FUSION facts

A Monthly Newsletter Providing Factual Reports On Cold Fusion Developments

ISSN 1051-8738 Offices located in the University of Utah Research Park

Fusion Facts Now Reports on Both Cold Fusion and Other Enhanced Energy Devices.

VOLUME 5 NUMBER 4 FUSION FACTS OCTOBER 1993

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UPCOMING CONFERENCES

4th ICCF - December 6-9, Maui, Hawaii

In the November 1993 issue we will report on the International Forum on New Science - Oct 13-17

In this issue see Call for Papers for the Minsk Conference on New Energy - May 1994

A. SUMMARY OF THE RCCF

September 29 through October 1, 1993
at Abrau Durso, Russia
By Hal Fox

The Russian Conference on Cold Fusion (RCCF) was held in the Black Sea resort of Abrau Durso. Five attendees were from outside the Commonwealth of Independent States, and an additional 30 CIS scientists attended, including attendees from Russia, Ukraine, and Belarus. Dr. Y. N. Bazhutov presided as chairman and Dr. V.P. Koretsky as Secretary of the Conference. All attendees were asked to provide the Secretary with copies of their papers for inclusion in a Proceedings of the Conference which is to be published later. All attendees were asked to provide abstracts of their papers for publication in *Fusion Facts*. These abstract will be published as soon as they are received. Several of the abstracts are printed in this issue.

The conference was opened by welcoming addresses from Drs. Bazhutov and Koretsky. The attendance of the five foreign guests was warmly acknowledged. The publication in Russian of Hal Fox's book on cold fusion was welcomed. The first sale of the book was made prior to the opening session of the conference. The publication of a book on cold fusion by a non-Russian author was deemed to be important for the convincing of important members of the CIS scientific community that cold fusion is a new science. The interpreter at the conference was Ms. Tamara Grinevich who did an outstanding and challenging task of interpreting all of highly technical materials in this Russian-English conference.

Hal Fox presented his review paper on cold fusion and other enhanced energy systems. This paper shows that the discovery of cold fusion has turned out to be rich in new phenomena. At least five methods of creating nuclear reactions in table-top experiments have now been reported and replicated. Fox handed out copies of his paper and a database on diskette of over 1500 references on cold fusion to all attendees.

A paper by Professor Steven E. Jones was presented by a Russian-born graduate student, Victor Shifrin, from Brigham

Young University (B.Y.U.) with the assistance of Hal Fox. Professor Jones declares himself to be a member of the scientific community who accepts the concept of cold fusion but not the production of excess power from cold fusion devices. He describes the latest work at BYU in his search for neutrons. Neutrons are considered to be the definitive byproduct to be expected from cold nuclear fusion. Jones' presentation included colored pictures of the excellent neutron-counting facility available deep under a mountain in a canyon near B.Y.U. and photos of experimental work currently being accomplished. Prof. Jones stated, "... my rationale in discussing our recent work at this conference is to seek advice of what can be done in our search for compelling evidence" [for cold fusion]. One of the suggestions was not to look for duck eggs in a hen house. [The preponderance of evidence from hundreds of experiments is that the nuclear by-products of cold nuclear fusion are heat, tritium, gammas, soft X-rays, and neutrons with the neutrons being the least likely byproduct of whatever reactions are producing excess power. In a paper soon to be published, it is shown that there are over 300 nuclear reactions that can be expected in selected types of cold nuclear fusion reactions, all of them aneutronic. However, there are cold fusion experiments that Jones might like to replicate that do produce extensive amounts of neutrons: e.g., Yamaguchi's work.] Prof. Jones should also consider the work reported by Lyakhov (see below) for replication in his neutron-measuring facility.

Dr. V.A. Romodanov presented three papers on various aspects of plasma devices used in cold nuclear fusion including the generation of tritium from a variety of metals. He and his associates (Elksnin, Glagolev, Korneev, Savin, & Skuratnik) are from the Scientific Research Institute of Scientific Industrial Association of LUTCH at Podolsk, Moscow Region. Their study of nuclear reactions in condensed media (NRCM) using powerful glow discharge is reported to be 100% reproducible in tritium generation at levels of one to ten million atoms per second. The heaviest elements of the periodic table are reported to be the most promising materials for NRCM.

Dr. Y.N. Bazhutov and his associates (Y.P. Chertov, A.A. Khodjakov, V.P. Koretsky, A.B. Kuznetsov, V.V. Orlov, E.M. Plotnikov, E.I. Saunin, G.M. Vereshkov, and V.A. Zhirnov) presented seven papers exploring various aspects of the Erzion massive particle theory. The Erzion particle theory proposes two charged and one neutral particle which promotes cold nuclear fusion by providing appropriate screening to reduce the effectiveness of the Coulomb barrier. The theory is extended beyond cold nuclear fusion to show that some aspects of solar and planetary physics can be explained by Erzion particle catalysis. The concept of Cold Nuclear Fusion by Erzion Catalysis (CNFEC) is an appealing theoretical concept. Further experimental evidence will be required to provide additional support for CNFEC.

Dr. J.-P. Vigier presented his review of cold nuclear fusion as being a two-stage process with a low-level stage that may be a new type of chemical process whereby the hydrogen isotope is reduced below it normal ground state with the production of excess energy. The second stage process, which experimental evidence shows to be nuclear, is more energetic, produces more excess power, and is likely associated with the original Ampére Law. Ampére proposed that charged particles can exert longitudinal forces. This part of Ampére's Law has been ignored but has been fully demonstrated in capillary cold fusion. Vigier showed that the observed excess heat can be calculated using the Bohr condition and Schrodinger equations. With the reduced orbit size, protons can be brought closer and clusters of H and D molecules can occur. This approach leads to a new quantum-chemistry of condensed matter.

