My History with Cold Fusion

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INTRODUCTION

The process called Cold Fusion is said to produce clean energy from fusion of deuterium nuclei using very simple devices, at least compared to the "hot" fusion method. Many scientists have been outspoken in rejecting this claim based on their belief that the observations have not been replicated, are impossible, and cannot be explained. The intent of this article is to provide a brief and easily understood description of why I believe this rejection is wrong.

Personal observation is the most convincing argument for believing a claim is real. Of course, as more people observe the claim using their own apparatus, the easier it is to accept – thus the need for replication. The second level of proof rests on everyone observing the same patterns of behavior. In other words, the novel phenomenon is found to react in the same way when the same changes are made in experimental conditions. Finally, the third level is reached when the phenomenon can be explained. This is the conventional approach. Unfortunately, some scientists reverse the order of these "proofs" by making an explanation the first requirement and personal experience the last, especially when cold fusion is discussed. This approach is not consistent with how science operates in most fields of study.

Cold fusion (aka, Low Energy Nuclear Reaction, LENR) is a phenomenon few people have experienced. Furthermore, no agreed upon explanation exists for why it can occur, while many reasons can be offered as to why it is impossible [1]. This being the case, why bother proving the phenomenon is real? The answer to this question is complex, but can be summarized as follows. Mankind is using energy that is polluting the air and land, with potentially catastrophic consequences. Even this energy will eventually run out, causing a serious reduction in world-wide standard of living and devastating conflict. Renewable sources of energy have been found to be inadequate or uneconomic for many applications. These simple facts create a need for a source of energy that does not suffer from these limitations. Cold fusion, if real, would provide an ideal solution to these problems. Because the need is so great, even an unlikely solution is worth exploring. It has been said that an extraordinary claim requires extraordinary proof. Likewise, an extraordinary need requires exploring extraordinary solutions.

In addition to anomalous energy production, evidence has been reported for a variety of nuclear reactions. These reactions include fusion, transmutation and fission, which are better described as being LENR processes. Only the fusion reaction appears to produce significant energy, although the other reactions might be used to convert radioactive material to nonradioactive isotopes. Besides the potential uses, these novel nuclear reactions suggest that an entirely new mechanism has been discovered to occur at relatively low energy in a regular array of atoms. The nature of this nuclear-active-environment (NAE) has not yet been determined, although it involves a solid lattice having small dimensions and containing certain critical elements. The NAE does not appear to be β-PdD as previously thought. Many people rejected the idea because they thought the lattice conditions in β-PdD were too simple and too well understood to support an explanation. The real conditions turn out to be far more complex.

To shorten the description given here, much information has been left out. The reader is directed to technical details published in the cited papers. These papers can be accessed in full text at www.LENR-CANR.org where over 3170 citations and over 330 full text papers are available. This brief paper emphasizes the Fleischmann-Pons effect and studies done in the U.S. because it was written for and submitted to the DoE Panel that revaluation the claims for cold fusion on August 23, 2004.

EVIDENCE

Personal Experience

I first got involved in the subject about 15 years ago while working at the Los Alamos National Laboratory (LANL). Studies done first LANL and later at Energy K. Systems, Inc. (EKS, Inc), a private laboratory, convinced me that anomalous energy [2] or tritium [3] can be produced when a suitable palladium cathode is electrolyzed in a solution of D_2O containing LiOD. This is a replication of the Fleischmann-Pons (F-P) effect, as

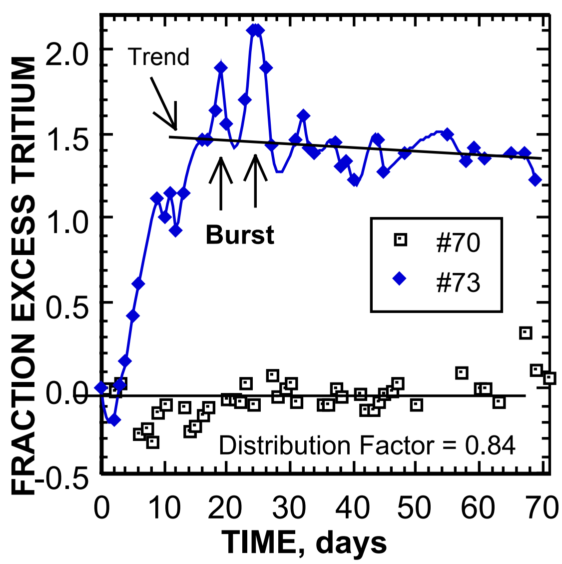

FIGURE 1. Tritium production in a F-P cell compared to an identical cell being electrolyzed at the same time. A fraction excess tritium of 2.0 means that the tritium content doubled over the initial tritium content always found in heavy-water. Closed, sealed cells containing a catalyst were used. Work was done at LANL.

described first by these authors in 1989[4-6]. Figure 1 shows an example of tritium being produced in a F-P cell at LANL that is compared to the behavior of a similar cell that did not produce tritium even though it was electrolyzed at the same time. Subsequent work demonstrated that tritium appeared only in the electrolytic solution, rather than in the evolving D_2 gas. This behavior was in direct contrast to the behavior of tritium known to be dissolved in a palladium cathode, which always left the cell along with evolving D_2 gas. The effect of tritium in the surrounding air was also explored and found to be inconsistent with the behavior observed when anomalous tritium was produced. Thus, anomalous tritium was shown not to result from contaminated palladium, did not come into the cell from the environment, and was produced within the cathode near its surface.

An example of anomalous energy is shown in Fig. 2. This energy was produced by a batch of palladium that experienced very few cracks upon reaction with deuterium. Another batch obtained from the same source (Tanaka Metals, Japan) that had a much larger amount of cracking was inert. Samples from the active batch produced anomalous energy at two other laboratories. [7, 8] Therefore, anomalous heat from the same material was replicated at three laboratories and was shown to be related to the amount of cracking.

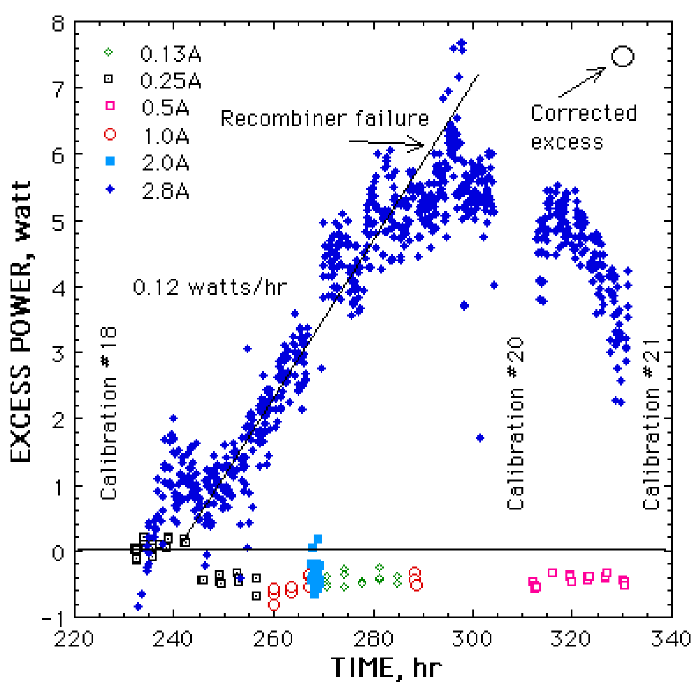

FIGURE 2. Excess power produced in a F-P cell using a palladium cathode (4 cm^2) that form few cracks. Heat was measured using an isoperibolic calorimeter. Notice that no excess was produced when applied current was less than 2.8 A. The drop off after 310 hours was caused by failure of the internal recombiner, for which a correction is shown. This study was made at LANL.

This anomalous energy was later found to be produced at the surface of the cathode in isolated regions of deposited material. [9-14] Palladium is not necessary either as the basic material or as the deposited material, although its use can produce anomalous energy.

These personal studies involve measurement of anomalous energy using a variety of calorimeter types. [15-17] Because rejection of the published claims is based on supposed errors in the measurement of anomalous energy, significant effort was made to identify and eliminate known errors. In addition, the resulting insights have allowed a more realistic evaluation of other reports.[18, 19]

Universal Experience and Patterns

Examples of Replications:

Table I lists a sampling of reported replications for the Fleischmann-Pons effect. Most of the studies observed anomalous heat being produced by more than one sample. Many other examples can be cited, but not all provided sufficient information to allow the studies to be evaluated or the listed values to be determined. Of course, many samples failed to produce anomalous energy for various reasons, some of which are suggested below.

D/Pd Ratio of Palladium Substrate is Important:

Very careful work at SRI first demonstrated the effect of average deuterium content within the palladium cathode. [20-23] One example is shown in Fig. 3.

