12th International Workshop on Anomalies in Hydrogen Loaded Metals

Preliminary Abstracts

Contents

Effect of Supporter Material on Heat Evolution from Ni-based Nano-Composite Samples under Exposure to Hydrogen Isotope Gas

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Hydrogen isotope absorption by palladium and nickel-based nanocomposite samples has been examined as a collaborative work using the experimental apparatus installed at Kobe University and Tohoku University in order to share scientific understanding of the anomalous heat effects both at room temperature (R.T.) and elevated temperatures (E.T.). The following samples have been tested so far at Kobe Univ. :

a) $Pd_{0.044}Ni_{0.31}Zr_{0.65}$ with ZrO_2 beads filler; PNZ3, PNZ4, PNZ5
b) $Cu_{0.044}Ni_{0.31}Zr_{0.65}$ with ZrO_2 beads filler; CNZ5
c) $Cu_{0.008}Ni_{0.079}$ supported by mesoporous SiO_2 powder; CNS3
d) Pd nanoparticles embedded in mesoscopic SiO_2 balls; PSf1

The samples a) PNZ and b) CNZ were amorphous mixture of the metal elements prepared by melt spinning method, and calcined in air at a temperature of 450 °C for 100 hr ~ 60 hr, during which preferential oxidation of Zr to ZrO_2 is expected with a consequent formation of binary-nanoparticles of Pd/Ni or Cu/Ni embedded in it. The results of the D (or H) absorption and heat release experiments were presented at ICCF20 last October, and will be published in Proceedings of ICCF20.

The sample c) CNS3 was synthesized in a solution of nickel chloride and copper chloride containing the mesoporous silica (mp-silica) powder as a suspended material to adsorb Ni and Cu in nano-pores or on the surfaces. The sample d) PSf1, fabricated at Kyushu University, consists of Pd nanoparticles embedded in silica balls. Comparison of the results of the absorption/heat measurements of the sample c) and d) are going to be presented and discussed at JCF17 Meeting this March. The main conclusions are:

(1) In the E.T. phases, excess heat is observed in the runs with binary nanocomposite samples, while no excess heat is observed with single-element nanoparticles.
(2) In the CNS3#2 run, the excess heat amounts to 29 MJ/mol-Ni or 0.11 GJ/mol-H without any observable change in the sample composition, which cannot be explained by any chemical process.

In the present paper, the D (or H) absorption and heat release characteristics will be discussed with a focus on the effect of the supporter material, ZrO_2 and SiO_2.

Model Mechanism for AHE by Nano-Metal and H(D)-Gas

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Burst like heat at room temperature and long lasting anomalous heat effect (AHE) at elevated temperature have been observed by D(H)-gas phase experiments with Ni-based nanocomposite metal samples by Technova-Kobe collaboration and 6 Japanese group collaboration works as reported at ICCF20, by A. Takahashi et al [1], A. Kitamura et al [2] and Y. Iwamura et al [3]. Observed AHE has been considered to be explainable by some nuclear mediated reactions with catalytic nano-composite condensed matter physics, as reviewed in Session-4 of ref. [1].

Presentation will be of model mechanisms based on the TSC theory. Surface catalytic and molecular physics models are reviewed and discussed first. Formation of SNHs (sub-nano-holes) on surface of modeled nano-composite sample, Ni-core + incomplete Pd (or Cu) shell, is a key idea of sites for TSC formation. After the TSC state is formed, it will make very rapid (ca. 1-2 fs) condensation-collapse motion getting into strong/weak nuclear interaction range for 4 protons (or deuterons) + 4 electrons system (the 8 body system dynamics) to generate specific nuclear ash (He-4, He-3, d). Mechanism of AHE by D-gas or H-gas phase will be discussed by the present model.

[1] A. Takahashi, A. Kitamura, K. Takahashi, R. Seto, T. Yokose, A. Taniike and Y. Furuyama: Anomalous Heat Effect by interaction of nano-metals and H(D)-gas, Proc. ICCF20 to be published in JCMNS

[2] Akira Kitamura, Akito Takahashi , Koh Takahashi, Reiko Seto, Yuki Matsuda, Yasuhiro Iwamura, Takehiko Itoh, Jirohta Kasagi, Masanori Nakamura, Masanobu Uchimura, Hidekazu Takahashi, Tatsumi Hioki, Tomoyoshi Motohiro, Yuichi Furuyama, Masahiro Kishida: Collaborative Examination on Anomalous Heat Effect Using Nickel-Based Binary Nanocomposites Supported by Zirconia, Proc. ICCF20 to be published in JCMNS

[3] Y. Iwamura, T. Itoh, J. Kasagi, A. Kitamura, A. Takahashi and K. Takahashi: Replication Experiments at Tohoku University on Anomalous Heat Generation Using Nickel Based Binary Nanocomposites and Hydrogen Isotope Gas, Proc. ICCF20 to be published in JCMNS

Erzion Interpretation of Rossi & "Lugano" Experiments with "Hot E-cat" Cell & Our Plasma Electrolysis Experimental Results

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There are presented the main results of Rossi and Sweden-Italian "Lugano" group experiments with the hydrogen loading of nickel on the "hot E-cat" cell. Also short review of our Cold Nuclear Transmutation investigation in plasma electrolysis is presented. For their interpretation it is proposed to use the Erzion model for theoretical explanation of excess heat generation, new chemical elements & isotopes production and radiation registration in these experiments. For such explanation Erzion model takes into consideration the Spin and Parity Preservations Laws.

Patents in the Land of LENR

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Interested observers of developments in the field of LENR were awakened by the first publication and issuance of a US patent to Leonardo Corporation, based on an invention by Andrea Rossi, on August 25, 2015. That US patent has its special story as to the procedure followed before the US Patent Office. It was processed in secret without the normal publication that occurs after 18 months from a first patent filing. This patent has some relevance. But it has now been followed by the publication of a corresponding, enhanced, PCT application. The more interesting issue is: Will these or any other patent filings eventually have a controlling impact on developments in the field of LENR?

This paper provides a concise review of key patent principles which should be understood by everyone concerned about this issue. Misconceptions abound. It is important that anyone wishing to understand the possible impact of patents on the development of LENR understand correctly what patents can and cannot accomplish.