Metyolkin Feordorovich presented two papers on the dominant role that is provided by the increased vibration in a metal lattice during or near phase changes. His analysis of data and knowledge of increased vibrations in the fracture or reconstruction of certain crystals has led to his characterization of cold nuclear fusion as being strongly dependent on the level of vibration in the crystal lattice. Deeper potential wells are formed. Vibrations can be acoustic and/or optic. The dominant vibration mode in solids may have a frequency of about 10^{11} cycles per second. The series of events: reconstruction of the crystal, generation of the dominant mode of vibration, the general property of crystals, the interaction of particles, and the resulting acceleration are the mechanisms for producing cold nuclear fusion.

Drs. Irina Savvatimova and Alexander Karabut presented a review of their work with glow-discharge cold nuclear fusion using a low-pressure deuterium atmosphere. The emphasis of their presentations was on the impurities found in the cathode materials before and after use in their cold nuclear fusion glow-discharge apparatus. Their conclusions are that when properly done, the glow-discharge device produces both fission and fusion by-products accompanied by bursts of neutrons, tritium, x-rays, gamma spectrum, transmuted elements, and some degree of lingering radioactivity. The replication of Karabut, Kucherov, Savvatimova's initial discoveries by DeFour in France and the continued similar work by Romodanov et al. is a substantial and important contribution to the growing evidence that the cold nuclear fusion science is rich in new phenomena.

Akito Takahashi presented a review of his extensive work in both experiments and theory of cold fusion. Dr. Takahashi boldly proclaimed, some years ago, that there was evidence for multi-body nuclear reactions in cold fusion devices. In

this latest presentation, he shows how a palladium lattice can provide for such 3- and 4- body nuclear events. He pointed out that several plasmas are required, a Pd metal plasma, an electron plasma, and a deuteron plasma. Under these conditions and subsequent to a high deuterium/palladium loading ratio (at least locally), that multi-body reactions can be observed. He has also observed experimental evidence for the production of high-energy alpha particles. Takahashi was highly commended for his continued work in the development of cold fusion and for his presentation.

A new aspect on cold fusion, not heretofore known to *Fusion Facts*, was the subject of a paper by Yu.A. Kornikenko, V.I. Visotskii, and R.N. Kuzmin (Kuzmin is from Moscow State University, the other two from Kiev, Ukraine). The paper is an excellent new lesson in rheology (the science of deformation and flow in matter) of metals. In their experimental work these scientists have found that certain rheological changes can be produced in 25 different metals including Pd, Pt, Ti, Al, Cu, etc. These changes, when in the presence of deuteron concentration, can result in the formation of micro-cavities; the automatic sizing of these cavities for optimal cold nuclear fusion; the creation of stress and collapse of the micro-cavities; and the atomic "welding" of two surfaces when properly held together in the correct environment. Examples of the butt welding of 2 cm rods were displayed. One was aluminum to aluminum and the other of aluminum to a 2 cm rod of copper. A polished portion of the Al-Cu weld showed a remarkably fine, uniform weld.

Dr. Rybalko from Kalkov belongs to a group of scientists that have been working on cold nuclear fusion since 1989. The report discussed ion implantation on Ti and Pd targets. Their work has been published in a Russian journal. In their first series of experiments they measured neutrons above background but not at the 3-sigma level. Later experiments used targets saturated with deuterium gas and used ion beams in the 8 to 10 keV range. They have measured neutrons and proton emissions. Their experimental results are to be published in *Fusion Technology*.

Dr. Melvin Miles (U.S. Navy, China Lake) presented the results of his elegant experiment in which the gaseous by-products of cold fusion were captured and tested for helium-4. Dr. Miles described the elaborate precautions taken to ensure that the helium-4 being measured did not come from atmospheric contamination. Initially, Miles expected to obtain helium-3. Miles described his latest experimental arrangement that has been improved to greatly reduce any transfer of helium in or out of the experimental apparatus and connections. Electrolysis gas samples collected in stainless steel flasks show evidence that heavy water electrochemical cells with excess power produce helium-4 at an approximate level of 10^{11} atoms per second per watt. This work has been accomplished within the past six weeks.

Dr Lipson presented a paper on "Cold Nuclear Fusion Induced in K_2DPO_4 Single Crystals." Control crystals were not deuterated. During thermal cycling of the crystals, neutrons are most likely to be observed at temperatures near the Curie point. Tritium was also measured as a by-product of the cold nuclear fusion. Some semiconductor materials were also tried and both neutrons and tritium were reported.

Dr. V.A. Filimonov (Institute of Physicochemical Problems, Belarussian State University, Minsk) presented a theoretical paper. The basic idea is that cold fusion can be promoted by strong non-equilibrium conditions such as in the presence of shock waves. Shock waves may be internally generated by the fracturing of Pd during phase changes. Filimonov showed by the citation of other known reactions rates that these rates have been measured to increase from 10^{30} to 10^{60} times near phase transitions and near melting points.

Dr. Michael McKubre presented a report on the flow-calorimetry work at SRI, International that is sponsored by funds from the U.S. Electric Power Research Institute. The essence of Dr. McKubre's presentation was: "If the palladium can be loaded with deuterium to a D/Pd ratio of 0.85 or more, then cold fusion excess heat is almost 100% reproducible. McKubre showed how 17 variables are monitored in the experimental cells; that over 50,000 hours of experimental observations have been made; and that it is important to measure and understand the loading ratio. McKubre announced that his group expects to publish the procedures used in Pd cathode preparation that will greatly improve the experimental successes. His presentation won for him an award as the best paper presented at the conference.