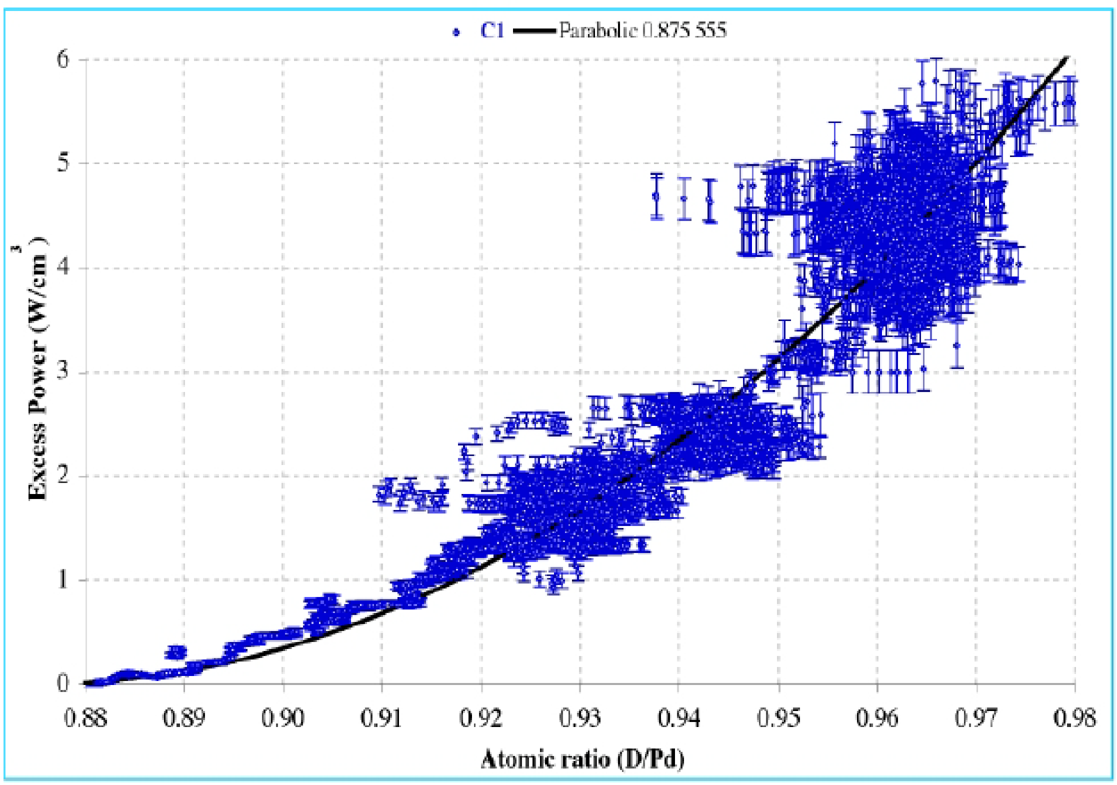

FIGURE 3. Anomalous power produced by a F-P cell as a function of average composition of the palladium cathode. Composition was measured using change in resistance of the entire cathode and power was measured using a flow-type calorimeter. Work was done at SRI.

Other laboratories reported similar behavior. [24-30] In general, the average D/Pd ratio must exceed a critical value before anomalous energy can be expected. However, the exact value for this composition depends on the shape and size of the cathode, on the nature of surface deposits, and on the method used to determine the average composition.

The average composition is much less than the composition at the surface region where the nuclear process actually occurs.[22] The surface composition has been measured on several occasions [29, 31, 32] to give a value of D/Pd in excess of 1.5. This surface composition is significantly increased by application of increased current density, as shown in Fig. 4, even though the average composition is increased only slightly. Also, as expected, the thin layer and bulk palladium have essentially the same composition at low applied current.

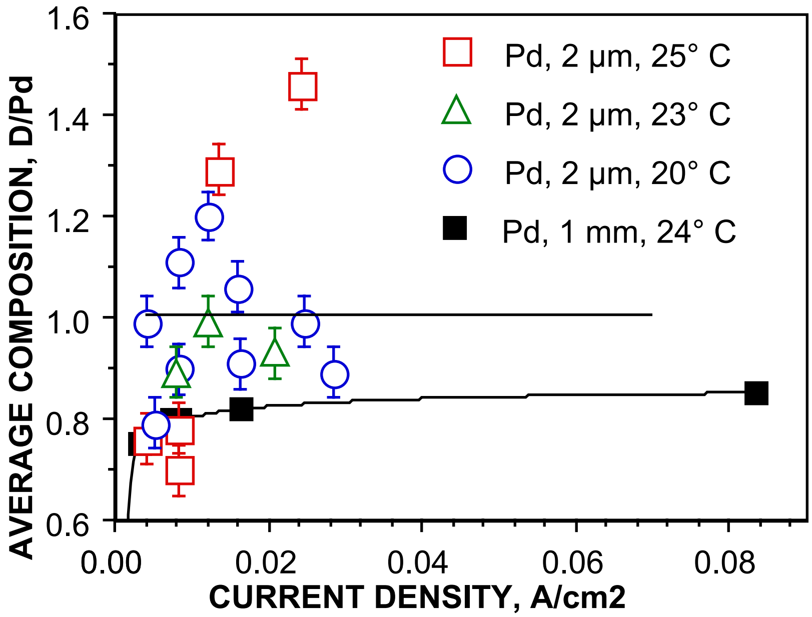

FIGURE 4. Average composition of a 2 µm layer of palladium on platinum as a function of applied current density in a F-P cell. The surface composition is compared to a typical average composition of a 1 mm thick palladium cathode as a function of applied current. Work was done at EKS, Inc.

From this behavior it is safe to assume that increased anomalous energy, resulting from greater applied current, is associated mainly with a change in surface composition, which is only partially related to the average composition of the entire sample. In addition, the surface region contains many elements besides palladium and deuterium – lithium and platinum being at especially high concentrations. [33-50] Consequently, it is reasonable to assume that difficult replication stems from a low probability for forming a suitable collection of deposited elements with correct morphology and proper crystal size.

Critical Current Density is Required to Produce an Effect:

As early as 1991, the relationship between applied current density and resulting anomalous power production was known, as shown in Fig. 5.[51] Although these studies show a range of values, they are all sensitive to applied current density and fall below an apparent upper limit as designated by the red line, which is a straight line when plotted on a linear scale. Since then, this relationship has been seen repeatedly, with one example plotted in Fig. 6[52] and another shown in Fig. 7[53]. This critical current density is required to initiate the effect only when solid palladium is used. In addition, the value depends on the geometry of the cathode. However, deposits placed on platinum do not show this critical value. Instead, anomalous power starts just as soon as a little current is applied (Fig. 8). [10]

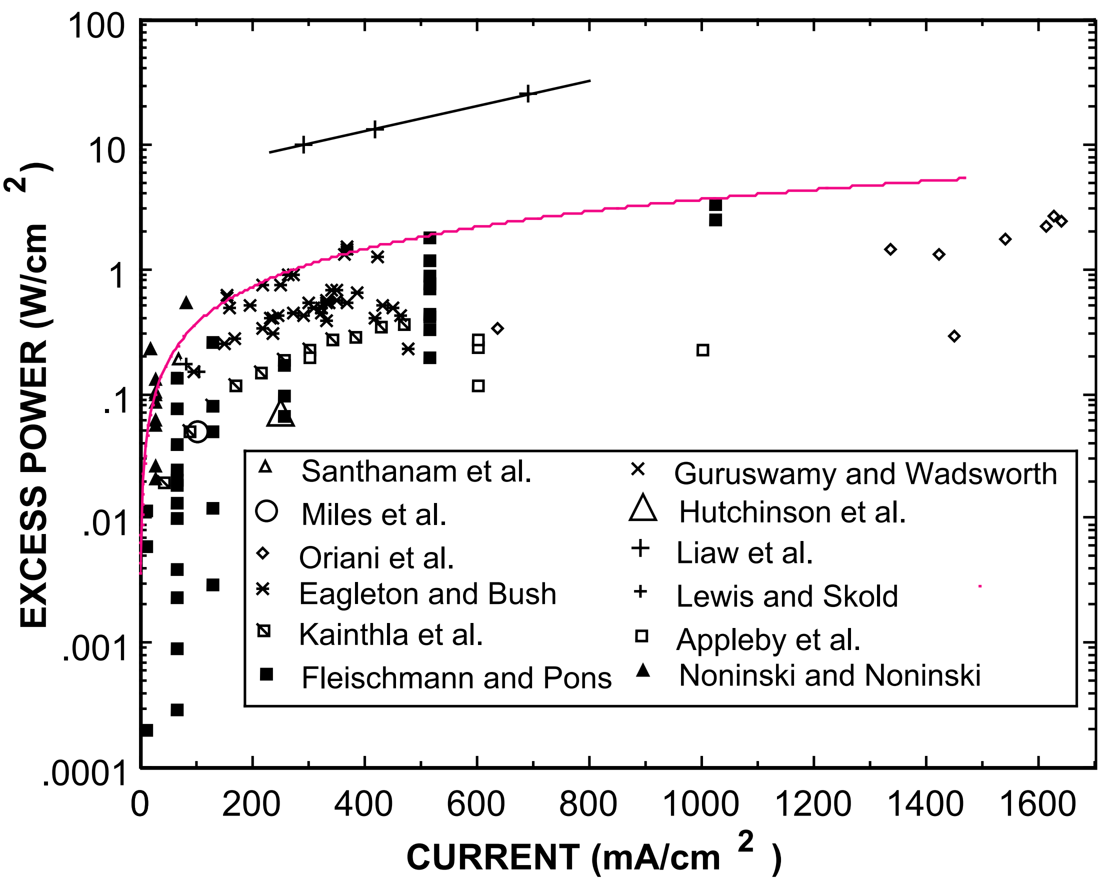

FIGURE 5. Comparison between studies showing the effect of applied current density on excess power density for a F-P cell. The study by Liaw et al. used molten salt made of potassium-lithium-deuterium and a palladium anode at which deuterium was deposited.

As the applied current is increased, temperature of the cathode will also increase. Because increased temperature results in increased excess power, the reported results will depend on both variables, the latter one being sensitive to the design of the calorimeter. Therefore, because of variations in surface characteristics and temperature, different studies will show somewhat different behavior.