Patents are referenced in a legal action commenced before the United States Federal District Court in Florida, filed on April 5, 2016. This action was commenced by Leonardo Corporation and Andrea Rossi against Industrial Heat, some of it is some related corporations and key individuals associated with these companies. This action will not likely come to a trial until sometime in 2017 at the earliest. It could also settle at any time. That action is essentially an effort to collect US$89 Million arising out of an agreement made between Industrial Heat and Leonardo Corporation in 2012. The status of those proceedings as of the beginning of October, 2016 will be reviewed.

Industrial Heat is accused of having improperly filed for two applications on its own both naming Andrea Rossi as at least a co-inventor. Apparently, based on the allegations in the lawsuit this happened without the consent of Andrea Rossi. How this could happen will be reviewed. However, equally significantly, these two patents will be examined for the apparent thinking and understanding that existed within Industrial Heat when these patents were first prepared 2 1⁄2 years ago.

Reference will be made to several other US patents that have issued in this field, and others that have been refused by the US Patent Office. Reference will also be made to selected patents that have been processed before the European Patent Office, including in particular the original patent that issued in Europe based on the work of Fleischman and Pons.

The paper will conclude with a projection as to the impact that prospective future patents in the LENR field may have on commercialization of LENR around the world.

Forgotten effects and inventions of LENR

George Egely

Most researchers of LENR think that history started with Pons and Fleischmann. Not so. Some important but scarcely documented inventions, like Nicola Tesla's „carbon button lamp” , go back as early as the 1890's. Henry Moray demonstrated his plasma-based electric energy generator from the 1920's. Hungarian-born Joseph Papp demonstrated his „noble gas” engine in the 1960' – 1980's. The Correas' (husband and wife) demonstrated and patented their plasma-based electric energy generator in the 1990's. The Russian V. Chernetzky demonstrated and published several articles about their arc discharge based device, which produced excess electric energy.

Other inventions like Shoulder's „heavy electron” discharge mechanism fells to the same category.

All of the above inventions work in transient plasma with discharge between metal electrodes, which erode during the process. Thus in fact a transient dusty plasma is the base of all these excess energy generating devices.

The inventors had no clue to the nature of the excess energy generating effects, just all of them stumbled into an interesting effect by accident. There were at least a dozen more but less clearly documented inventions, as transient dusty plasma is easy to generate. All underwater transient discharge experiments automatically belong to this branch.

Arguably hydrogen isotopes are behind all of these effects, that is, there is a wide unrecognized area of LENR, which is unknown to researchers working in LENR.

Obviously not only bright and lucky tinkerers, backyard inventors stumbled into this area, but physicists, too. Steven B. Krivit has compiled an eye-opening volume of these important, but ignored discoveries. All of them were in the area of transient discharges between metal electrodes, which in turn yield dusty plasma. Thus as early as 1907, W. Ramsay, and independently of him F. Soddy demonstrated the unexpected appearance of He and Ne in the discharge of hydrogen.

Several other LENR effects were discovered – and forgotten, neglected in the coming decades.

It is high time to relate them and find the physical mechanism behind these interrelated effects.

"Road Map" for Developing Engineering Applications of LENR Technologies

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The results of experimental research of LENR phenomena that have become evident of late are making urgent to start active works in the field of developing engineering applications of LENR technologies.

The presentation stipulates to demonstrate several major technologies that can be fulfilled to be implemented in the near future. Those technologies incorporate the following directions: Generating ecologically clean and safe heat; Generating ecologically clean and safe electricity; Complete neutralizing radioactive waste and spent nuclear fuel; Cheap and ecologically clean desalinating sea water; Neutralizing war gases and toxic hazardous waste products; Producing precious and rare metals out of cheaper materials; Producing new special materials and alloys; Using LENR-radiation for technical and medical needs.

The power point slides will exhibit to demonstrate technical and commercial parameters of 11 projects including: 100 kW water heating unit; 5 MW electric power generator; 120 kW fuelless electrical generator; 10 MW power installation; Technological complex for deactivating radioactive waste and spent nuclear fuel; Technology for economically effective distillating sea water; Ecologically safe desalinating sea water; Detoxication of poisonous materials and war gases; Equipment for manufacturing stable isotopes; Reactor for manufacturing gold and special alloys; Technology for producing Xenon gas; Unit for generating and implementation of TM-radiation for medical purposes.

The video presentation will contain 45 slides illustrating the design of the technologies proposed, main technical characteristics, and projects parameters.

An Improved Differential Calorimeter to study the Synthesis of an Iron Pico-Hydride. Characterization of the Iron Pico-Hydride

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The differential calorimeter used to carry out the Iron Pico-hydride synthesis has been improved:

-The supports of the inner alumina tube of the calorimeter are now outside the heater, resulting in the 2 alumina tubes facing each other with nothing in the heated zone. The thermal signal used to measure the enthalpy of formation is thus easier to understand.

-The calibrating constant of the calorimeter is now measured by the melting of a copper mass in the reference cell of the calorimeter.

As regards the characterization of the Iron Pico-hydride, a scan of the absorbance (by Absorption Spectro-Photometry in the UV VIS range) has been made. Two solutions 200mM in HCl 10N of the Iron used for the synthesis and of the resulting mixture Iron/Iron pico-hydride after synthesis, have been washed 3 times with diethyl-ether. A clear difference between the two spectra of the washed samples has thus been evidenced: the maximum of absorbance of the Iron pico-hydride is shifted by 16 nm (towards UV) compared to the maximum of absorbance of the Iron.

The consequences of this observation, combined with the ICP-MS results will be discussed.

A LENR view after SSICCF20 and ICCF20

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At SSICCF20 and ICCF20 we have presented several paramount results which we quickly summarize here.