Dr. Skuratnik presented an excellent paper on the heat balance with nickel cathodes using light water. A nickel plate of 1 x 4 cm and 4 mm thick was used. The electrolyte was Cesium Carbonate. The calorimeter design was described and the experimental results reported. Measurements made of excess power as compared with cell current was observed. The following pairs of numbers represent mA of current followed by percent of excess power observed: 100 - 7; 200 - 3; 300 - 30; 400 - 34; 500 - 20; 920 - 29.5. When the polarity of the current was reversed the excess heat output went to zero.

Dr. Lyakhov reported on experiments using Pd and PdO structures. With the use of deuterium a production of neutrons is observed plus a burst of heat. The measurements showed that the neutron burst preceded the heat emission. Neutrons bursts were 300 to 500 neutrons per second for 1 micro second intervals. With the use of hydrogen, there were

no neutron bursts. This experiment may be a good one for Dr. Jones to replicate.

One of the presentations had great historic interest and was made by Alikin Victor Pavlovich of Perm. Pavlovich had discovered, about 20 years ago, that an electrochemical cell using stainless steel electrodes and sulfuric acid as the electrolyte would produce excess heat. His work was not scientifically accepted at the time. However, after Pons and Fleischmann made their announcement, his work became more believable. One of the systems he proposed, as a result of his experimental efforts, was the use of a plate which was bombarded on one side and would produce high-energy protons from the opposite side. He proposed that this device could be developed and used in space applications. In the publication *Socialisticheskaya Industria* May 25, 1989, was reported the 1968-1971 work of Pavlovich. The initial world-wide stir of interest caused by the Pons-Fleischmann discovery gave credence to what Pavlovich had been working on for 20 years. [A prophet is without honor in his own country.] Pavolich has continued his experimental investigations.

CONCLUSIONS

The RCCF was an important conference. More cold fusion researchers have again met and exchanged experimental results and theories. No one had a negative paper. All experimental papers reported on the achievement of nuclear reactions or at least on some strong evidence for anomalous excess power obtained from a variety of different types of devices or systems. The only negative part of the conference was that there are several important groups of CIS researchers that were not represented at the conference. The co-chairmen (one of which is Hal Fox) of the International Conference to be held in Minsk, Belarus in May, 1994, have dedicated their time and talents to have representations from a broad international group including the groups represented at the RCCF and other groups of CIS cold fusion researchers that were not at Abrau Durso.

B. PATENT LITERATURE UP-TO-DATE

By Peter Glück

In order to give a maximum of information, patents have to be systematized:

Chronologically: according to the date of priority (first application), date of publication includes the patent office's standard bureaucracy.

Logically: according to the category of technical solution.

Technologically: According to the companies which have elaborated more patents, which have to be judged globally.

From the attached list we can see that 123 cold fusion patent applications have been published and summarized in *Chemical Abstracts* through June 1993.

Classification of Cold Fusion Patent Applications
By Type and Priority

Pat. Appl. by Country	Total Number	1989	1990	1991
Japanese	57	41	13	3
World	32	17	7	8
European	11	9	1	1
German	12	8	4	-
French	4	2	2	-
Other	7	5	1	1
Total	**123**	**82**	**28**	**13**
		(66.7%)	(22.7%)	(10.6%)

Cold Fusion Patent Applications:
Monthly Evolution

Year	Jan	Feb	Mar	Apr	May	Jun
1989	-	-	2	23	16	13
1990	2	2	7	3	4	2
1991*	-	-	1	2	-	8

Year	Jul	Aug	Sep	Oct	Nov	Dec
1989	2	5	2	2	4	8
1990	2	1	3	1	1	-
1991*	2	-	-	-	-	-

*incomplete

REMARKS

1. This information is significant, it is quite possible that some of the roots of future cold fusion technologies are here, in these patents. However, it is not up-to-date because it takes a time period of about 18 months in order to get a patent application published and abstracted in *Chemical Abstracts* (our main patent information source). I think *Chemical Abstracts*, as the source, could be bypassed by using sources available to patent attorneys (such as the equivalent of the U.S. Official Gazette.)

2. Actually, Japanese companies own 64 patent applications. This is a common situation for almost all high tech or great tech fields, due in part to the cult of creativity in this country and, in an even greater part, as a result of a peculiar stimulating patenting policy in Japan. Usually 2+ Japanese patents have to be combined/assembled to give a U.S. patent.

In 1995 we will probably see the results of the present Japanese achievements and dominance in cold fusion research, perhaps over 70% of patent applications for 1993 will be Japanese.*

3. Patent literature can reveal some interesting aspects, e.g., the great group of EPRI's 'Pixie Dust' patents or Jacques Dufour, whose first publication appeared in *Fusion Technology*, September 1993, applied for a patent in 1989. Such details are important for a global vision of the field.

4. It is desirable to follow up and up-date this patent information on a regular basis. The continuity of the research work in the cold fusion field has to be obvious for everybody. It is deemed important that similar evidence needs to be presented, in detail, for papers and conference proceedings. These tasks could be effective in destroying the nastiest lies of our detractors: "There are no publications on this subject."

* For a much more thorough understanding of the Japanese patenting system, please see a paper of G. Melloan, Wall Street Journal, 12 July 1988, p 33, (or Current Contents, vol 38, 19 Sept. 1988, p 16.)

C. NEWS FROM THE U.S.

CALIFORNIA - ATOMIC SCREENING

Courtesy of Sam Faile

T.D. Shoppa, S.E. Koonin, K. Langanke, and R. Seki (W.K. Kellogg Radiation Lab., Calif. Inst. Tech., Pasadena, CA), "One- and Two-Electron Atomic Screening in Fusion Reactions," *Physical Review C*, vol 48, no 2, pp 837-840, 9 refs, 6 figs.