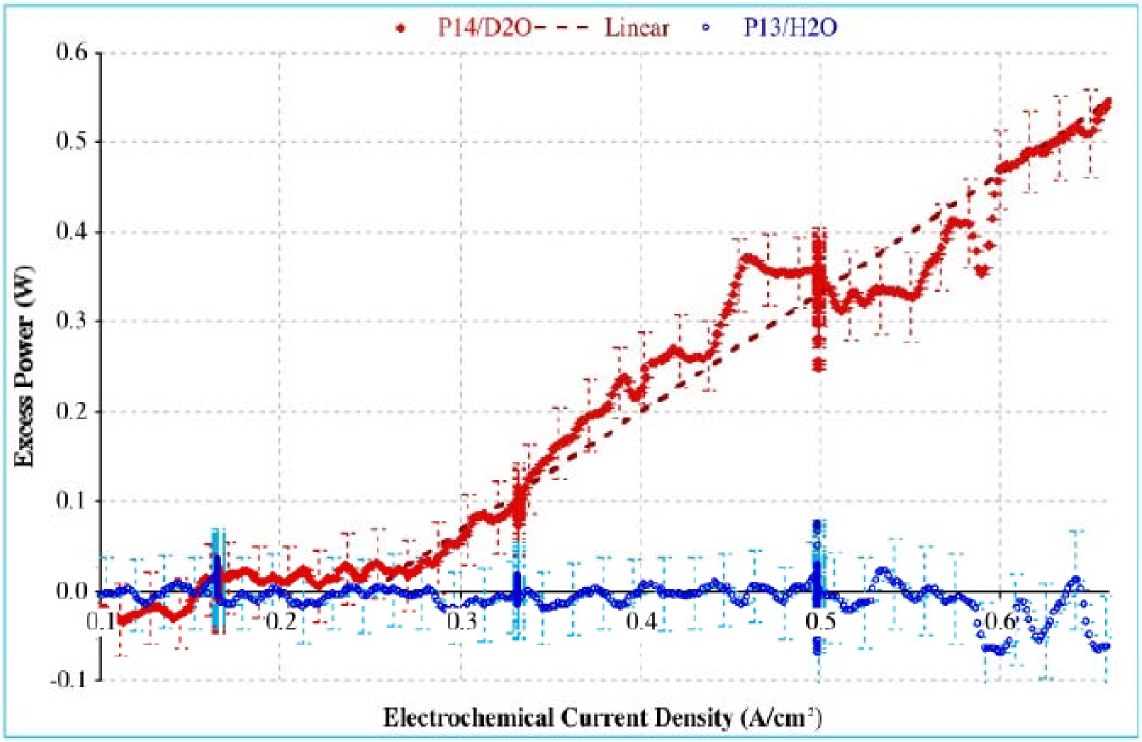

FIGURE 6. Effect of applied current density on anomalous power production. A cell containing H_2O instead of D_2O does not show the effect. Work was done at SRI.

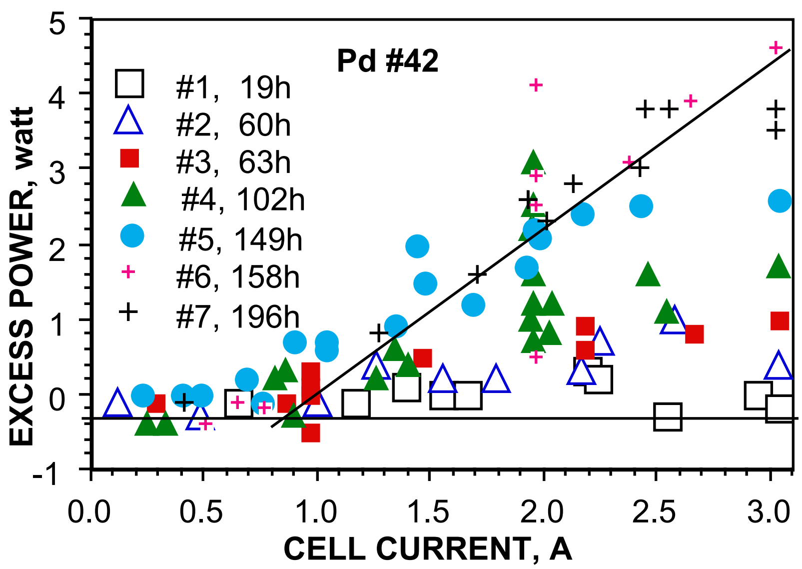

FIGURE 7. Effect of applied current on anomalous power production in a F-P cell. This is a sample of 1mm thick palladium (4 cm^2) obtained from Japan. Excess power gradually increased as the sample was exposed to applied current. A flow-type calorimeter was used at EKS, Inc.

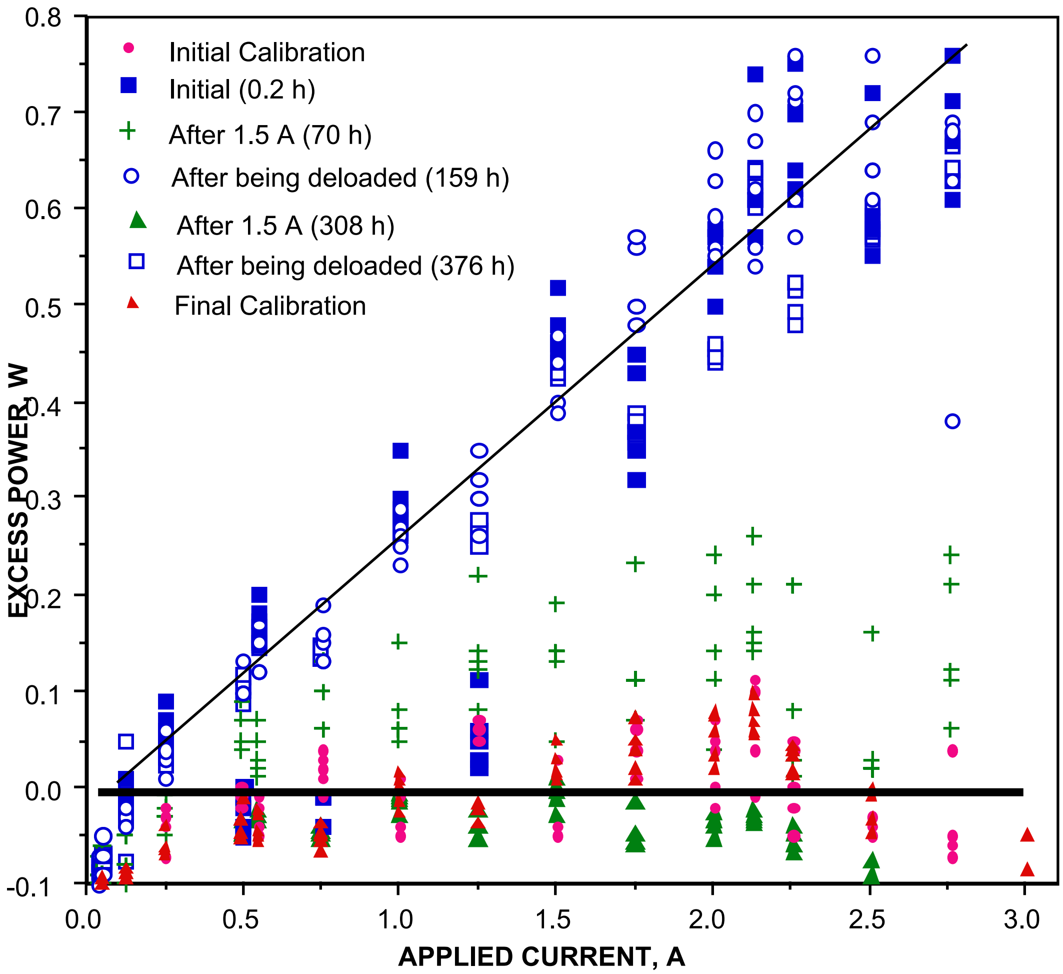

FIGURE 8. Anomalous power as a function of applied current using a platinum cathode on which an active deposit had formed. Application of sufficient current caused anomalous heat to disappear. However, the sample could be reactivated after being boiled in water (159 h and 376 h). Power was measured using a flow-type calorimeter that was calibrated before and after the study. Work was done at EKS, Inc.

<u>Special Palladium is Required:</u>
Success is critically related to the properties of the palladium. Some batches show a high success rate and others are uniformly inert. Table II lists a few examples. Very pure palladium seems to be less frequently active than material that is less pure. Part of the problem involves formation of cracks,[54, 55] which prevent material from achieving the required critical composition.[56] In addition, surface deposits including bacteria can interfere with loading.[57]

<u>Various Methods Found to Work:</u>
F-P first used electrolysis to react the palladium cathode with deuterium. Subsequent studies show that deuterium could be applied using ultrasonic methods [58], using D_2 gas [59-61], by diffusion of D^+ through various complex oxides under electrical potential

[62-66] [67], and by D^+ and/or D_2^+ ion bombardment using low voltages[68-74]. Plasma generation within a liquid also appears to initiate nuclear reactions in the cathode material. [75-79] Even simple life forms appear to initiate certain anomalous nuclear reactions[1]. [80-82] In other words, the nuclear reactions are not unique to how deuterium or hydrogen is introduced into a suitable assembly of atoms.

Evidence for Nuclear Products:

Anomalous energy must have an identified source before its existence can be accepted. The amounts being reported are too large to be explained by chemical based processes [83] or by any prosaic process suggested thus far. [19] This leaves a nuclear source as the most likely possibility.