1- If we use the same math as quantum physicists, then a straightforward application of the Banach-Tarski [1] theorem to the Hamiltonian of an isolated system in classical statistical thermodynamics brings to the non-conservation of energy.
2- If we start physics, in a trial to get a new global approach, through the theorem of Curie basically saying that for an event to occur in any physical system we need to have a dissymmetry and that systems evolve from a dissymmetric state to a symmetric one, we proved that symmetry means disorder whereas dissymmetry means order on the contrary of common intuition. This brought us to consider a new mathematical view of what symmetric means and we elaborated the notion of symmetry from a point of view which can be inside a figure or outside. And this results in entities which are, say, symmetric from the inside and dissymmetric from the outside.
3- We pushed the traditional argument of evolution of any closed system towards a state of maximum entropy to its limits by extending the notion of what order means in any physical system and showed that in such a new model there is a theoretical way to make an artificial fuel which will give more energy when combustion occurs than what we needed for its manufacturing and this without contradicting the first and second principles of thermodynamics.
4- We also showed that it is possible to extend thermodynamics which is limited in its formalism to closed systems, to open systems in general and the whole universe in particular.
5- According to these results we suggested that LENR reactions could be not “cold fusion” but new kind of reactions, “above” chemistry. This is a strong conviction linked to previous work presented at New3-SC with a new model of the atom which justifies what some experiments already have detected! However, we shall show in this paper that our model based on symmetries can perfectly explain why and under which conditions cold fusion could occur. We will even show a way to master it!

Most of these theoretical results, which we think are of importance, were presented at LENR conferences, but we did not explain how to use them to make LENR working systems. In this paper we are going to try to give some more concrete indications of how to do this.

S. Wagon, The Banach-Tarski Paradox, Cambridge University Press, 1985.

News about symmetries in physics

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In this paper we are going to present the theory we began developing in SSICCF20 about symmetries. Basically, we start from Pierre Curie's theorem as the basis. This implies developing new mathematics and in particular revisit what the notion of symmetry is. We shall mathematically define what a mathematical symmetry is. This definition is consistent with the currently known one, but adds an ingredient: the point of view we look at a figure.

So, basically, considerations in physics bring to elaborating new mathematical concepts. Then we push up the mathematical concepts to apply them to the initial physics. This results, when adding to Curie's view the one of Einstein, to the justification of a non-Archimedean universe. In the meanwhile this approach shows that the fields we deal with must follow functions like $1/r^{\alpha}, \alpha > 0$. We are therefore very near the well-known electromagnetic and gravitational fields. We also mathematically prove that motion is a necessity for having a symmetric system, hence stability or equilibrium.

This theory gives clues of how to manage and build a LENR device. More details on this are provided in another paper of ours.

Deepening Questions about Electron Deep Orbits of the Hydrogen Atom

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In a previous work [1] we summarized arguments for and against the deep orbits, as discussed in published solutions. The most complete of such works, Maly and Va'vra [2], indicates an infinite family of EDO solutions of the Dirac equation when using a Coulomb potential modified by taking into account a finite size nucleus. We analyzed, verified, and improved their method of computing the EDO mean radius, in particular, by using a more complete ansatz and we extended their results by varying some contextual parameters. Moreover, in [3] and under a more detailed form in [4], we revealed the essential role of Special Relativity as source of EDOs with high binding energy, due to the quadratic expression of the relativistic total energy, and as leading to a dynamic correction of the original Coulomb potential. We also showed, from a well-known analytic method of solution of the Dirac equation, that the *EDOs have a positive energy E*.

When including the magnetic interactions near the nucleus, we observed a breakthrough [5] in how to satisfy the HUR requirement for electrons confined near the nucleus in a radial zone of only a few fm. Indeed, when considering only the electric Coulomb potential, the deep-orbit-electron kinetic energy is of order several keV to a few MeV (with a correspondingly low momentum). However, with magnetic interactions, preliminary computations indicate such energies in the hundred MeV range.

We continue our study here by examining the Special (e.g., Thomas precession) and General Relativity effects [6] at the MeV level and by including magnetic interactions (e.g, spin-spin) in the highly relativistic regime of electrons (~100 MeV). It is seen that the Thomas precession, already included in the relativistic equations, may play the same role in the deep orbits that the deBroglie wavelength plays in the atomic-electron orbits. We noted previously that Special Relativity tends to mix energy parameters, while generating further terms, because of its non-linear features; so one can no longer simply add the potentials. A full relativistic treatment requires full covariant methods from QFT techniques, such as e.g. two-body Dirac equations of constraint dynamics, to avoid the Currie-Jordan-Sudarshan "non-interaction problem" [7]. Moreover, radiative corrections are certainly very strong in the nuclear zone, so we have to analyze and adapt to this zone, small effects well-known for the atomic electrons. This can imply changes in the regularization processes required for closed loops and also requires Effective Field Theory [8] which considers a layered structure of energy levels. It appears that in solving the cold fusion problem, new insight into the physics of the nucleus and its multi-energy structures may become available.

[1] Paillet, J.L., Meulenberg, A., "Electron Deep Orbits of the Hydrogen Atom". Proc. 11th Internat. Workshop on Hydrogen Loaded Metals, Airbus Toulouse, 15-16 Oct. 2015, J. Cond. Matter Nucl. Sci. 22, (2016).

[2] Maly J.A., Va'vra J., "Electron transitions on deep Dirac levels II," Fusion Science and Technology, V.27, N.1, pp.59-70 (1995), http://www.ans.org/pubs/journals/fst/a_30350

[3] Paillet, J.L., Meulenberg, "Relativity and Electron Deep Orbits of the Hydrogen Atom", Proc. of the 1st French Symp. RNBE-2016 on CMNS, Avignon, 18-20 March. Journ. CMNS 21, 40-58 (2016).

[4] Paillet, J.L., Meulenberg, A: "Special Relativity, the Source of the Electron Deep Orbits", Foundations of Physics, 47(2),256-264,Springer (2017).

[5] Paillet J.L., Meulenberg A., "Advance on Electron Deep Orbits of the Hydrogen Atom". presented at ICCF20, 20th Intern Conf. on CMNS, Sendai, 2-7 Oct 16, 2016, Sendai (Japan)

[6] Burinskii, A. "Complex Kerr Geometry, Twistors and the Dirac Electron," J. Phys. A, 41:164069, 2008 arXiv:0710.4249v2

[7] Currie D.G., Jordan T.F., Sudarshan E.C.G., Relativistic invariance and Hamiltonian theories of interacting particles, Rev. Mod. Phys. 34 (1963) 350–375.

[8] Hartmann S., Studies in History and Philosophy of Modern Physics, **32B**, 267-304 (2001).

Re-analysis of an Explosion

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An electrochemical cell operated with a hollow palladium cathode in heavy water led to a very strong explosion. The glass calorimeter was shattered into small pieces thrown at several meters. (ref.: Unexplained Explosion During an Electrolysis Experiment in an Open Cell Mass Flow Calorimeter - JCMNS 2 (2009) 1-6). In order to find out if the explosion could result from a chemical reaction, a reanalysis of the experiment is presented.

