driven LEC. Using numerical techniques with boundary conditions observed for the LEC could contribute to the optimization of LEC power output by several orders of magnitude.

Previous Analyses and Publications

- **JJ Thomson and Rutherford (1896) considered diffusion but dismissed it because he used a known external ionization source and a dominating electric field. As he increased the electric field, he conducted more current up to the point (saturation) where no more ions were collected. Thomson (1903) includes diffusion and makes several assumptions to perform a mathematical analysis where he concludes that the loss of ions due to diffusion is large compared to the loss of ions due to recombination. (This is contrary to observed LEC results.)**
- **Rieke (1903) and Darrow (1932) both derived 2nd order nonlinear differential equations that included ion recombination, electric field, and diffusion but they could not find an analytic solution. However, Rieke did could get an analytical solution by successive substitution.**
- **Tate (1966) combined the equations into a 4th order nonlinear differential equation and solved the equation numerically but his boundary conditions and the assumption of saturation and equal diffusion coefficients, don't match LEC experimental results.**
- **Ohmart (1966) receives a patent for a device that uses an external ionizing source**
- **R Rosen and EP George (1975), get an analytic analysis with recombination but without diffusion**

Electrical conduction through a gas containing ions began with JJ Thomson and E Rutherford in 1896 when they reported using a known ionization source to ionize the gas and an applied electric field to measure the current collected. They observed that by increasing the applied electric field, the current would increase and ultimately saturate where further increases to the electric field, below breakdown, did not increase the current collected. For these experiments they considered the potential impact of ion diffusion within the gas but dismissed it because the electric field dominated.

In 1903, Rieke, and in 1932, Darrow both derived 2nd order nonlinear differential equations that included terms for recombination, diffusion, and electric field but they could not find an analytic solution to the equations although Rieke did make assumptions for some of the variables and used successive substitution with some success.

In 1966, Tate combined the two equations into a 4th order nonlinear differential equation which he solved numerically but the boundary conditions that he assumed do not match those observed in a LEC.

In 1966, Ohmart received a patent for a contact potential difference device that used an external source to ionize the gas. He states that the plots in his patent were from experimental data, but he doesn't provide any numbers along the axes.

In 1975, Rosen and George report an analytic analysis with recombination but

without considering diffusion. They concluded that recombination had a small effect.

The LEC is a Unique Device

- **LEC experimental data shows that when an external electric field is applied, *current increases and does not saturate,* unlike the known ionization sources used by Thomson and others. The Pd-D working electrode produces more ions as the electric field is increased.**
- **LEC experimental data shows that when the electric field is high, the increase in ionizing radiation is offset by the reduction of ions that are conducted via diffusion through the gas due to the electric field which opposes diffusion.**
- **As the load resistance is reduced, the voltage (electric field) is reduced which allows more diffusion current to flow.**
- **Ion-ion recombination is occurring throughout the gas and as more ions are produced, more recombine. Applying an external field may reduce the number of ions that recombine but getting more energy out than energy in is not possible unless LENR is involved.**
- **Cell designs that reduce the time constant within the ionized gas limited to that produced by the difference in work functions, diffusion becomes important and dominates at low voltages.**
- **LEC output power peaks when diffusion of the ions matches their electric field induced drift**

As shown on this slide, the LEC is unique and LEC experimental results differ in one way or another from the analyses by scientists from 1896 through the present time.