Although various nuclear products and emissions have been detected, only the production rate of ^4He is consistent with measured power production, which has been replicated by six different studies. [84-89] An example showing the relationship between power production and helium production can be seen in Fig. 9. The result is within a factor of two of the expected relationship based on known energy resulting from the $D + D = {}^4He$ reaction. If additional ^4He that is expected to be retained by palladium were taken into account, the result would be even closer to the expected value. An additional study, shown in Fig. 10, using gas loaded palladium deposited on carbon (a typical chemical catalyst) gives a similar quantitative relationship between produced energy and observed helium.

Evidence for other kinds of nuclear reactions has been reported. This includes various transmutation reactions involving light and heavy hydrogen that convert various elements to other elements, for which only a few citations are given. [38, 41, 90-96] [97-106] However, these reactions produce so little energy, they do not have a practical application. Nevertheless, they do suggest the existence of a novel nuclear process.

Neutron and charged particle emission have also been detected. However, these products are in such small amounts that their relationship to the F-P effect is unknown and may not be important other than to reveal another novel process.

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[1] This very unusual and difficult to believe claim is supported by some very careful studies that need to be evaluated before the claims are rejected.

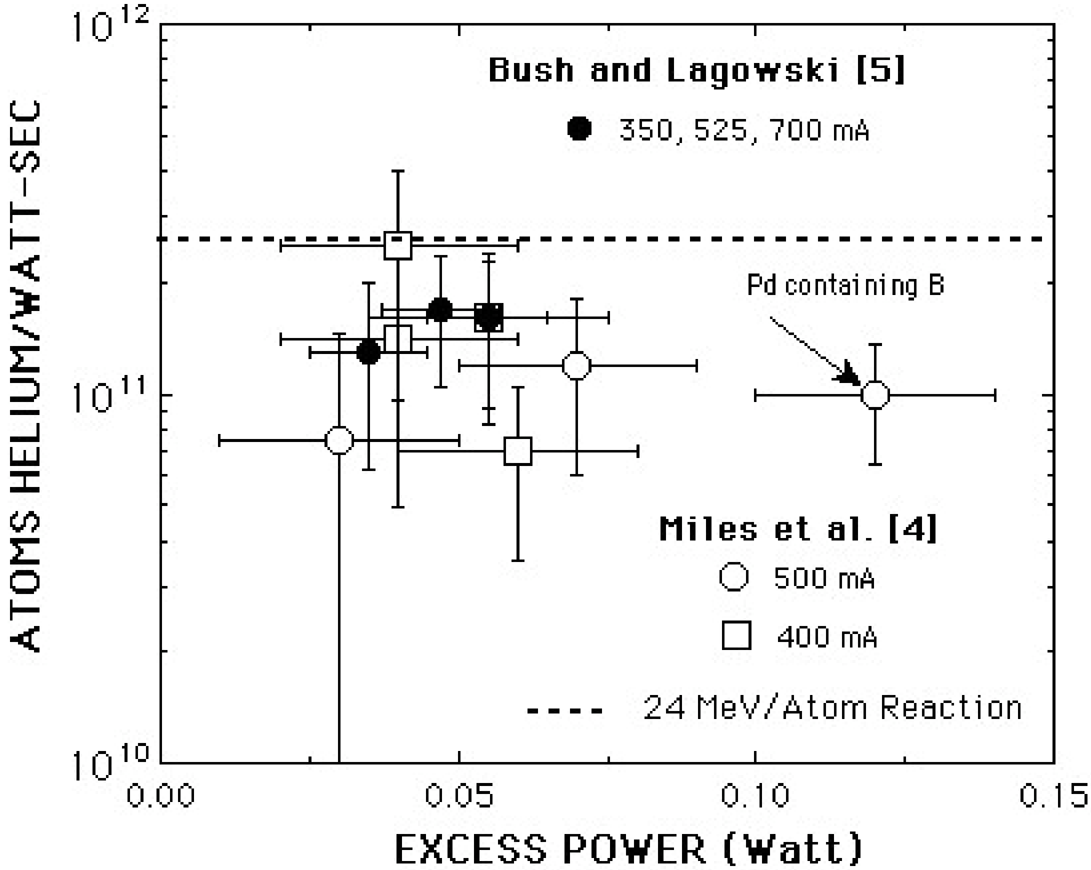

FIGURE 9. Excess power compared to atoms of He/watt-sec. The dashed line shows the expected behavior if energy/fusion event is 24 MeV. Data from these two independent studies agree well and are within a factor of two of the expected energy.

<u>Why it Works and Why it Doesn't:</u>
Conventional thinking rejects the possibility of such low energy nuclear reactions occurring because no mechanism is known that would allow the Coulomb barrier to be overcome under these conditions. In addition, the proposed production of helium does not also produce the expected gamma ray and the other fusion products (tritium and neutrons) are not seen in expected amounts. In brief, the observations are not consistent with behavior observed when fusion is initiated at high energy.[107] Even if the process should occur at low energy, the proposed reaction would appear to violate conservation of momentum laws and require a unique mechanism to quickly couple the large amount of released energy to the lattice.

Instead of using brute force, the reactions are proposed to involve subtle processes. For example, wave interaction [108], neutron generation [109], neutron release [110, 111], phonon involvement [112], electron involvement [113] or ion clusters [114] have been proposed. However, no suggested mechanism explains all aspects of the phenomenon nor does any model allow significant predictions of previously unobserved behavior even though hundreds of theories have been proposed. Nevertheless, some approaches have been useful and may lead to eventual understanding.

Difficulty in replication can be explained by failure to take into account several important variables. First of all, production of anomalous energy requires sufficient time for active

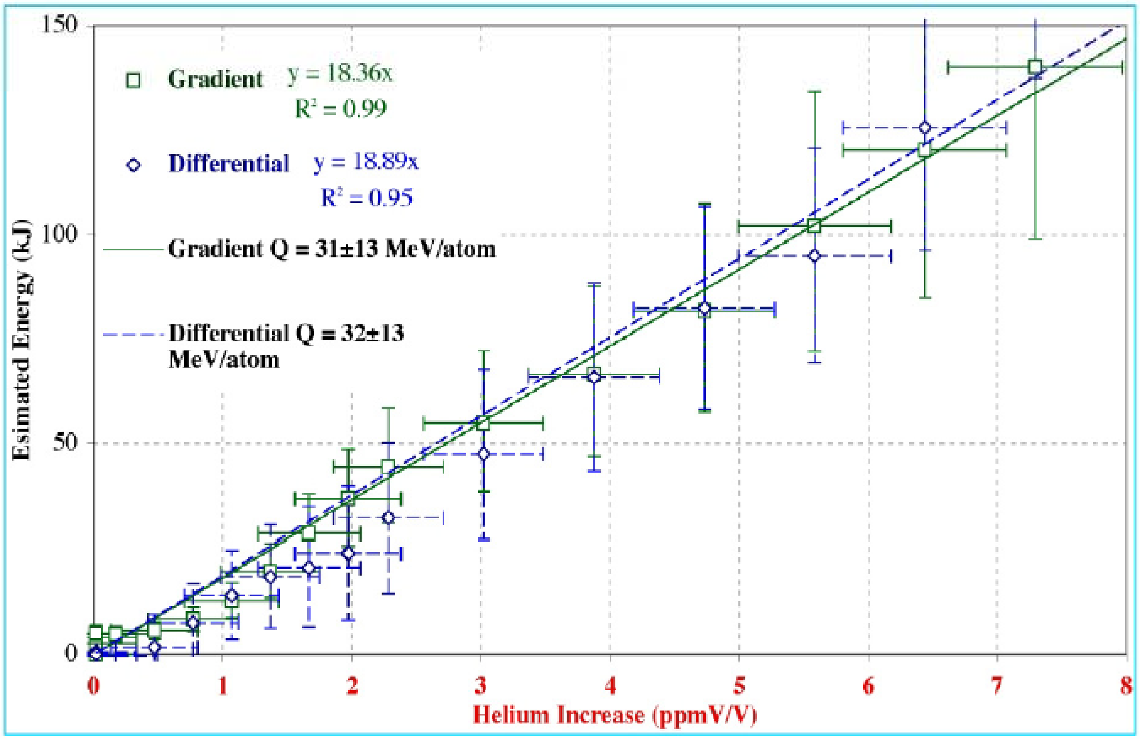

FIGURE 10. Helium produced (as volume ppm) by finely divided palladium on carbon exposed to D_2 gas compared to the amount of excess energy being measured. The amount of excess energy is estimated because it is based on two different methods to arrive at the amount of anomalous power production. Work was done at SRI.

deposits to form. This can be a very slow process if the electrolyte is especially pure. Presence of even a small amount of light water (H_2O) in the D_2O will stop the reaction. Because D_2O easily absorbs water from the air, cells must be carefully sealed. A critical current density must be used to start anomalous energy production, as noted above. Finally, if palladium is used as the substrate, it must be obtained from a batch that does not crack when it reacts with deuterium.

The easiest method for replication uses co-plating [115] of palladium on an inert metal substrate using a D_2O electrolyte containing various salts. This method involves adding $PdCl_2$, for example, to the electrolyte so that palladium plates on the cathode as fully saturated deuteride. An active deposit can also be applied outside of the active cell using a suitable electroplating bath, by vapor deposition, or by sputtering. However, all methods for applying an active surface still fail on many occasions. The reasons for this failure are only now being understood.