The explosion mechanisms of the mix of H_2 and O_2 are reviewed based on the literature. Depending on the conditions, the reaction might take the form of a deflagration, a detonation or a super-detonation (also known as strong detonation). A detonation has a much larger damaging power than a deflagration. A super-detonation is even more damaging, but the conditions of occurrence of this type of explosion are said to be difficult to obtain.

Explosion tests were performed in 25mm diameter, 200 mm long glass tubes under various conditions, the reaction being triggered by a hot wire or by a spark. Deflagrations and detonations were obtained, but the glass tube was not fractured during these tests. Other experiments were performed in closed steel tubes with a setup making it possible to evaluate the damaging power exerted on the tube ends. Values ranging from 10 bars to 30 bars were obtained.

A series of experiments were made in 25mm diameter glass tubes. The igniter was a 2mm internal diameter copper tube placed along the glass tube axis. The copper tube was connected to a pre-chamber where the explosion was triggered. In several cases a super-detonation occurred and the glass tube was shattered into small debris, mimicking the event observed in the original cell.

The small diameter ignition tube seems to play an important role in the development of a super-detonation. In the original cell, the hollow palladium cathode may have provided this role. This hypothesis is discussed based on the known theories of gaseous explosion.

This reanalysis leads to the conclusion that a fast reaction is initiated within the hollow cathode, for a reason that is not clear at this stage. The explosion wave propagated along the palladium tube and resulted in the super-detonation.

Other similar explosions have been reported in the LENR research field. They are reviewed in the light of the present investigation.

Isotopic and Elemental Composition of Substance in Nickel-Hydrogen Heat Generators

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Results of the analysis of isotopic and elemental composition of the fuel before and after work in Rossi heat generators, as well as in similar nickel-hydrogen reactors are shown. As a result of Rossi reactor operation (excess heat 5800 MJ) a dramatic change both the elemental and isotopic composition of the fuel was happened. Our nickel - hydrogen reactors with excess heat to 700 MJ strong changes of the elemental composition have occurred, but equally strong as in Rossi reactor changes of lithium and nickel isotopic composition were not found.

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Verification of the results of G. L. Wendt and C. E. Irion experiment on electric explosion of tungsten.

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G. L. Wendt and C. E. Irion study suggests that alpha-decay of tungsten occurs during the electric explosion. The authors of the present work decided to check G. L. Wendt and C. E. Irion results by using modern diagnostic methods and relying on modern theoretical concepts. Gas phase formed in the chamber after the electric explosion was carefully studied in the experiments. The results of the study do not contradict with the results of the experiment G. L. Wendt, C. E. Irion experiments.

Keywords: electrical explosion of conductors, gas phase analysis, optical spectral lines, gas mass-spectrometer, alpha-decay, alpha- beta-decay.

Interaction of Erosive Metal Clusters with Hydrogen Atoms in Heterogeneous Plasmoid

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We studied the physical parameters and properties of a long-lived heterogeneous plasmoid (plasma formation with erosive nano-clusters) created by combined (high frequency+ DC) discharge in high-speed swirl flow in our previous papers [1-5]. This work is a continuation of these previous works. Interaction of metal nano-clusters with hydrogen atoms was studied in a vortex plasma reactor with argon- water steam gas mixture [2-5]. Metal nano-clusters in electric discharge region were created by nickel cathode's erosion. Hydrogen atoms were obtained by water steam dissociation in electric discharge region. These hydrogen atoms interacted with metal nano-clusters. In a result of this interaction, a stable heterogeneous plasmoid was created in swirl gas flow. The typical diameter of this spherical plasmoid is 10 mm. Electric potential of this plasmoid measured by electric probe is about of 2-4 kV. Plasmoid's structure and its dynamics were studied by high-speed camera. It was revealed that a heterogeneous non-equilibrium plasmoid creates intensive soft X-ray radiation. We determined that excited and charged cluster particles are responsible for this soft X-ray radiation creation (with quantum energy about 1–4 keV). Plasma parameters of this plasmoid (electron concentration N_e, electron temperature T_e, vibration and rotation temperatures T_V, T_R) were measured by optical spectroscopy method. It was obtained that there is a high non- equilibrium plasmoid in vortex plasma reactor: - $T_e > T_V >> T_R$. We determined that there is extra power release in heterogeneous plasmoid created by combined discharge. The measured COP of this plasmoid is about 2–10. We suppose that this extra power release in heterogeneous plasmoid is connected with LENR. The obtained experimental results (COP, optical spectra, soft X-ray spectra, chemical composition of dusty particles) prove our suggestion.

References

1. Klimov A., Vortex Plasmoids Created by High-Frequency Discharges, Atmosphere and Ionosphere: Dynamics, Processes, Monitoring, Springer, Berlin, 2013, P.251-273
2. Klimov A., Evstigneev N., Moralev I., et.al., Vortex Control by Combined Electric Discharge Plasma, AIAA Paper 2013-1046, 51th AIAA Aerospace Sciences Meeting, Dallas, Texas, 2013, P.15
3. Klimov A., Calorimetric Measurements in Vortex Plasmoid, Proc. 12th Conf. RCCNT and BL, M. 2005, C.246
4. A. Klimov, A. Grigorenko, A. Efimov, et.al., High-energetic Nano-Cluster Plasmoid and Its Soft X-ray Radiation, J. Condensed Matter Nucl. Sci, 19, P.1-10
5. A. Klimov, A. Grigorenko, A. Efimov, et.al., Optical and X-radiation Spectra of Heterogeneous Plasma, Proc. AIS-2016, Kaliningrad 2016, P.287-293