AUTHORS' ABSTRACT

Recent laboratory experiments have measured fusion cross sections at center-of-mass energies low enough that the effects of atomic electrons are important. To extract the cross section for bare nuclei from these data (as required for astrophysical applications), it is necessary to understand these screening effects. We present a model in which the evolution of the electron wave function is treated dynamically in the time-dependent Hartree-Fock scheme, while the motion of the nuclei is treated classically. We have calculated screening in the d + ^{2}H and d + ^{3}H reactions and give the effective screening energy U_e at small internuclear separations as a function of E. The resulting U_e values do not exceed the previously established adiabatic limits, and thus cannot explain the higher screening energies derived from experiment.

EDITOR'S COMMENTS

The authors mention, in their discussion, that their dynamical calculation cannot explain why experiments evidently observe larger electron screening effects than obtained in the adiabatic approach. They state, "If this behavior is in fact real, then it obvisouly challenges our understanding of low-energy nuclear collisions in the present of atomic electrons." Professor Koonin has been an exceptionally vocal opponent to cold fusion. We hope that he is able to help develop a theoretical explanation for the observed discrepancy in low-energy nuclear collisions because it will probably also help to explain the experimental cold fusion results which are so abhorrent to Professor Koonin. There is increasing evidence, especially from the cold fusion experimental results, that the Coulomb barrier is being reduced, bypassed, tunneled through, or screened in a manner not fully understood by conventional science. See the abstract of Dr. Akito Takahashi's paper recently presented at the RCCF in this issue. **This is a challenging problem that should receive the intent focus of our best theorists.** The fact that semi-stable clusters of millions or billions of electrons can be produced (as taught by Ken Shoulders in U.S. patent 5,018,180) should also be seriously considered by theorists.

GEORGIA - 28TH IECEC MEETING

By Dr. Patrick Bailey

The 28th Intersociety Energy Conversion Engineering Conference was held in Atlanta, Georgia on August 8-13, 1993. 354 papers were included in the proceedings, and about 445 people attended. It is thought that the cutback in defense spending and the general lessening of government funding were responsible for the lower than expected attendance.

The sessions of interest to readers of *Fusion Facts* were probably Advanced Applications, and Innovative Concepts I and II, which covered several areas of new energy research. Although not able to attend, papers by Carol White ("A Summary Review of the Third International Conference on Cold Fusion"), Ed Storms ("The Status of Cold Fusion"), and Hal Fox ("Commercialization of Enhanced Energy Systems") are included in the proceedings. [Hal Fox sent a fax update to the paper which was presented to the session by Dr. Pat Bailey.] Another paper of interest was "Progress on Beating the Carnot-Cycle Efficiency Limit" by Henry Oman, on heat-to-mechanical power conversion improvement.

The IECEC is held yearly, and is not considered a technically professional meeting as much as it serves as a platform for summaries of current and planned research. This year it was sponsored by the American Chemical Society, one of seven technical engineering societies which rotate in hosting the

conference. Next year the 29th IECEC will be held in Monterey, California on May 13-15, 1994, and sponsored by the American Institute of Aeronautics and Astronomics.

HAWAII - MOLTEN SALTS

Courtesy of the author

Bor Yann Liaw (Hawaii Natural Energy Inst., U. of Hawaii), "Hydride-Containing Molten Salts and Their Technology Implications," presented at European Workshop of Electrochemical Technology of Molten Salts, Mar. 14-17, 1993, 13 pages, 31 refs, 5 figs, 1 table.

AUTHOR'S ABSTRACT

Hydride-conducting molten salts such as LiH in eutectic LiCl-KCl are attractive electrolyte systems for intermediate-temperature applications. The chemically reducing characteristics of these hydride melts provide a unique method to clean metal surfaces. The high conductivity of these hydride melts makes them the best electrolytes for hydrogen-based energy applications at intermediate temperatures. We will review some earlier work on hydride-conducting molten salts and their potential applications in energy technology. We will also describe some recent work on these hydride-containing molten salts for energy conversion and storage applications, including hydrogen sensing and hydrogen storage, electrochemical characterizations, and thermodynamic and kinetic investigations of metal-hydrogen reactions. More recently, lithium deuteride containing eutectic LiCl-KCl melts have been used for excess heat production by the process of electrolysis to charge deuterium into metal matrix such as Pd and Ti. From these studies we illustrate the prospects of this hydride molten salt technology and its implications for the use in intermediate-temperature electrochemical energy conversion configurations. It will also reveal some interesting electrochemical aspects involved in the process.

AUTHOR'S CONCLUSIONS

If the interesting result of excess heat generation using the molten salt techniques is proven, the significance of its contribtution to energy applications will be enormous. High efficiency, superb kinetics and low power consumption will be the benefits from the use of elevated-temperature excess heat generation. Improved understanding of the electrochemical behavior of the hydride-conducting molten salt will facilitate the realization of the technology. Particularly interesting is the control of high current density in the cell configuration to establish a critical deuteride concentration to be sustained for excess heat generation. As evidenced by the previous discussion, this molten salt system seems simple in operation but actually complicated in the electrochemical reaction mechanism. Characterizing the transport property as a function of LiD concentration and current density will help elucidate the mystery of the "uncharacterized" excess heat reaction and its associated charge transfer mechanism. The effect of electrode morphology and impurity poisoning may also play vital roles in achieving a high deuterium loading in metals.

Unique stability regime, impressive kinetics, simple and inexpensive cell configurations constitute great potential for the employment of hydride-conducting molten salt electrolytes in energy storage and conversion technologies. These unique features for electroyltic applications are especially attractive in the intermediate temperature range where no other competitive candidates are available. High power devices have been demonstrated to be feasible in a number of experiments that show a consistent behavior of the molten salts in a Nernstian and Faradaic fashion. More fundamental characterization of the molten salt systems is still urgently needed to improve the performance characteristics.