CONCLUSION

The "cold fusion" claims have been replicated many times by laboratories all over the world, in spite of claims to the contrary. Methods required to increase success are known, and several consistent patterns of behavior have been observed by different laboratories. In addition, the nuclear process producing anomalous energy has been identified and replicated. Therefore, major requirements for acceptance by conventional science have been met. However, a satisfactory theory has not yet been demonstrated.

Many examples can be cited for acceptance of novel processes without supporting theory. Whether absence of an explanation is critical to believing these claims depends on how much of an exception to the usual acceptance process should be applied to cold fusion.

TABLE I

List of Studies Reporting Anomalous Energy Using the Fleischmann-Pons Method

AUTHOR	DATE	TYPE(a)	CLOSED/ OPEN(a)	PRECISION W	MAXIMUM AP(b) W, mA/cm^2
Huang et al. [116]	1989	Flow-type(c)	open	±0.05	2.3, 450
Kainthla et al. [117]	1989	Isoperibolic(d)	open	±0.05	1.08, 468
Samthanam et al. [118]	1989	Isoperibolic(e)	open	?	1.54, 63
Appleby et al. [119]	1990	Seebeck(e)	open	±0.000001	0.0457, 600
Beizner et al. [120]	1990	DW Isoperibolic (d)	open	~0.1	~1, ~500
Eagleton and Bush [121]	1991	Isoperibolic(d,f)	closed	±0.3	6.0, 450
Scott et al. [122]	1990	Flow-type(c)	open and closed	±0.2	2.0, 600
Fleischmann et al. [5]	1990	Isoperibolic(d)	open	<±0.01	2.8, 1024
Hutchinson[123]	1990	DW Isoperibolic	open	±1.0	4, 250
Zahn[124]	1990	Double cell comparison	open	?	~2, 124
Miles et al. [125]	1990	DW Isoperibolic(d)	open	±0.05	0.3, 100
Oriani et al. [126]	1990	Seebeck(d)	open	±0.2	3.2, >1000
Yang et al, [127]	1990	A primative flow-type	open	~±5	9.1, ?

Zhang[128]	1990	Seebeck	open	±0.00001	0.15, ~15
Bertalot et al.[129]	1991	Seebeck	open	±0.005	0.08, 650
Bush et al. [130]	1991	Isoperibolic	open	~±0.05	0.52, 227
McKubre et al. [131]	1991	Flow-type(d)	closed	±0.05	0.5, 660
Noninski[132]	1991	Isoperibolic	open	?	2.6, 80
Yun et al. [133]	1991	Seebeck(e)	Open and closed	±0.01	0.24, 500
Bertalot et al. [134]	1992	Flow-type	open	±0.025	3.0, 190
Gozzi et al. [135]	1992	Isoperibolic(g)	open	±0.63	9.0, ?
Hasegawa et al. [136]	1992	Temperature of cathode	closed	~±0.1	~0.7, ?
McKubre et al. [20]	1992	Flow-type(d)	closed	±0.1	1.2, 440
Ota et al. [137]	1992	Flow-type	closed	~±0.1	1.0, ?
Storms[2]	1993	Isoperibolic(g)	closed	±1.0	7.5, 700
Okamoto et al. [138]	1994	Flow-type	open	±3.5	6.0, 66
Storms[139]	1994	Isoperibolic(d,f)	closed	±0.5	2.0, 600
Bertalot et al. [140]	1995	Flow-type(e)	open	?	11, 2000
Takahashi et al. [141]	1995	Double cell comparison(f)	open	±0.65	3.5, ?
Kamimura et al. [142]	1996	Isoperibolic(g)	closed	±0.25	0.700, 800
Yasuda et al. [143]	1996	Flow-type	closed	±0.05	5, ?
Ota, et al. [144]	1996	Flow-type(d)	closed	±0.075	0.29, 750
Szpak et al. [115]	1999	Isoperibolic	open	±0.01	0.4, 133
Storms [10]	2001	Flow-type(d)	closed	±0.03	0.8, 0.75

(a) * With a flow-type calorimeter, power is measured by flowing water through a jacket that surrounds the cell, or a coil inside the cell, and recording the flow rate and the

temperature change of the water stream. Although this is an absolute method, it must be calibrated because the water cannot capture all of the heat.
*The isoperibolic calorimeter determines power production by measuring the temperature drop across the cell wall. The device must be calibrated and is accurate only when the measured temperature represents the average ΔT.
*The double-wall (DW) isoperibolic calorimeter uses an additional thermal barrier outside of the cell across which the temperature drop is measured. The device must be calibrated, but is independent of any temperature variation within the cell.
*The Seebeck calorimeter determines power production by measuring a voltage generated by the temperature difference between the inside and outside of its walls. In this device, all walls are sensitive to this temperature difference, hence any energy that escapes the enclosure will generate a voltage proportional to the amount of power being lost. The device must be calibrated and is independent of the cell temperature.
* Double cell comparison uses two nearly identical cells, one of which is active and the other is assumed to make no AP. Heat production is based on the temperature difference between the two cells and accuracy depends on the two cells remaining identical in their properties.
*An open cell allows the generated gases to escape. A closed cell causes the gases to be converted back to water using an internal recombiner.
(b) Although only one value is given, frequently several different samples of palladium were reported to produce anomalous power (AP). The amount of anomalous energy (AE) is highly variable, depending on how long the active sample was studied.
(c) Calibration could have been unstable.
(d) Calibrated with internal heater and checked with Pt cathode and/or H_2O based electrolyte
(e) Calibrated only with internal heater
(f) Mechanical stirring used
(g) Calibrated using only an inert cathode.

TABLE II

Example of How the Palladium Source Affects Anomalous Energy Production

SOURCE	EXCESS ENERGY Success	Total
Boron Containing Samples made at NRL	7	8
J-M Pd	15	26
NRL Pd	1	6
WESGO Pd	0	6
NRL Pd-Ag	0	3
IMRA Pd-Ag	0	2
Pd-Cu	0	2
Pd-Ce	2	2
Co-deposition	2	34

J-M: Johnson and Matthey Company
NRL: Naval Research Laboratory
IMRA: IMRA, Japan
Co-deposition: Pd plated from solution during calorimetry measurement
WESCO: A secondary supplier used early in the work
Work done at Naval Air Warfare Center Weapons Division, China Lake, CA [88]

References

1. Huizenga, J.R., *Cold Fusion: The Scientific Fiasco of the Century*. second ed. 1993, New York: Oxford University Press. 319.
2. Storms, E., *Measurements of excess heat from a Pons-Fleischmann-type electrolytic cell using palladium sheet.* Fusion Technol., 1993. **23**: p. 230.
3. Storms, E. and C. Talcott, *Electrolytic tritium production.* Fusion Technol., 1990. **17**: p. 680.
4. Fleischmann, M., S. Pons, and M. Hawkins, *Electrochemically induced nuclear fusion of deuterium.* J. Electroanal. Chem., 1989. **261**: p. 301 and errata in Vol. 263.
5. Fleischmann, M., et al., *Calorimetry of the palladium-deuterium-heavy water system.* J. Electroanal. Chem., 1990. **287**: p. 293.
6. Fleischmann, M. and S. Pons, *Calorimetry of the Pd-D2O system: from simplicity via complications to simplicity.* Phys. Lett. A, 1993. **176**: p. 118.
7. Takahashi, A., *Production of neutron, tritium and excess heat.* Oyo Butsuri, 1993. **62**: p. 707 (In Japanese).
8. Celani, F., et al. *Measurement of Excess Heat and Tritium During Self-Biased Pulsed Electrolysis of Pd-D2O*. in *Third International Conference on Cold*

Fusion, "Frontiers of Cold Fusion". 1992. Nagoya Japan: Universal Academy Press, Inc., Tokyo, Japan.
9. Storms, E. *Some Thoughts on the Nature of the Nuclear-Active Regions in Palladium*. in *Sixth International Conference on Cold Fusion, Progress in New Hydrogen Energy*. 1996. Lake Toya, Hokkaido, Japan: New Energy and Industrial Technology Development Organization, Tokyo Institute of Technology, Tokyo, Japan.
10. Storms, E. *Excess Power Production from Platinum Cathodes Using the Pons-Fleischmann Effect*. in *8th International Conference on Cold Fusion*. 2000. Lerici (La Spezia), Italy: Italian Physical Society, Bologna, Italy.
11. Storms, E., *Ways to Initiate a Nuclear Reaction in Solid Environments.* Infinite Energy, 2002. **8**(45): p. 45.
12. Storms, E. *Ways to Initiate a Nuclear Reaction in Solid Environments*. in *American Physical Society Meeting*. 2001. Seattle, WA.
13. Storms, E. *What Conditions Are Required To Initiate The Lenr Effect?* in *Tenth International Conference on Cold Fusion*. 2003. Cambridge, MA: LENR-CANR.org.
14. Storms, E. *Use Of A Very Sensitive Seebeck Calorimeter To Study The Pons-Fleischmann And Letts Effects*. in *Tenth International Conference on Cold Fusion*. 2003. Cambridge, MA: LENR-CANR.org.
15. Storms, E., *Proposal for Study of Palladium Powder at UNM*. 1999.
16. Storms, E. *How to Make A Cheap and Effective Seebeck Calorimeter*. in *Tenth International Conference on Cold Fusion*. 2003. Cambridge, MA: LENR-CANR.org.
17. Storms, E., *Calorimetry 101 for cold fusion*. 2004, www.LENR-CANR.org.
18. Storms, E., *A critical evaluation of the Pons-Fleischmann effect: Part 1.* Infinite Energy, 2000. **6**(31): p. 10.
19. Storms, E., *A critical evaluation of the Pons-Fleischmann effect: Part 2.* Infinite Energy, 2000. **6**(32): p. 52.
20. McKubre, M.C.H., et al. *Excess Power Observations in Electrochemical Studies of the D/Pd System; The Influence of Loading*. in *Third International Conference on Cold Fusion, "Frontiers of Cold Fusion"*. 1992. Nagoya Japan: Universal Academy Press, Inc., Tokyo, Japan.
21. McKubre, M.C.H., et al. *Loading, Calorimetric and Nuclear Investigation of the D/Pd System*. in *Fourth International Conference on Cold Fusion*. 1993. Lahaina, Maui: Electric Power Research Institute 3412 Hillview Ave., Palo Alto, CA 94304.
22. Tanzella, F.L., et al. *Parameters affecting the loading of hydrogen isotopes into palladium cathodes*. in *Sixth International Conference on Cold Fusion, Progress in New Hydrogen Energy*. 1996. Lake Toya, Hokkaido, Japan: New Energy and Industrial Technology Development Organization, Tokyo Institute of Technology, Tokyo, Japan.
23. McKubre, M.C.H. and F.L. Tanzella. *Materials Issues of Loading Deuterium into Palladium and the Association with Excess Heat Production*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.