LENR - What we must do to complete Martin Fleischmann's undertaking

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More than 28 years have elapsed since the public announcement by Martin Fleischmann and Stanley Pons on March 23rd 1989 of the observation of anomalous thermal effects with possible nuclear fusion implications associated with the super-loading of deuterium into palladium by electrochemical means. This announcement triggered widespread attempts to replicate these measurements especially in the USA, Japan, Italy, Russia and other former states of the USSR, India, and latterly France. While a majority of replication attempts failed, several groups (inclusive of SRI and BARC groups) indeed reported observation of tritium and He^4 (SRI, Melvin Miles and others) in Pd-D_2O electrochemical cells; the cumulative yield of He^4 produced was nearly commensurate with the integrated excess heat energy released, clearly pointing to the "anomalous" occurrence of nuclear fusion of the deuterium, catalyzed within the Condensed Matter environment of the Pd lattice. A noteworthy feature of these observations was the absence of penetrating radiation from the cells, suggesting the operation of new nuclear physics. Although replicated in a number of laboratories around the world, the reality of LENR has still not been accepted by the broader scientific community primarily because the nuclear processes that occur within the solid state environment are quite different from what happens in free space. The essential findings of this new field were recently reviewed in a special issue on LENR of the Journal ***Current Science*** (issue dated 25th Feb 2015) published by the Indian Academy of Sciences. This issue has also discussed various theoretical models put forward to explain how such anomalous reactions could be taking place in metal-hydrogen systems. An exhaustive survey of the present international efforts in the field, as of early 2017 labeled as "LENR ecosystem" is available at www.anthropoceneinstitute.com/LENR.

The CMNS community is aware that the problem of non recognition of LENR by the mainstream scientific community needs to be addressed to register further progress. Most experimental efforts to date have not been well-enough resourced, staffed or focused, primarily because of inadequate funding support. To move forward it is obvious that 1. Unmistakable and irrefutable scientific proof must be provided that nuclear effects do take place in condensed matter by means, at rates and with products different from nuclear reactions in free space and 2. Demonstration must be made of a practical application of the energy so created. Since industrial devices would have to operate at elevated temperatures, emphasis is increasingly shifting to gas based systems wherein nano powder complexes composed of mixtures of various compounds are exposed to either hydrogen or deuterium at high temperatures. While consistent excess heat has been reported, the magnitude of the obtained COP is not yet at levels which can attract venture capital, although some forward looking private entities are quietly bank rolling development efforts, as listed in the Anthropocene Inst survey mentioned above. Also atleast a handful of Academic Institutes are pursuing basic studies on a variety of metal hydrogen configurations. The six-Institute collaborative effort in Japan involving four Japanese Universities and two Industrial houses supported by the Japanese government under their NEDO program is noteworthy. The talk will present a brief resume of the status of the field, emphasizing the need for a more proactive role by public and private sector authorities given the potential of LENR to serve as a source of clean and compact source of Energy for the future.

Cold Nuclear Transmutation Study of Various Atimic Nuclei Structures

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Excess heat occurrence is no longer to demonstrate. Nevertheless, two main problems are still facing us. The one is the reproducibility of the cold fusion process, the other concerns the possibility of nuclear transmutations which generate that excess heat. The work presented deals with the issue of transmutation at low temperature, i.e. LENR. The structure of the nuclei is addressed as being the basis for understanding the process of transmutation.

The hypothesis I develop founds its background in the structure of the neutron and the proton I proposed in my document posted on the internet one finds under http://philippehatt.com/

I proposed there a distribution of mass within the neutron and the proton and hence a distribution of mass within the alpha particle and as consequence its binding energy.

The issue is to see if that structure is verified in the case of other nuclei and at which conditions.

I will first consider the case of the n alpha nuclei: Be8, C12, O16, Ne20 etc. till Ca40.

In a second part I will take the case of their isotopes.

It will be shown that binding energy of the n alpha nuclei is composed out of a multiple of the binding energy of alpha particle with addition of some bonds linking the several alpha particles. These bonds are called NN, NP (= BE of Deuterium), NPP (= BE of He 3) and NNP (=BE of Tritium), NN bond being a part of alpha bond.

Similarly, the binding energy of their isotopes is constituted with the same number of alpha particles and the same type of bonds, nevertheless more numerous.

According to the hypothesis developed the nuclei of the various elements are constituted out of alpha particles and other nucleons grouped in order to form sub nuclei bound together by four types of bonds, NN, NP, NNP, NPP.

These bonds are strong, nevertheless less strong than that one of alpha particle, and are reversible as they are present in positive or negative value, the final value being positive in the case of stable nuclei. They are also flexible as they are oscillating between them.

These properties could explain the LENR process.

Structure of the Neutron and Proton

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1. The objective of the work is to determine a structure for the neutron, the proton and hence for the various nuclei of the table elements. This will help to understand the process of LENR. Indeed, knowing the structure of the element at the beginning of the LENR process as well as the structure of the element obtained by transmutation is of primordial importance to understand the LENR process.
2. To understand my theory on the nucleon structure it is necessary to assume that a particle X is entering our space time and acquiring a mass (nude mass, without charge). It lasts one (Planck) instant in our space time before leaving it. Hence it loses its mass acquired when entering our space time. There will be instead a hole of mass I called an antimass. So, this particle acquires first a positive mass and after an instant a negative mass, a mass "down" when coming into the space time, a mass "up" when leaving it, these two "masses" being in opposition, hence the term of mass and antimass.
3. When a second particle enters our space time it also acquires a mass. So, there are a mass for particle B and an antimass + a mass for particle A. There is a conjunction of mass and antimass as well as a new mass linked to one particle. There is one particle for three quantic states. We will see that mass + antimass are modified in a negative electromagnetic charge. In other terms, if the particle B is for instance a "nude" electron it has acquired a mass of one electron as well as one electronic charge which results from the transformation of the former electron into one charge.
4. The process is explained on my website, especially on pages 110 and following of my first document. The schemas of the process are displayed there. One will notice that the process described is similar to the Fractional Quantum Hall Effect. Indeed, the particle will, on average, be found on a particular site only 1/3 of the time. The average electron number per site is thus 1/3. However, the value of the measured mass or charge is always an integer. Two thirds of the time one measures zero mass and one third of the time one measures unity mass. For the charge, it will be an integer charge made up of two masses (one mass and one antimass). The accepted interpretation is that there are fluctuations. My interpretation is the following (see page 113):

   The particle had a mass, lost it after an instant and an antimass challenging the mass was created. So, there is a mass loss of two (2/3 of time) and a mass rest of one, integer mass but only 1/3 of the time. The same happens with the charge as the charge is mass + antimass. Each time the positive and the negative mass or charge are challenging, with a slight advantage for mass over antimass and for the negative charge over the positive one, as far as neutron is concerned. For proton, it is partly the contrary, hence the slight loss of mass and the positive magnetic moment.
5. At page 115 on the schema about direct and indirect electromagnetism ,one notices that indirect electromagnetism is constantly changing sense, being negative then positive and again negative according to the progression of mass and direct electromagnetism .So each line is once negative ,once equal to zero as if in that case the electromagnetism was missing .The series are 1/3 and 2/3,2/5 and 3/5 ,3/7 and 4/7 etc .As said before the charge is always a integer multiple of the electron charge as far as the column concerns 10 minus 2 .If one considers the other columns the integer numbers are each time a multiple of 1/100,1/10000,

etc. At the end of the process one observes that the result is equivalent to the dipolar magnetic moment of the neutron. Please look at schemas 2and 3 of the annexes to part one of the document.