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Understanding and Characterizing the LEC

- **LECs are very unusual "electrophysical" (ion migration) cells rather than "electrochemical" (oxidation/reduction) cells.**
- **Contact potential difference (CPD) or Volta potential is one of the critical parameters that characterizes LEC performance**
- **Mobile ions must continuously be produced in the electrolyte between the electrodes to produce a voltage and current**
- **When the electrolyte is an ionized gas, the energy required to ionize the gas is the source of a LEC's energy**
- **Electric Field and Diffusion simultaneously work against each other**

Lattice Energy Converters (LECs) are types of contact electrification devices based upon the contact potential difference (CPD) or Volta potential between dissimilar metal electrodes that have different work functions. Mobile ions, in the electrolyte in the gap between the electrodes, completes the circuit and electrical current will continue to flow as long as there are mobile ions between the electrodes. LEC CPD cells will spontaneously self-initiate and self-sustain the production of a voltage and current when hydrogen occluded hydrogen-host-material, such as electrodeposited palladium (Pd) or iron (Fe), is between the electrodes. Both the source and the nature of the ionization radiation is currently unknown, but no naturally radioactive materials are used in the construction of a LEC. One possible explanation being considered is that the ionization of the gas is due to Low Energy Nuclear Reactions (LENR). Although LEC devices currently only produce micro-watts of power per square centimeter of electrode surface area, there are multiple ways to increase the power output of a LEC. Including: a) better metallurgy of the active material; b) alternative gas mixtures that reduce the energy required to produce an ion pair; c) increased gas pressures; d) increased operating temperature; e) increased active material surface area; as well as possibly changing from a gaseous electrolyte to a liquid, gel, or even a solid-state electrolyte.

Understanding and Characterizing the LEC cont.

- **LEC cells are diffusion driven**
- **LEC cells operate at temperature ranges well below 0 °C and to well above 100 ° C**
- **LEC cells work with many types of electrode materials and electrolytes**
- **The conduction equations provide insight into optimizing the electrode separation, gas pressures, etc.**
- **A good reference is Ohmart's patent #3,152,254 which uses external ionization rather than an internal source of ionization**
- **LEC cell implementations that reduce recombination could lead to significantly increased power output**

LEC cells are diffusion driven devices that produce electricity as a current source rather than a voltage source.

LEC cells have been tested at temperature ranges well below 0 °C and to well above 100 °C. They produce increased power output at higher temperatures.

LEC cells work with many types of electrode materials and electrolytes

The conduction equations provide insight into optimizing the electrode separation, gas pressures, etc. but detailed modelling or numerically solving the equations would greatly assist in the optimization of LEC power output

A good reference is Ohmart's patent #3,152,254 which is a contact potential difference device that uses external ionization rather than an internal source of ionization

LEC cell designs that reduce recombination could lead to significantly increased power output

What we think we know/don't know

- **We don't know how, or at what locations within the cell, that the gas is being ionized**
- **Active materials that produce more ionizing radiation will help**
- **The importance of ion diffusion is an inadequately studied area of research.**
- **Our successive approximation analyses of LEC ion-gas dynamics using LEC experimental results indicates that several orders of magnitude improvement should be possible**
- **Exploring numerical or modern plasma modelling techniques to solve the nonlinear differential equations using experimentally observed boundary conditions will lead to improved LEC cell designs**
- **These challenges are ideal thesis topics for Master's and PhD students**

We don't know the source or mechanism that is ionizing the gas. Knowing how and where the gas is being ionized would be helpful in LEC cell design to reduce recombination.

The gas-ion dynamics equations indicate that increase ion density improves LEC power output. Better active materials that increase ion production will help in scaling up LEC power output.

The physics of ion diffusion has received only limited attention. Not only is this an interesting area of potential original research, a better understand of ion diffusion will be helpful in designing LEC cells to increase output power.

Modern numerical analysis and plasma modelling techniques could significantly improve the understanding and lead to increased power output.

Many graduate students could become excited about a thesis topic with the opportunity to contribute to the development of a new low-cost, green energy source for the world

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Opportunities for Collaboration

- **Improved metallurgy, including particulate materials**
  - **Codeposition particulate works, but is it optimum?**
  - **Do active materials, including particulates that produce heat also produce ionizing radiation?**
  - **Pd particulate and preliminary data from one test of an active powder also produced ionizing radiation.**
- **The gas ion physics within the cell is a 4^{th}-order nonlinear differential equation that does not have an analytic solution**
  - **Repeat the numerical analysis by Tate using different diffusion coefficients and boundary conditions**
  - **Model using one of the Plasma models that Florian Metzler referenced**
- **Universities have expertise, professors, students, and facilities**
- **Companies have expertise and facilities**
- **Individuals have specific areas of expertise such as theories**

Five targeted areas for improvement have been identified including better metallurgy, optimized gas composition, improved ion harvesting capability, increased temperatures, and increased active electrode surface area. Admittedly, these are not all independent variables so care must be taken to not double count improvements.