24. Violante, V., et al. *Metallurgical effects on the dynamic of hydrogen loading in Pd*. in *The 9th International Conference on Cold Fusion, Condensed Matter Nuclear Science*. 2002. Tsinghua Univ., Beijing, China: Tsinghua Univ. Press.
25. Celani, F., et al., *Reproducible D/Pd ratio > 1 and excess heat correlation by 1-microsec-pulse, high-current electrolysis.* Fusion Technol., 1996. **29**: p. 398.
26. Hasegawa, N., et al. *Electrolytic Deuterium Absorption by Pd Cathode and a Consideration for High D/Pd Ratio*. in *5th International Conference on Cold Fusion*. 1995. Monte-Carlo, Monaco: IMRA Europe, Sophia Antipolis Cedex, France.
27. Miles, M., K.B. Johnson, and M.A. Imam. *Electrochemical loading of hydrogen and deuterium into palladium and palladium-boron alloys*. in *Sixth International Conference on Cold Fusion, Progress in New Hydrogen Energy*. 1996. Lake Toya, Hokkaido, Japan: New Energy and Industrial Technology Development Organization, Tokyo Institute of Technology, Tokyo, Japan.
28. Bertalot, L., et al., *Study of deuterium charging in palladium by the electrolysis of heavy water: heat excess production.* Nuovo Cimento Soc. Ital. Fis. A, 1993. **15 D**: p. 1435.
29. Storms, E. *Relationship Between Open-Circuit-Voltage and Heat Production in a Pons-Fleischmann Cell*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.
30. Takahashi, A., et al., *Excess heat and nuclear products by D2O/Pd electrolysis and multibody fusion.* Int. J. Appl. Electromagn. Mater., 1992. **3**: p. 221.
31. Oya, Y., et al. *Material Conditions to Replicate the Generation of Excess Energy and the Emission of Excess Neutrons*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.
32. Yanokura, M., et al., *An approach to the cold fusion through hydrogen isotopes analysis by the heavy ion Rutherford scattering.* Chem. Lett., 1989: p. 2197.
33. Dalard, F., et al., *Electrochemical incorporation of lithium into palladium from aprotic electrolytes.* J. Electroanal. Chem., 1989. **270**: p. 445.
34. Mebrahtu, T., et al., *Observations on the surface composition of palladium cathodes after D2O electrolysis in LiOD solutions.* J. Electroanal. Chem., 1989. **267**: p. 351.
35. Augustynski, J., M. Ulmann, and J. Liu, *Electrochemical measurements on palladium cathodes in LiOD/D2O solutions related to the 'cold fusion experiments'.* Chimia, 1989. **43**: p. 355.
36. Ulman, M., et al., *Surface and electrochemical characterization of Pd cathodes after prolonged charging in LiOD + D2O solutions.* J. Electroanal. Chem., 1990. **286**: p. 257.
37. Rolison, D.R., et al. *Anomalies in the Surface Analysis of Deuterated Palladium*. in *The First Annual Conference on Cold Fusion*. 1990. University of Utah Research Park, Salt Lake City, Utah: National Cold Fusion Institute.
38. Rolison, D.R. and W.E. O'Grady, *Observation of elemental anomalies at the surface of palladium after electrochemical loading of deuterium or hydrogen.* Anal. Chem., 1991. **63**: p. 1697.
39. Kazarinov, V.E., et al., *Cathodic behaviour of palladium in electrolytic solutions containing alkali metal ions.* Elektrokhimiya, 1991. **27**: p. 9 (in Russian).

40. Nakada, M., et al. *A Role of Lithium for the Neutron Emission in Heavy Water Electrolysis*. in *Third International Conference on Cold Fusion, "Frontiers of Cold Fusion"*. 1992. Nagoya Japan: Universal Academy Press, Inc., Tokyo, Japan.
41. Dillon, C.T. and B.J. Kennedy, *The electrochemically formed palladium-deuterium system. I. Surface composition and morphology.* Aust. J. Chem., 1993. **46**: p. 663.
42. Lihn, C.J., et al., *The influence of deposits on palladium cathodes in D2O electrolysis.* Fusion Technol., 1993. **24**: p. 324.
43. Czerwinski, A., *Influence of lithium cations on hydrogen and deuterium electrosorption in palladium.* Electrochim. Acta, 1994. **39**: p. 431.
44. Asami, N., et al. *Material Behaviour of Highly Deuterium Loaded Palladium by Electrolysis*. in *Sixth International Conference on Cold Fusion, Progress in New Hydrogen Energy*. 1996. Lake Toya, Hokkaido, Japan: New Energy and Industrial Technology Development Organization, Tokyo Institute of Technology, Tokyo, Japan.
45. Miley, G.H., et al. *Quantitative observations of transmutation products occuring in thin-film coated microspheres during electrolysis*. in *Sixth International Conference on Cold Fusion, Progress in New Hydrogen Energy*. 1996. Lake Toya, Hokkaido, Japan: New Energy and Industrial Technology Development Organization, Tokyo Institute of Technology, Tokyo, Japan.
46. Hagans, P.L., D.D. Dominguez, and M.A. Imam. *Surface composition of Pd cathodes.* in *Sixth International Conference on Cold Fusion, Progress in New Hydrogen Energy*. 1996. Lake Toya, Hokkaido, Japan: New Energy and Industrial Technology Development Organization, Tokyo Institute of Technology, Tokyo, Japan.
47. Bockris, J.O.M. and Z. Minevski, *Two zones of "Impurities" observed after prolonged electrolysis of deuterium on palladium.* Infinite Energy, 1996. **1**(5/6): p. 67.
48. Oya, Y., et al. *A Role of Alkaline Ions for Dynamic Movement of Hydrogen Isotopes in Pd*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.
49. Jiang, X.-L., et al. *Tip Effect and Nuclear-Active Sites*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.
50. Li, X.Z., et al. *Nuclear Transmutation in Pd Deuteride*. in *8th International Conference on Cold Fusion*. 2000. Lerici (La Spezia), Italy: Italian Physical Society, Bologna, Italy.
51. Storms, E., *Review of experimental observations about the cold fusion effect.* Fusion Technol., 1991. **20**: p. 433.
52. McKubre, M.C.H., et al., *Isothermal Flow Calorimetric Investigations of the D/Pd and H/Pd Systems.* J. Electroanal. Chem., 1994. **368**: p. 55.
53. Storms, E. *Anomalous Heat Generated by Electrolysis Using a Palladium Cathode and Heavy Water*. in *American Physical Society*. 1999. Atlanta, GA.

54. Lynch, J.F., J.D. Clewley, and T.B. Flanagan, *The Formation of Voids in Palladium Metal by the Introduction and Removal of Interstital Hydrogen.* Phil. Mag., 1973. **28**: p. 1415.
55. Bockris, J., D. Hodko, and Z. Minevski. *Fugacity of hydrogen isotopes in metals: degradation, cracking and cold fusion*. in *Symp. Hydrogen Storage Materials, Batteries, Electrochemistry 1991*. 1991.
56. Storms, E., *A Study of Those Properties of Palladium That Influence Excess Energy Production by the Pons-Fleischmannî Effect.* Infinite Energy, 1996. **2**(8): p. 50.
57. Celani, F., et al. *High Hydrogen Loading into Thin Palladium Wires through Precipitate of Alkaline-Earth Carbonate on the Surface of Cathode: Evidence of New Phases in the Pd-H System and Unexpected Problems Due to Bacteria Contamination in the Heavy-Water*. in *8th International Conference on Cold Fusion*. 2000. Lerici (La Spezia), Italy: Italian Physical Society, Bologna, Italy.
58. Stringham, R., et al. *Predictable and Reproducible Heat*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.
59. Arata, Y. and Y.C. Zhang, *A new energy caused by "Spillover-deuterium".* Proc. Jpn. Acad., Ser. B, 1994. **70 ser. B**: p. 106.
60. Arata, Y. and Y.C. Zhang. *Picnonuclear fusion generated in "lattice-reactor" of metallic deuterium lattice within metal atom-clusters.* in *The 9th International Conference on Cold Fusion, Condensed Matter Nuclear Science*. 2002. Tsinghua Univ., Beijing, China: Tsinghua Univ. Press.
61. Case, L.C. *Catalytic Fusion of Deuterium into Helium-4*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.
62. Mizuno, T., et al. *Anomalous Heat Evolution from $SrCeO_3$-Type Proton Conductors during Absorption/Desorption in Alternate Electric Field*. in *Fourth International Conference on Cold Fusion*. 1993. Lahaina, Maui: Electric Power Research Institute 3412 Hillview Ave., Palo Alto, CA 94304.
63. Oriani, R.A., *An investigation of anomalous thermal power generation from a proton-conducting oxide.* Fusion Technol., 1996. **30**: p. 281.
64. Samgin, A.L., et al. *Cold Fusion and Anomalous Effects in Deuteron Conductors During Non-Stationary High-Temperature Electrolysis*. in *5th International Conference on Cold Fusion*. 1995. Monte-Carlo, Monaco: IMRA Europe, Sophia Antipolis Cedex, France.
65. Jorné, J., *Neutron emission studies during the electrolysis of deuterium by using BaCeO3 solid electrolyte and palladium electrodes.* Fusion Technol., 1994. **26**: p. 244.
66. Biberian, J.P., et al. *Electrolysis of LaAlO3 Single Crystals and Ceramics in a Deuteriated Atmosphere*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.
67. Biberian, J.-P. *Excess Heat Measurements in $AlLaO_3$ Doped with Deuterium*. in *5th International Conference on Cold Fusion*. 1995. Monte-Carlo, Monaco: IMRA Europe, Sophia Antipolis Cedex, France.