6. To summarize my theory matter is composed with:
   -mass and antimass, the resultant mass being the mass one observes in our space time,
   -mass and antimass combine to create the electron charge, negative in the case of mass + antimass, positive in the case of antimass + mass,
   -negative and positive charges combine to create pure energy.
   The last assumption is known, the two others are still to be discovered.
7. Mass and antimass are also partially combining to create binding energy. Knowing the mass structure of neutron and proton enables us to determine the deuterium and alpha particle binding energy, as well as that one of tritium and He3. These are enough to determine the binding energy of all elements of the table.
8. My theory is coming to the following results as far as neutron is concerned:
   -mass of neutron in electron masses conforms to the experimental measurement,
   -its dipolar magnetic moment also,
   -the structure of neutron I propose enables to determine the binding energy of any nucleus.

Recent Progress on Transmutation Experiments induced by D_2 gas permeation

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Nuclear transmutation - Cs->Pr, Sr->Mo, Ba->Sm - induced by D_2 gas permeation through nano-size Pd/CaO multi-layer complex, was reported by Iwamura et.al.[1]-[2] and replicated by Hioki et.al.[3]. Our team is conducting research on nuclear transformation by gas permeation from the following two viewpoints.

The first is to reconfirm Pr transmuted from Cs by a different method not reported so far. There is a criticism that the mass of the nucleus was not identified, since the employed mass spectrometry, such as ICP-MS, cannot exclude possibilities of chemical compound objects. Therefore, we employed the Rutherford Backscattering Spectroscopy (RBS) to identify ^{141}Pr for direct nuclear mass assignment.

Experiments were performed at the Cyclotron and Radioisotope Center of Tohoku University. Several pieces of Cs doped Pd/CaO multi-layer foil with/without D_2 gas permeation were bombarded by 128 MeV $^{40}Ar^{7+}$ beam obtained from the K110 AVF cyclotron. For some samples, we could identify the ^{141}Pr events as well as ^{133}Cs, although the statistics is not enough. In addition, a signal indicating the existence of a nuclide with mass number around 192 was obtained. This observation is very interesting, since there is a possibility that the impurity W in Pd/CaO multi-layer complex was transmuted into the elements of mass 192. Details will be reported in the conference.

The second is to confirm transmutation in nuclides other than transmutation observed so far, such as Cs, Ba, Sr[1][2], and to get the knowledge on the mechanism of this phenomenon. Therefore, we study to clarify the following points: (1) Does reaction of transmutation occur or not? (2) What is a target element to be transmuted? (3) Are radionuclides generated in our transmutation process or not?

We started Rb transmutation experiments in last year. Samples are prepared as follows: The Pd/CaO complex is composed of bulk Pd on the bottom, alternating CaO and Pd layers, and a Pd thin film on top [1]. Rb is doped into Pd/CaO complex using electrochemically plating. We set these samples in experimental device and carried out after D_2 gas permeation for about 100 hours. Element and mass analyses on the Pd complexes were carried out by XPS (X-ray Photoelectron Spectroscopy) and ICP-MS (Inductively Coupled Plasma Mass Spectrometry). We compared the results on foreground samples with those without D_2 gas permeation. In XPS analysis, weak signals of Zr and Mo were detected on samples after D_2 gas permeation. We will report on the results in detail.

Acknowledgements

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[1] Y. Iwamura et al., Jpn. J. Appl. Phys. 41 (2002) 4642.

[2] Y. Iwamura, T. Itoh and S.Tsuruga, Current Science, VOL.108, NO. 4, 25, 2015.

[3]T. Hioki et al., Jpn. J. Appl. Phys. 52 (2013) 107301.

On the Heat Transfer in LENR Experiments

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Thermal conduction is considered in deuterated palladium. We assume that the energy released in a single LENR event thermalizes in a region that has a typical dimension of the order of hundred nanometers. Then it is shown that the thermal conductivity enables the heat transfer of the energy released in repeated events without causing the lattice to melt. Consequently, a continuous power is possible. It is argued that a power up to about 0,5 W can arise from a single nuclear active environment, NAE. Both the experimental and theoretical consequences of the results are discussed.

Chemical and nuclear catalysis mediated by the energy localization in crystals and quasicrystals

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Catalysis is at the heart of almost every chemical or nuclear transformation process, and a detailed understanding of the active species and their related reaction mechanism is of great interest. We propose a catalytic mechanism based on the energy localization, manifested as *localised anharmonic vibrations* (LAVs) and *phasons*. In the former case, one deals with a large amplitude (~ fractions of an angstrom) time-periodic oscillations of a small group of atoms around their stable positions in the lattice, known also as *discrete breathers* [1, 2], which can be excited either thermally or by irradiation [3] in regular crystals as well as in quasicrystals (QCs). On the other hand, phasons are a specific property of QCs, which are represented by very large amplitude (~angstrom) collective oscillations of atoms between two quasi-stable positions determined by the geometry of a QC, which is neither crystalline nor amorphous [4]. Among many surprizing properties of QCs is their high catalytic activity [5].

Large amplitude atomic motion in LAVs and phasons results in *time-periodic driving* of adjacent potential wells occupied by hydrogen ions (protons or deuterons) in case of hydrogenated materials. As shown in [6, 7], this driving may result in the increase of amplitude and energy of *zero-point oscillations*. Based on that, we demonstrate a drastic increase of the D-D or D-H fusion rate with increasing number of modulation periods evaluated in the framework of Schwinger model [8], which takes into account suppression of the Coulomb barrier due to the lattice vibrations. We present atomistic simulations of LAVs in crystals and phasons in QCs and a model *of chemical* and *nuclear catalysis* that is mediated by the energy localization. Experimental verification of this model can open new ways towards engineering materials containing *nuclear active environments* based on the catalytic properties of LAVs and phasons.