EDITOR'S COMMENTS

Dr. Liaw was recognized as one of *Fusion Facts'* **Scientists of the Year** for his work in showing that excess heat could be obtained in a lithium-deuterium-palladium electrochemical cell with a molten salt electrolyte. Although very difficult to control and replicate, the molten salt cold fusion reactor is expected to be improved and become a commercially-viable component of the new cold fusion science. Dr. Liaw's work has been sponsored, in part, by Fusion Resources, Inc. (a Utah company recently acquired by Fusion Energy Applied Technology who has recently changed its corporate name to ENECO, Inc.). ENECO has acquired rights to the Liaw-Liebert molten-salts cold fusion technology.

MARYLAND - METALLIC NANOWIRES

Courtesy of Dr. Samuel P. Faile

T.M Whitney, P.C. Searson, J.S. Jiang, and C.L. Chien (Johns Hopkins Univ., Baltimore, Maryland), "Fabrication and Magnetic Properties of Arrays of Metallic Nanowires," *Science*, vol 261, no 5126, 1993, pp 1316-1319, 17 refs, 5 figs.

AUTHORS' ABSTRACT

Arrays of ferromagnetic nickel and cobalt nanowires have been fabricated by electrochemical deposition of the metals into templates with nanometer-sized pores prepared by nuclear track etching. These systems display distinctive characteristics because of their one-dimensional microstructure. The preferred magnetization direction is perpendicular to the film

plane. Enhanced coercivities as high as 680 oersteds and remanent magnetization up to 90 percent have also been observed.

EDITOR'S COMMENTS

It has been demonstrated and replicated that Bizmuth wires, if of sufficiently small diameter, exhibit room-temperature superconductivity. In addition, significant work has been done by Graneau, Vigier, and Rambaut on capillary cold fusion. This article is recommended as a possible method by which such important innovations can be further studied.

NEW MEXICO - COLD FUSION STATUS

Edmund Storms (Los Alamos National Laboratory, New Mexico), "The Status of Cold Fusion," Proceedings of the 28th Intersociety Energy Conversion Engineering Conference, vol 2, pp 315-320, 40 refs.

AUTHOR'S INTRODUCTION

The phenomenon initially called "Cold Fusion" should now more appropriately be called "Chemical Assisted Nuclear Reactions" (CANR). This new field, founded most recently by Drs. Pons, Fleischmann and Jones, is continuing to grow as a number of nuclear reactions are discovered to occur in a variety of chemical environments at modest temperatures. These environments include electrolytic cells containing D_2O or H_2O, gas discharge cells containing D_2 and palladium, various metals loaded with pressurized D_2, ion implantation using D^+, and chemical reactions of various types involving compounds of deuterium with other reactants.

AUTHOR'S DISCUSSION

Other observations too numerous to mention here have clearly demonstrated that a new phenomenon has been discovered. This phenomenon involves the ability of the chemical (electron) environment to reduce the barrier between nuclei and to dissipate the resulting nuclear energy through out the surrounding atomic lattice. Because the environment used for these studies is greatly different from that used when isolated ions are interacted at high energy, the process and the products are expected to be different as well. Consequently, most past experience using high energy plasmas might not apply and should not be used to dismiss the new observations out of hand. It is not yet known in what ways this phenomenon might be applied. The possibilities exist to change one element into another and to produce large amounts of clean energy. If ways can be found to scale the heat producing process to industrial levels, an inexhaustible and clean source of CO_2-free energy would be available. If ways can be found to properly tailor the electron environment, harmful radioactive isotopes might be converted to nonradioactive elements and rare elements might be created from common elements. These extraordinary possibilities are too important to ignore just because they are inconsistent with present knowledge. Even if these applications are not realized, a new understanding of nucleus-electron interaction is already in process.

We must be reminded periodically that science involves the open minded search for new knowledge. It is the nature of this search that new knowledge will always conflict with old. When this conflict becomes too great, individuals are required to reexamine their commitment to objectivity and to the absence of emotional bias.

EDITOR'S COMMENTS

Dr. Storms is noted for his excellent cold fusion experimental work, especially his recent delineation of why some palladium cathodes support cold fusion reactions and some cathodes fail. Storms has also provided the new science with excellent review papers.

UTAH - NEUTRON EMISSIONS AT BYU

Steven E. Jones (Phys. Dept., Brigham Young Univ., Utah, USA), "Recent BYU Experiments: Correlation of Neutron Emissions with Deuterium Outgassing," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, 6 figs.

AUTHOR'S INTRODUCTION

The purpose of this paper is to provide information regarding ongoing experiments at BYU, searching for compelling evidence of a (low-level) nuclear effect. At the onset, I suggest that the reader disabuse himself of any notion that the existence of such an effect implies to any connection to excess heat claimed by some. The nuclear effects which we have claimed evidence for, along with Kevin Wolf, P. Golubnichiy, A. Arzhannikov, Vladimir Tsarev, Ed Cecil, Howard Menlove, Graham Hubler, Franco Scaramuzzi, Antonio Bertin y Vitale, Seelinger, Ryoichi Taniguchi and other serious researchers in this field, are too small by many orders of magnitude to correlate with excess heat production. Indeed, most (but not all) of these wish to disassociate themselves from claims of Pons and Fleischmann, M. Miles, R. Bush, R. Mills et al. It is in this attitude, then, that I present our work: distinct and separate from the claims of excess heat generation.

Nor do I seek to persuade anyone that our results are already compelling. **Indeed, my rationale in discussing our recent work at this conference is to seek advice of what can be done in our search for compelling evidence.** How can we scale up the small effect we are (may be) seeing? What theoretical notions can be used to enhance our search for a larger signal? Or can someone help us find the systematic error that is causing us trouble? Frankly, I would just like to resolve the matter one way or the other. I cannot in good conscience abandon the results we have without resolving the matter. Hopefully this will become clear as we explore the current status of BYU (and other) experiments on possible nuclear emissions at low-levels from deuterated materials.