68. Dufour, J., et al., *Interaction of palladium/hydrogen and palladium/deuterium to measure the excess energy per atom for each isotope.* Fusion Technol., 1997. **31**: p. 198.
69. Claytor, T.N., et al. *Tritium Production from Palladium Alloys*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.
70. Alekseev, V.A., et al., *Tritium production in the interaction of dense streams of deuterium plama with metal surfaces.* Tech. Phys. Lett., 1995. **21**: p. 231.
71. Karabut, A.B., Y.R. Kucherov, and I.B. Savvatimova. *Excess Heat Measurements in Glow Discharge Using Flow "Calorimeter-2"*. in *5th International Conference on Cold Fusion*. 1995. Monte-Carlo, Monaco: IMRA Europe, Sophia Antipolis Cedex, France.
72. Karabut, A.B. *Excess heat power, nuclear products and X-ray emission in relation to the high current glow discharge experimental parameters.* in *The 9th International Conference on Cold Fusion, Condensed Matter Nuclear Science*. 2002. Tsinghua Univ., Beijing, China: Tsinghua Univ. Press.
73. Savvatimova, I.B. and V.U. Korolev. *Comparative Analysis of Heat Effect in Various Cathode Materials Exposed to Glow Discharge*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.
74. Yamada, H. and T. Fujiwara, *Neutron emission from palladium point electrode in pressurized deuterium gas under DV voltage application.* Int. J. Soc. Mat. Eng. Resources, 1998. **6**(1): p. 14.
75. Mizuno, T. and T. Ohmori, *Neutron and Heat Generation Induced by Electric Discharge.* J. New Energy, 1998. **3**(1): p. 33.
76. Ohmori, T. and T. Mizuno, *Excess energy evolution and transmutation.* Infinite Energy, 1998. **4**(20): p. 14.
77. Sundaresan, R. and J.O.M. Bockris, *Anomalous Reactions During Arcing Between Carbon Rods in Water.* Fusion Technol., 1994. **26**: p. 261.
78. Hanawa, T. *X-ray Spectroscropic Analysis of Carbon Arc Products in Water*. in *8th International Conference on Cold Fusion*. 2000. Lerici (La Spezia), Italy: Italian Physical Society, Bologna, Italy.
79. Matsumoto, T. *Cold Fusion Experiments by Using Electrical Discharge in Water*. in *Fourth International Conference on Cold Fusion*. 1993. Lahaina, Maui: Electric Power Research Institute 3412 Hillview Ave., Palo Alto, CA 94304.
80. Komaki, H. *Observations on the Biological Cold Fusion or the Biological Transformation of Elements*. in *Third International Conference on Cold Fusion, "Frontiers of Cold Fusion"*. 1992. Nagoya Japan: Universal Academy Press, Inc., Tokyo, Japan.
81. Vysotskii, V.I., A.A. Kornilova, and I.I. Samoyloylenko. *Experimental discovery of phenomenon of low-energy nuclear transformation of isotopes (Mn55=Fe57) in growing biological cultures*. in *Sixth International Conference on Cold Fusion, Progress in New Hydrogen Energy*. 1996. Lake Toya, Hokkaido, Japan: New Energy and Industrial Technology Development Organization, Tokyo Institute of Technology, Tokyo, Japan.

82. Vysotskii, V.S., V.; Tashirev, A.; Kornilova, A. A. *Successful Experiments On Utilization Of High-Activity Waste In The Process Of Transmutation In Growing Associations Of Microbiological Cultures*. in *Tenth International Conference on Cold Fusion*. 2003. Cambridge, MA: LENR-CANR.org.
83. Kainthla, R.C., et al., *Eight chemical explanations of the Fleischmann-Pons effect.* J. Hydrogen Energy, 1989. **14**(11): p. 771.
84. Arata, Y. and Y.C. Zhang, *Anomalous production of gaseous 4He at the inside of 'DS cathode' during D2O-electrolysis.* Proc. Jpn. Acad., Ser. B, 1999. **75**: p. 281.
85. De Ninno, A., et al. *4He Detection In A Cold Fusion Experiment*. in *Tenth International Conference on Cold Fusion*. 2003. Cambridge, MA: LENR-CANR.org.
86. Gozzi, D., et al., *Quantitative measurements of helium-4 in the gas phase of Pd + D2O electrolysis.* J. Electroanal. Chem., 1995. **380**: p. 109.
87. McKubre, M.C.H. *Review of experimental measurements involving dd reactions, PowerPoint slides*. in *Tenth International Conference on Cold Fusion*. 2003. Cambridge, MA: LENR-CANR.org.
88. Miles, M., K.B. Johnson, and M.A. Imam. *Heat and Helium Measurements Using Palladium and Palladium Alloys in Heavy Water*. in *Sixth International Conference on Cold Fusion, Progress in New Hydrogen Energy*. 1996. Lake Toya, Hokkaido, Japan: New Energy and Industrial Technology Development Organization, Tokyo Institute of Technology, Tokyo, Japan.
89. Bush, B.F. and J.J. Lagowski. *Methods of Generating Excess Heat with the Pons and Fleischmann Effect: Rigorous and Cost Effective Calorimetry, Nuclear Products Analysis of the Cathode and Helium Analysis.* in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.
90. Mizuno, T., et al., *Confirmation of the changes of isotopic distribution for the elements on palladium cathode after strong electrolysis in D2O solutions.* Int. J. Soc. Mat. Eng. Resources, 1998. **6**(1): p. 45.
91. Notoya, R., *Cold fusion by electrolysis in a light water-potassium carbonate solution with a nickel electrode.* Fusion Technol., 1993. **24**: p. 202.
92. Ohmori, T., et al., *Nuclear transmutation reaction occurring during the light water electrolysis on Pd electrode.* Int. J. Soc. Mat. Eng. Resources, 1998. **6**(1): p. 35.
93. Oriani, R.A., *Anomalous heavy atomic masses produced by electrolysis.* Fusion Technol., 1998. **34**: p. 76.
94. Savvatimova, I.B. and A.B. Karabut, *Nuclear reaction products detected at the cathode after a glow discharge in deuterium.* Poverkhnost', 1996(1): p. 63 (in Russian).
95. Silver, D.S., J. Dash, and P.S. Keefe, *Surface topography of a palladium cathode after electrolysis in heavy water.* Fusion Technol., 1993. **24**: p. 423.
96. Celani, F., et al. *Preliminary Results with "Cincinnati Group Cell" on Thorium "Transmutation" under 50 Hz AC Excitation*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.