Results of new experiments on the interaction of hydrogen isotopes with Ni powders and melt spun $Nd_{90}Fe_{10}$ alloy are discussed in the framework of the proposed model.

[1] V. I. Dubinko, P. A. Selyshchev, and J. F. R. Archilla, Reaction-rate theory with account of the crystal anharmonicity, Phys. Rev. E 83: 041124 (2011).

[2] V.I. Dubinko "Quantum tunneling in gap discrete breathers," Letters on Materials, 5 (2015) 97-104.

[3] V. I. Dubinko, Radiation-induced catalysis of low energy nuclear reactions in solids**,** J. Micromechanics and Molecular Physics, 1 (2016) 165006 -1-12.

[4] E. Abe, S.J. Pennycook, A.P. Tsai, "Direct observation of a local thermal vibration anomaly in a quasicrystal", Nature (London), 421, (2003) 347-350.

[5] S. Kameoka, T. Tanabe, F. Satoh, M. Terauchi, A.P. Tsai, "Activation of Al–Cu–Fe quasicrystalline surface: fabrication of a fine nanocomposite layer with high catalytic performance" Sci. Technol. Adv. Mater., 15 (2014) 014801.

[6] V.I. Dubinko, D.V. Laptev "Chemical and nuclear catalysis driven by Localized Anharmonic Vibrations", Letters on Materials 6 (2016)16-21.

[7] V. I. Dubinko, D. V. Laptev, A. S. Mazmanishvili, J. F. R. Archilla, "Quantum dynamics of wave packets in a nonstationary parabolic potential and the Kramers escape rate theory", J. Micromechanics and Molecular Physics, 1 (2016) 1650010 -1-12.

[8] J. Schwinger, "Nuclear Energy in an Atomic Lattice I," Z. Phys. D 15 (1990) 221-225.

Peculiarities of hydrogen interaction with Ni powders and melt spun $Nd_{90}Fe_{10}$ alloy

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Hydrogen interaction with Ni powders has provoked a lot of excitement and controversy due to the works of Rossi, Parkhomov and others, who claimed to produce excess heat in their experiments that could not be explained by conventional chemical reactions [1]. Yet, there is no reliable 100% evidence of the effect up to date, and some of subsequent experiments produced less [2] or *zero* [3, 4] effect as their measuring accuracy increased. Unfortunately, the claimed evidence often depends on indirect calorimetry methods and as such it does not produce an ultimate proof. We present an experimental setup that allows accurate measuring of the main parameters controlling the reaction: hydrogen pressure, temperature inside the fuel and at the heater, the difference between which can provide direct evidence of the excess heat. Our program pursues two goals: (i) verify the previous results and (ii) test our facility in a wide range of parameters to be used in experiments with novel types of fuel that we plan to create in future.

One of the new materials tested in our reactor was a melt spun $Nd_{90}Fe_{10}$ alloy with a large degree of amorphous or quasicrystalline phase. A fierce exothermic reaction was detected in $Nd_{90}Fe_{10}$ films upon filling them with *hydrogen* or *deuterium* and heating up to ~300 C, which resulted in the melting of the samples and the Cu foil, in which the samples have been wrapped. Quantitative analysis have shown that the amount of heat produced in large $Nd_{90}Fe_{10}$ samples in our experiments is 80÷100 kJ per g of hydrogen, which is an order of magnitude higher that that recorded by a differential scanning calorimetry method in small $Nd_{90}Fe_{10}$ samples in the same temperature range. Possible reasons for the discrepancy are discussed including low energy nuclear reactions taking place at the *initial stage* of hydride formation when 80÷90% of the material is in amorphous or quasicrystalline phase that facilitates the energy localization, which triggers LENR as has been argued in refs. [5-8]. Subsequently, the disordered phase transforms to crystalline hydrides NdH_2 and $Nd_2Fe_{17}H_{4.8}$ (observed by XRD analysis), where the energy localization becomes more difficult, which stops the LENR.

[1] A.G. Parkhomov, Ni-H reactors created after the Lugano Report, International Journal of Unconventional Science, 11(4), (2016) http://www.unconv-science.org/n11/parkhomov/ .

[2] A.G. Parkhomov, Long-term tests of Ni-H thermal generators in flow calorimeter, International Journal of Unconventional Science, 12-13(4), (2016) http://www.unconv-science.org/n12/parkhomov/

[3] Jean-Paul Biberian, Replication attempts of the Parkhomov experiment, Proc. 11th International Workshop on Hydrogen Loaded Metals (October 15-16, 2015).

[4] K.P. Budko, A.I. Korshunov, Calorimetric investigation of anomalous heat production in Ni-H systems, Proc.11th International Workshop on Hydrogen Loaded Metals (October 15-16, 2015).

[5] V. I. Dubinko, "Low-energy Nuclear Reactions Driven by Discrete Breathers," J. Condensed Matter Nucl. Sci. 14 (2014) 87-107.

[6] V. I. Dubinko, Radiation-induced catalysis of low energy nuclear reactions in solids**,** J. Micromechanics and Molecular Physics, 1 (2016) 165006 -1-12.

[7] V.I. Dubinko, D.V. Laptev "Chemical and nuclear catalysis driven by Localized Anharmonic Vibrations", Letters on Materials 6 (2016)16-21.

[8] V. Dubinko, D. Laptev, K. Irwin, Catalytic mechanism of LENR in quasicrystals based on localized anharmonic vibrations and phasons, presented at ICCF20, Sendai, October 2016, to be published in JCMNS.

Anomalous Excess Heat Generation by the Interaction between Nano-structured Pd/Ni surface and D_2/H_2 gas

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A new experimental setup based on the Mizuno's work [1]-[2] was introduced in our lab in order to confirm the existence of the anomalous heat effects and to reveal the nature of the effects. Similar experiments to Mizuno were done at Tohoku University and their experimental results are described.