EDITOR'S COMMENTS

The following advice from the RCCF is offered: Don't look for duck eggs in the henhouse. There are 338 nuclear reactions that do not produce neutrons. The cold fusion literature is replete with experimental evidence that the tritium/neutron ratio is 10^3 to 10^8. Heat is also a nuclear byproduct. Several well-documented experiments, that are now well replicated, produce large numbers of neutrons including the report by Yamaguchi (ICCF-3) and a group (Dr. Lyakhov et al.) at this same Russian conference. It is suggested that these experiments should be replicated at the excellent BYU facility.

WASHINGTON D.C. - COLD FUSION SUMMARY

Carol White (21st Century Science Associates, Washington D.C.), "A Summary Review of the Third International Conference on Cold Fusion," Proceedings of the 28th Intersociety Energy Conversion Engineering Conference, vol 2, pp 309-314.

EDITOR'S COMMENTS

Carol White presents a comprehensive overview of the ICCF held in Nagoya, Japan, in October, 1993. Her review covers the dramatic "turn-on" of a series of electrochemical cells and the rapid boil-off of the electrolyte by heat produced in the palladium cathode; the exciting results of Yamaguchi to repeatably reproduce neutron emissions and helium-4 from deuterium gas-loaded palladium foils; Kucherov et al., excess heat and nuclear by-products from palladium cathodes used in a low-pressure deuterium atmosphere; Kaliev's work with tungsten bronzes; McKubre's work at SRI, International funded by EPRI; and other important papers presented.

D. NEWS FROM ABROAD

BRITAIN - WATER FUEL

Admiral Sir Anthony Griffin (Chairman, British Maritime Charitable Foundation, Bosham, West Sussex, UK), "Water as Fuel," from Proceedings of the Impact of New Technology on the Marine Industries, held Sept. 13-15, 1993, at Southampton Inst., Warsash, UK.

AUTHOR'S ABSTRACT

The Earth's main sources of non-solar energy are fossil fuels, which cause severe pollution and cannot last indefinitely; nuclear, which is capital intensive, and whose waste disposal is problematical; tidal and wind schemes which are inefficient; and thermal and hydro installations which are efficient but lack flexibility and require major capital investment.

An alternative is water (salt, fresh or distilled) as a cheap and inexhaustible source of global energy which has none of the foregoing disadvantages. The theoretical evidence in support of the relevant technology is briefly described and related to the first and second laws of thermodynamics. Practical evidence is illustrated and the impact of this revolutionary development on the marine industries, with ships floating in their own fuel and thus having no need for either bunkers or ambient air, is indicated.

Much wider and global implications for the environment, industry, defence and political stability are discussed.

GERMANY - SILICON ALCHEMY?

Volker Lehmann (Dept. ZFE, Siemens AG, Munich, Germany), "Porous Silicon Preparation: Alchemy or Electrochemistry?" *Advanced Materials*, vol 4, no 11, 1992, pp 762-764, 21 refs, 3 figs.

AUTHOR'S ABSTRACT

There is a saying in the silicon community that the bulk of the crystal was created by God, while the surface was made by the devil. Since the internal surface area of microporous silicon is on the order of 600 m^2/cm^3, which makes every tenth Si atom a surface atom, it is obvious with whom one is dealing in the preparation of microporous silicon (microPS). Since early in 1990, when the usual optical properties of microPS were interpreted in terms of structure on a quantum scale, there has been great interest in this material. But this enthusiasm has sometimes been followed by confusion and even frustration. This was caused, in the one hand, by the fact that porous silicon has been studied since 1956, and

therefore some "brand new" findings, such as photoetching of silicon for holographic applications, proved to be a repetition of early work, and on the other, by irreproducible results with their origins in the fragile morphology of microPS, which is sensitive to environmental conditions during and after preparation.

AUTHOR'S CONCLUSIONS

In conclusion, it can be said that the different environmental conditions that have an effect on the PS properties can be viewed as a disadvantage; but if their influence is understood, they offer the possibility not only of studying the physics and chemistry of PS formation but also of controlling its properties.

[It should be noted that if, after 48 years since the invention of the transistor, we are still having reproducibility problems with silicon, that maybe we can forgive the cold fusion scientists after 4 1/2 years for still having reproducibility problems with palladium. Ed.]

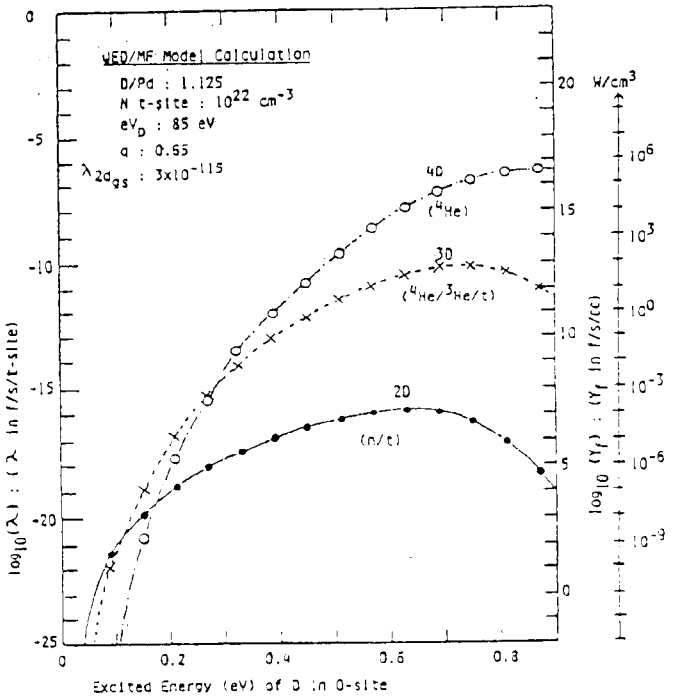
JAPAN - MULTI-BODY FUSION

Akito Takahashi, Toshiyuki Iida, Hiroyuki Miyamaru and Morio Fukuhara (Dept. Nuc. Eng., Osaka Univ., Japan), "Multibody Fusion Model to Explain Experimental Results," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, 23 refs, 16 figs.