97. Notoya, R., T. Ohnishi, and Y. Noya. *Products of Nuclear Processes Caused by Electrolysis on Nickel and Platinum Electrodes in Solutions of Alkali-Metallic Ions*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.
98. Bush, R.T. and R.D. Eagleton, *Evidence for Electrolytically Induced Transmutation and Radioactivity Correlated with Excess Heat in Electrolytic Cells with Light Water Rubidium Salt Electrolytes.* Trans. Fusion Technol., 1994. **26**(4T): p. 334.
99. Savvatimova, I., Y. Kucherov, and A. Karabut. *Cathode Material Change after Deuterium Glow Discharge Experiments*. in *Fourth International Conference on Cold Fusion*. 1993. Lahaina, Maui: Electric Power Research Institute 3412 Hillview Ave., Palo Alto, CA 94304.
100. Ohmori, T., T. Mizuno, and M. Enyo, *Isotopic distributions of heavy metal elements produced during the light water electrolysis on gold electrodes.* J. New Energy, 1996. **1**(3): p. 90.
101. Mizuno, T., et al., *Formation of 197Pt radioisotopes in solid state electrolyte treated by high temperature electrolysis in D2 gas.* Infinite Energy, 1995. **1**(4): p. 9.
102. Mo, D.W., et al. *The Evidence of Nuclear Transmutation Phenomenon in Pd-H System Using NAA (Neutron Activation Analysis)*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.
103. Dufour, J., et al. *Hydrex Catallyzed Transmutation of Uranium and Palladium: Experimental Part*. in *8th International Conference on Cold Fusion*. 2000. Lerici (La Spezia), Italy: Italian Physical Society, Bologna, Italy.
104. Iwamura, Y., et al., *Detection of anomalous elements, X-ray and excess heat induced by continuous diffusion of deuterium through multi-layer cathode (Pd/CaO/Pd).* Infinite Energy, 1998. **4**(20): p. 56.
105. Miley, G.H., *Possible Evidence of Anomalous Energy Effects in H/D-Loaded Solids-Low Energy Nuclear Reactions (LENRS).* J. New Energy, 1997. **2**(3/4): p. 6.
106. Celani, F., et al. *Unexpected Detection Of New Elements In Electrolytic Experiments With Deuterated Ethyl-Alcohol, Pd Wire, Sr And Hg Salts*. in *JCF-4*. 2002. Morioka, Japan.
107. Close, F., *Too Hot to Handle. The Race for Cold Fusion*. second ed. 1992, New York: Penguin, paperback.
108. Chubb, T.A. and S.R. Chubb, *Wave function overlap and nuclear reactions in D+ ion band state matter.* 1995.
109. Phipps Jr., T.E., *Neutron formation by electron penetration of the nucleus.* Infinite Energy, 1999. **5**(26): p. 58.
110. Fisher, J.C., *Liquid-drop model for extremely neutron rich nuclei.* Fusion Technol., 1998. **34**: p. 66.
111. Kozima, H. *On the existence of trapped thermal neutron in cold fusion materials*. in *Sixth International Conference on Cold Fusion, Progress in New Hydrogen Energy*. 1996. Lake Toya, Hokkaido, Japan: New Energy and Industrial

Technology Development Organization, Tokyo Institute of Technology, Tokyo, Japan.

112. Hagelstein, P.L. *Unified Phonon-Coupled SU(N) Models for Anomalies in Metal Deuterides*. in *Tenth International Conference on Cold Fusion*. 2003. Cambridge, MA: LENR-CANR.org.

113. Preparata, G. *Cold Fusion '93': Some Theoretical Ideas*. in *Fourth International Conference on Cold Fusion*. 1993. Lahaina, Maui: Electric Power Research Institute 3412 Hillview Ave., Palo Alto, CA 94304.

114. Takahashi, A., et al., *Multibody fusion model to explain experimental results.* Fusion Technol., 1995. **27**: p. 71.

115. Szpak, S., P.A. Mosier-Boss, and M.H. Miles, *Calorimetry of the Pd+D codeposition.* Fusion Technol., 1999. **36**: p. 234.

116. Huang, N., et al. *A Flow Calorimeter Used in Duplication of 'Cold Fusion'.* in *Special Session Cold Fusion, Electrochemical Society*. 1989. Hollywood, Fl: Electrochemical Society.

117. Kainthla, R.C., et al., *Sporadic observation of the Fleischmann-Pons heat effect.* Electrochim. Acta, 1989. **34**: p. 1315.

118. Santhanam, K.S.V., et al., *Electrochemically initiated cold fusion of deuterium.* Indian J. Technol., 1989. **27**: p. 175.

119. Appleby, A.J., et al. *Anomalous Calorimetric Results During Long-Term Evolution of Deuterium on Palladium from Alkaline Deuteroxide Electrolyte*. in *The First Annual Conference on Cold Fusion*. 1990. University of Utah Research Park, Salt Lake City, Utah: National Cold Fusion Institute.

120. Belzner, A., et al., *Two fast mixed-conductor systems: deuterium and hydrogen in palladium - thermal measurements and experimental considerations.* J. Fusion Energy, 1990. **9**(2): p. 219.

121. Eagleton, R.D. and R.T. Bush, *Calorimetric experiments supporting the transmission resonance model for cold fusion.* Fusion Technol., 1991. **20**: p. 239.

122. Scott, C.D., et al., *Measurement of excess heat and apparent coincident increases in the neutron and gamma-ray count rates during the electrolysis of heavy water.* Fusion Technol., 1990. **18**: p. 103.

123. Hutchinson, D.P., et al., *Initial Calorimetry Experiments in the Physics Division - ORNL*. 1990, Oak Ridge National Laboratory ORNL/TM-11356: Oak Ridge, TN.

124. Zahm, L.L., et al., *Experimental investigations of the electrolysis of D2O using palladium cathodes and platinum anodes.* J. Electroanal. Chem., 1990. **281**: p. 313.

125. Miles, M.H., K.H. Park, and D.E. Stilwell, *Electrochemical calorimetric evidence for cold fusion in the palladium-deuterium system.* J. Electroanal. Chem., 1990. **296**: p. 241.

126. Oriani, R.A., et al., *Calorimetric measurements of excess power output during the cathodic charging of deuterium into palladium.* Fusion Technol., 1990. **18**: p. 652.

127. Yang, C.-S., et al. *Observation of Excess Heat and Tritium on Electrolysis of D2O*. in *8th World Hydrogen Energy Conf.* 1990. Honolulu, HI: Hawaii Natural Energy Insitute, 2540 Dole St., Holmes Hall 246, Honolulu, HI 96822.

128. Zhang, Z.L., et al. *Calorimetric Observation Combined with the Detection of Particle Emissions During the Electrolysis of Heavy Water*. in *Anomalous Nuclear Effects in Deuterium/Solid Systems, "AIP Conference Proceedings 228"*. 1990. Brigham Young Univ., Provo, UT: American Institute of Physics, New York.
129. Bertalot, L., et al. *Analysis of Tritium and Heat Excess in Electrochemical Cells With Pd Cathodes*. in *Second Annual Conference on Cold Fusion, "The Science of Cold Fusion"*. 1991. Como, Italy: Societa Italiana di Fisica, Bologna, Italy.
130. Bush, B.F., et al., *Helium production during the electrolysis of D2O in cold fusion experiments.* J. Electroanal. Chem., 1991. **304**: p. 271.
131. McKubre, M.C.H., et al. *Isothermal Flow Calorimetric Investigations of the D/Pd System*. in *Second Annual Conference on Cold Fusion, "The Science of Cold Fusion"*. 1991. Como, Italy: Societa Italiana di Fisica, Bologna, Italy.
132. Noninski, V.C. and C.I. Noninski, *Determination of the excess energy obtained during the electrolysis of heavy water.* Fusion Technol., 1991. **19**: p. 364.
133. Yun, K.-S., et al., *Calorimetric observation of heat production during electrolysis of 0.1 M LiOD + D2O solution.* J. Electroanal. Chem., 1991. **306**: p. 279.
134. Bertalot, L., et al. *Study of Deuterium Charging in Palladium by the Electrolysis of Heavy Water: Search for Heat Excess and Nuclear Ashes*. in *Third International Conference on Cold Fusion, "Frontiers of Cold Fusion"*. 1992. Nagoya Japan: Universal Academy Press, Inc., Tokyo, Japan.
135. Gozzi, D., et al. *Experiments with Global Detection of Cold Fusion Byproducts*. in *Third International Conference on Cold Fusion, "Frontiers of Cold Fusion"*. 1992. Nagoya Japan: Universal Academy Press, Inc., Tokyo, Japan.
136. Hasegawa, N., et al. *Observation of Excess Heat during Electrolysis of 1 M LiOD in a Fuel Cell Type Closed Cell*. in *Third International Conference on Cold Fusion, "Frontiers of Cold Fusion"*. 1992. Nagoya Japan: Universal Academy Press, Inc., Tokyo, Japan.
137. Ota, K., et al. *Heat Production at the Heavy Water Electrolysis Using Mechanically Treated Cathode*. in *Third International Conference on Cold Fusion, "Frontiers of Cold Fusion"*. 1992. Nagoya Japan: Universal Academy Press, Inc., Tokyo, Japan.
138. Okamoto, M., et al., *Excess Heat Generation, Voltage Deviation, and Neutron Emission in D2O-LiOD Systems.* Trans. Fusion Technol., 1994. **26**(4T): p. 176.
139. Storms, E., *Some Characteristics of Heat Production Using the "Cold Fusion" Effect.* Trans. Fusion Technol., 1994. **26**(4T): p. 96.
140. Bertalot, L., et al. *Power Excess Production in Electrolysis Experiments at ENEA Frascati*. in *5th International Conference on Cold Fusion*. 1995. Monte-Carlo, Monaco: IMRA Europe, Sophia Antipolis Cedex, France.
141. Takahashi, A., et al. *Experimental Correlation Between Excess Heat and Nuclear Products*. in *5th International Conference on Cold Fusion*. 1995. Monte-Carlo, Monaco: IMRA Europe, Sophia Antipolis Cedex, France.
142. Kamimura, H., et al. *Excess Heat in Fuel Cell Type Cells from Pure Pd Cathodes Annealed at High Temperatures*. in *Sixth International Conference on Cold Fusion,Progress in New Hydrogen Energy*. 1996. Lake Toya, Hokkaido, Japan:

New Energy and Industrial Technology Development Organization, Tokyo Institute of Technology, Tokyo, Japan.

143. Yasuda, K., Y. Nitta, and A. Takahashi. *Study of Excess Heat and Nuclear Products with Closed D2O Electrolysis Systems.* in *Sixth International Conference on Cold Fusion, Progress in New Hydrogen Energy*. 1996. Lake Toya, Hokkaido, Japan: New Energy and Industrial Technology Development Organization, Tokyo Institute of Technology, Tokyo, Japan.

144. Ota, K., et al. *Heat Measurement During the Heavy Water Electrolysis using Pd Cathode*. in *The Seventh International Conference on Cold Fusion*. 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.