At first, temperature measurements were performed using a non-fabricated Pd wire with 7W and 40W heater input powers under few Pa and 250 Pa as blank runs. The temperature was measured by a thermocouple built in a heater rounded by the non-fabricated Pd wire. We fabricated nano-structured material composed of Pd and Ni by glow discharge on the heater located in the center of a vacuum chamber. And then, the nano-structured Pd/Ni was filled with D_2 or H_2 gas (~250Pa) for more than 10 hours. After the nano-structured Pd/Ni material absorbed D_2 or H_2, electrical power was applied to the heater covered with nano-structured Pd/Ni while evacuating the chamber, and observed the heater temperature behavior. Excess heat was estimated by comparing the heater temperatures for the nano-structured and blank experiments. Next, we introduced D_2 or H_2 gas about 250Pa to the chamber while keeping the heater input. And then, temperature measurement was performed and the excess heat was estimated.

For all the cases except for an insufficient nano-structured Pd/Ni case, significant temperature increases compared to the blank experiments were observed. In particular, in experiments with 7 W input, we observed 123°C heater temperature increase compared to the blank experiment. It would be possible to say that we successfully replicated Mizuno's work.

Since the heater was covered with nano-structured material, there was a concern that emissivity change affected heater temperature measurement. Numerical calculation was conducted to estimate the effect of the change of the surface emissivity. It is concluded that even if the emissivity would drop extremely from 0.7 to 0.3 due to the coating of the nano-structured Pd/Ni, the temperature rise would be only 70°C at the most. The postulated emissivity change cannot be explain the observed temperature increase 123°C.

These experimental and numerical results strongly suggest that anomalous excess heat was generated by the interaction between nano-structured Pd/Ni surface and D_2 or H_2 gas. Elemental analysis for the nano-structured Pd/Ni will also be presented at this workshop.

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References

[1] T. Mizuno, “REACTANT, HEATING DEVICE, AND HEATING METHOD”, Patent Application, WO2015/008859 A2.

[2] H. Yoshino, E. Igari and T.Mizuno, Presentation at 2014 CF/LANR Colloquium at MIT, March.21-23, 2014, Massachusetts Institute of Technology, Cambridge, MA, USA.

Anomalous Heat Generation Experiments Using Metal Nanocomposites and Hydrogen Isotope Gas

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Anomalous heat generation experiments using metal nanocomposites and hydrogen isotope gas based on Kitamura and Takahashi paper [1] have been performed at Kobe University and Tohoku University as a collaborative work in order to confirm the existence of the anomalous heat effects and to reveal the nature of the effects. In this paper, we describe experimental results obtained at Tohoku University.

Heat generation experiments using the following metal nanocomposites with hydrogen isotopes have been done at Tohoku University:-

1) $Pd_{0.044}Ni_{0.31}Zr_{0.65}$ with ZrO_2 beads filler; PNZ
2) $Cu_{0.044}Ni_{0.31}Zr_{0.65}$ with ZrO_2 beads filler; CNZ
3) $Cu_{0.008}Ni_{0.079}$ with mesoporous SiO_2; CNS
4) Pd nanoparticles embedded in mesoporous SiO_2; PS

These samples 1), 2), 3) were fabricated at Kobe University and 4) at Nagoya University. Similar experiments were conducted at Kobe University using the metal nanocomposites that have identically the same compositions as those at Tohoku University.

Results so far are as follows:-

1) Anomalous excess heat generations were observed for all the samples at elevated temperature (150℃-300℃), except for the Pd nanoparticles embedded in mesoporous SiO_2.

2) Integrated excess heat reached more than several MJ/mol-H(D) which could NOT be explained by any known chemical process.
3) Coincident burst-like increase events of the pressure of reaction chamber and gas temperature, which suggested sudden energy releases in the reaction chamber, were observed many times for an experiment using the $Cu_{0.044}Ni_{0.31}Zr_{0.65}$ sample.
4) Qualitative reproducibility between Kobe and Tohoku experiments was good.

Reference

[1] A. Kitamura and A. Takahashi et. al, Current Science, vol. 108, no. 4, pp. 589-593, 2015.

Demonstration of Large Excess Heat in Ecological Plasma Electrolysis

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We present the variant of installations Fakel-D2ST series (Demonstration 2 Small Thermostat) for ecological demonstration of plasma electrolysis in public auditorium. Demonstration of large excess heat, using evaporation calorimetry, was performed by comparison water evaporation of installations Fakel-D2ST & standard thermos electro heater (TEH) at equal power. For nuclear control "Sosna" β-dosimeters, neutron and β-radiometers were used. We show about 3 time excess heat generation in Fakel-D2ST installations.

Simulations & Measurements of the Thermal Behaviour of an Electrochemical Cell

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Lattice Enabled (or Low Energy) Nuclear Reactions (LENR) provide a new way to produce clean nuclear energy free of damaging prompt radiation, radioactive waste and greenhouse gases. Electrochemical means are being used in attempts to generate LENR by the interactions of protons with nickel. The protons are produced by the electrolysis of water in cells with tubular nickel cathodes. Following experiments in the early 1990s with the Ni-H system, which reported excess heat production, we are using carbonate electrolytes of Li, Na, K and Rb. The thermal behaviour of our cells due to electrical heating must be understood. It will serve as the basis on top of which LENR might be produced. Thermocouples are used to measure temperatures at two points, one in the cell and the other in the nearby air. While invaluable, such limited measurements are insufficient to understand the overall thermal behaviour of the cell.

To acquire more detailed information, the electrical and thermal modules of COMSOL are being used to simulate the generation and redistribution of heat in the cells. Included sequentially are the geometry, materials, voltages, fields, currents, resistive heating and heat redistribution of the cells as a function of the applied voltages and chemical composition of the electrolytes. Conductive, convective and radiative transfers of heat are all considered. Meshing of the simulations is an important consideration, which determines run times. The simulations are benchmarked by comparison with the measured temperatures.

Results of the simulations provide details far beyond what can be measured. For example, the spatial distributions of temperatures are obtained at any time after initial application of voltages. They will be compared with thermal images from an infrared camera. And, the time histories of the temperatures at any spatial point within the cells are available. They are compared with the measured time variations of temperatures in the centre of the cells, including the time constant for the temperature rises and the asymptotic temperature increases. The latter are achieved when the conductive, convective and radiative power losses are equal to the input electrical power.

The combination of simulations and measurements helps to determine the relative importance of thermal power losses (a) to the air surrounding the cells and (b) through the nickel cathode, platinum anode wires and the aluminium base plate, which holds the cells. Work to date has involved steady input electrical currents. A future goal will be to simulate and measure the results of pulsed electrical input profiles. The current simulations and measurements provide the baseline for later quantification of LENR power.