AUTHORS' ABSTRACT

Many cold fusion experiments worldwide have given us very anomalous results, i.e., kev/atom level excess heat, ^{4}He generation, very low level emission of neutrons and tritons with 10^{-4} to 10^{-7} n/t yield ratio, and the emission of high energy charged particles, which cannot be explained with known d+d fusion process. A multi-body deuteron fusion model in solids was previously proposed and is elaborated further in this report to explain these anomalous results.

A transient dynamics in metal-deuterides is proposed to generate close pairs and clusters of deuterons with time-dependent deep atomic potential inducing strong screening effect on Coulomb barrier penetration. Very approximate numerical estimation of reaction rates for the competing process of 2D, 3D, and 4D fusion processes in PdDx and TiDx are obtained with high level reaction rates enough to explain observed heat levels. Decay channels of virtual compound states, i.e., ^{4}He*, ^{5}Li*, ^{6}Li*, ^{7}Be* and ^{8}Be* by 2D, H+2D, 3D, H+3D, and 4D fusions, are discussed in detail to know nuclear products. Major generations of ^{4}He by H+2D, 3D, H+3D, and 4D processes are concluded. Identifications of particle-types and their specific released kinetic energies are given to explain measured charged particle spectra by deuteron beam implantation experiments.



Roughly estimated fusion rates in PdDx, by the present model.

EDITOR'S COMMENTS

Dr. Takahashi must be commended for his bold interpretation of experimental evidence showing that unexpectedly high-energy neutrons are produced in cold fusion experiments and his attempts to explain the source of those high-energy by-products. This latest paper present new theoretical considerations that should be carefully reviewed by cold fusion scientists.

RUSSIA - CF IN TUNGSTEN OXIDE BRONZE

K.A. Kaliev, A.N. Baraboshkin, A.L. Samgin (Rus. Acad. Sci, Inst. High Temp. Electrochem., Ekaterinburg, Russia), P.I. Golubnichy (Lugansk Mech. Engr. Inst., Ukraine), E.G. Golicov and A.L. Shaliapin, "Reproducible Nuclear Reactions at Deuterium Interaction with Tungsten Oxide Bronze," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, 6 refs., 2 figs.

AUTHORS' ABSTRACT

New class of materials for deuterium loading was used in this work: tungsten oxide bronze single crystals (non-stoichiometric compositions Na_xWO_3). By electrochemical methods Na can be removed from the crystal and be substituted by deuterium. During deuterium interaction with the crystals, one can see temperature increasing and neutron emission. The temperature difference can be 40-50 C°, neutron flux is around 10σ. Neutron emission stops after 10-20 minutes from deuterium filling the vacuum chamber with the tungsten bronze sample. Blank experiments with hydrogen produced no neutrons.

RUSSIA - CF IN SINGLE CRYSTAL

Courtesy of Sam Faile

A.G. Lipson, D.M. Sakov, E.I. Saunin, V.B. Kalinin, M.A. Kolovov, B.V. Deryagin, and A.A. Khodyakov (Inst. of Phys. Chem., Russian Acad. Sciences), "Cold Nuclear Fusion Induced in KD_2PO_4 Single Crystals by a Ferroelectric Phase Transition," *Journal of Experimental and Theoretical Physics--Russian,* vol 103, no 6, pp 1070-1076, 28 refs, 4 figs, 2 tables. [Similar information was also presented by Dr. Lipson at the RCCF on September 30, 1992 at Abrau Durso.]

AUTHORS' ABSTRACT

A reproducible generation of neutrons and tritium -the products of nuclear fusion- has been observed during temperature cycling of ferroelectric KD_2PO_4 (DKDP) single crystals near their Curie point (T_c-222 K). A substantial asymmetry in the yield of cold fusion products in the neutron (n) and tritium (T) channels was found experimentally ($n/T \approx 10^{-7}$). It was found by a thermal depolarization method that the neutron emission occurs in the same temperature interval as the switching of domain walls in the crystal. It is suggested that the cold fusion in the DKDP crystals stems from a nonzero probability for the simultaneous occupation of two neighboring *D* sites by deuterons near the surface of the crystal in the course of the ferroelectric phase transition and a possible displacement of deuterons substantial distances, up to 3.5 Å, in strong electric fields.

EDITOR'S COMMENTS

The authors note in their conclusions that this study has provided the first experimental observation of a reproducible emission of cold-fusion products (neutrons and tritium) in ferrorelectric DKDP single crystals with controllable properties and that the emission of these nuclear byproducts occurs near the Curie point. We commend these scientists for providing some strong additional experimental evidence to help understand the conditions under which cold nuclear fusion reactions occur.

RUSSIA - BEAMS OF NUCLEI

Y.N. Bazhutov, G.M. Vereshkov, V.P. Koretsky, and E.M. Plotnikov, "Initiating the Cold Nuclear Fusion Reaction by Beams of Nuclei," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, 4 refs.

INTRODUCTION

An arrangement of experiment using accelerators of nuclei in order to test a model of Cold Nuclear Fusion (CNF) by Erzion Catalysis was proposed. It demonstrated that some heavy elements' nuclei which do not react with enions [sic], may hold the latter near the nucleus with bonding energy within 10 + 100 eV range, and thus, serve as donors to enions for erzion catalysis.

It seems the most famous and effective of them is isotope Pd^{110} which is contained in a natural isotope mixture with relative concentration of 12%.