Hand-in-hand with the focus areas is analysis. At this point, we don't know how the gas is being ionized. That information would be very helpful in cell design and optimization. Extensive testing at the Bahaba Atomic Research Center in India by Dr. Srinivasan and others in the early 1990's showed that radiation would fog film, but even using very sensitive instruments, they were unable to detect identifying the type radiation. That situation remains today, some 30 years later and is an opportunity for more research.

Gas ion dynamics has been studied since the 1890's however while most acknowledge diffusion in their publications, only 4 authors that we are aware of include diffusion in their analysis. In the early 1900's, Eduard Riecke published several papers that included diffusion in his analysis but he didn't draw any conclusions. KK Darrow published a book in 1932 where he includes diffusion, ending up with a set of 2nd order differential equations, some of which are linear and some are nonlinear. Darrow makes the important observation that voltage and current do not need to simultaneously decay to zero. In 1965, Tate combines the set of 2^{nd} order differential equations, resulting in a 4^{th} order nonlinear differential equation which he uses numerical techniques to solve for the electric field distribution in the gas. However, some of Tate's assumptions and boundary conditions that he used to solve the equations are not supported by LEC data. Phenomenologically, a LEC appears to be a diffusion driven, temperature dependent current source, shunted by a voltage dependent conduction, such that the optimum power occurs where the voltage determined by the load impedance matches the temperature dependent diffusion current. Our publication titled "Lattice Energy Converted" J. Condensed Matter Nucl. Sci. 35 (2021) 1–19 includes a Norton equivalent circuit and more

details.

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Conclusion

We believe that there are multiple opportunities to scale up the LEC to become a useful green energy source

and

Collaborative teaming will accelerate the development

In fact,

The work that you're already doing to develop better materials, including active nanoparticles, could contribute directly to scaling up LEC power output

The Lattice Energy Converter is a device that directly converts the energy in a specially prepared electrode into electricity without requiring the use of naturally radioactive materials. While the power output is small, based on experimental results and analysis, we believe that there are many reasons to be optimistic that the LEC can be scaled up to become a useful green energy source.

We welcome your comments and help to achieve this important objective.

Acknowledgements

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- Replicators including Jean-Paul Biberian, Fabrice David, Antonio Di Stefano,, Andrew Erickson, Hang Zhang, and
- Many others for their advice and support including:

Bill Collis, RIP

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Remembering Stan Szpak

Stan was born when his parents were attending school in the U.S. They returned to Poland when he was 2 years old where he received degrees in Chemical Engineering. Stan returned to the U.S. in 1948, arriving in New York with less than $20 dollars in his pocket. He lived with a cousin and worked in as a chemist with a specialty in corrosion. He went back to school to get advanced degrees where he met and became friends with John Bockris and Martin Fleischmann.

Stan's is best remembered for his contributions to LENR in using codeposition to prepare the working electrode. His last work was a 144-page manuscript titled "CHEMICAL ASPECTS OF THE Pd/nH – H2O SYSTEM IN ITS NUCLEAR ACTIVE STATE" https://www.lenr-canr.org/acrobat/SzpakSchemicalas.pdf

https://www.infinite-energy.com/images/pdfs/SzpakMemorial.pdf
https://www.youtube.com/watch?v=QxBJjWzlKl0

Dr. Stanislaw Szpak in 2015

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Thank You for your attention

We welcome and look forward to your questions and comments and most of all

We Welcome your Collaboration

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