In order to initiate CNF reaction it is advisable to use accelerated Pd ions because kinetic energy transmission of the latter to the nuclei of the Palladium target goes on in the Coulomb co-strike with an effectiveness approaching 100%. Because of closeness of Pd^{110} nucleus mass to the enion mass ($\sim$100 GeV), enions are being released with minimal energy. For effective using the neutral erzions -E^0, being born in all erzion reactions on palladium and leaving thin ($\sim$100 mkm) palladium target, the latter is being surrounded from all sides with a layer of lithium deuteride (Li^7D), actively interacting with E^0. Deuterium interacts with E^0 when enion (E_N) and proton /E $\approx$ 3.9 MeV/ appear. Released E_N may once again interact with D, producing tritium (T) and E^0 and thus closing a chain of erzion catalysis on deuterium through E_N and E^0.

RUSSIA - SOLAR & PLANETARY CNF

Y.N. Bazhutov and G.M. Vershkov, "Possible Role of Cold Nuclear Fusion by Erzion Catalysis in Solar and Planetary Physics," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, 7 refs.

AUTHORS' INTRODUCTION

The modern astrophysics consider thermonuclear energy nature of studying the Sun and stars as a generally accepted fact. However, for more than 20 years the problem of a solar

neutrino stays unsolved. Thermonuclear model of the sun even with a minimum flow of the solar neutrino of high energies gives an approximately 2.5 times excess of the neutrino flow over the experimentally discovered one. Besides, the Davis group experimental results indicate at a possible correlation of the solar neutrino flow with the solar activity (11 year cycle). This fact, in its turn, indicates a possible neutrino generation not only in the central but also in the peripheral area of the sun where the temperature of the matter is considerably lower than in the central region and cannot be provided by thermonuclear mechanism. These contradictions can be understood only if it is considered that not only thermonuclear fusion reactions of light nuclei are occurring within the sun, but also a mechanism of the Cold Nuclear Fusion by Erzion Catalysis (CNFEC) is working almost in all the volume of the Solar matter. According to the CNFEC model the fusion reactions are effectively running with the catalyzers' release ($E \geq 1$ Ev) at the temperature $T \geq 10^4$ K.

RUSSIA - ERZION CATALYSIS MODEL

Y.N. Bazhutov and G.M. Vereshkov, "Constructing a Model of Cold Nuclear Fusion by the Erzion Catalysis," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, 24 refs.

AUTHORS' INTRODUCTION

The process of Cold Nuclear Fusion (CNF) in deuterated palladium and titanium possesses a number of specific properties, two of which are most important ones:

(1) suppression of the neutron and γ-quanta outcome (approximately 10^7 times) with respect to the tritium outcome;

(2) CNF reactions go in deliberately stationary conditions: electrolysis, mechanical stroke, temperature and pressure changes.

RUSSIAN - PALLADIUM ISOTOPE CHANGES

Y.N. Bazhutov, G.M. Vereshkov, and A.B. Kuznetsov, "Interpretation of the Cold Nuclear Fusion Experiments on Altering Isotope and Chemical Composition of Palladium Within the Framework of the Erzion Catalysis Model," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, 5 refs.

AUTHORS' INTRODUCTION

The general report made by Prof. J.O'M. Bockris at the First International conference on Cold Nuclear Fusion revealed experimental results by D.R. Rolison and W.E. O'Grady on altering isotope composition and chemical composition (Ru, Rh, Ag elements appeared) of the palladium cathode as the result of the CNF radiation when electrolyzing heavy water. There were no changes achieved when electrolyzing light water.

We suggest a qualitative explanation to these results on the basis of the CNF reaction may be both meson doublet (negative erzion -E^- and neutral erzion -E^0) and barion (enion - E_N) which produce energetically profitable nucleon exchanges with nuclei. Enion presents a five-quark bag and is originated from confluence of E^0 with neutron ($\Delta^0 = 6.15$ MeV) or E^- with proton ($\Delta^- = 7.75$ MeV) with corresponding bonding energies (Δ). Mass difference between E^- and E^0 is 2.9 MeV. On every isotope there are 6 principally possible reaction channels, but some of them are closed at low catalyst energies for energy reasons. For instance let us write down all possible channels of catalysts' reactions on deuterium:

$D + E_N = T + E^0$	(+ 0.15 MeV)	(1.1)
$D + E_N \neq He^3 + E^-$	(- 2.25 MeV)	(1.2)
$D + E^0 = P + E_N$	(+ 3.95 MeV)	(1.3)
$D + E^0 \neq 2P + E^-$	(- 3.8 MeV)	(1.4)
$D + E^- = n + E_N$	(+ 5.55 MeV)	(1.5)
$D + E^- \neq 2n + E^0$	(- 0.6 Mcv)	(1.6)

RUSSIA - EXPERIMENTAL TESTS OF MODEL

Y.N. Bazhutov, A.B. Kuznetsov, V.A. Zhirnov, Y.P. Chertov, E.I. Saunin, and A.A. Khodjakov, "Experimental Testings of the Cold Nuclear Fusion Model," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, 1 ref.

AUTHORS' INTRODUCTION

This study describes several experiments on stimulation of the CNF reaction by electrolysis and X-raying. These electrolytic experiments differed from the traditional way because in the process of electrolysis direction of a running current was changed several times (a current cycling was performed). The authors suppose that this kind of treatment was meant to promote a more full transition of the tritium which had appeared in the electrolytic solution. 1.5 M solution of Li, Od in D_2O serving as an electrolyte.

RUSSIA - CNF CALORIMETRY

Y.A. Bazhutov, V.V. Orlov, E.I. Saunin, Y.P. Chertov, and A.A. Khodjakov, "Calorimetric Experiment in Cold Nuclear Fusion," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, 2 refs, 1 fig.

AUTHORS' INTRODUCTION

Two intriguing peculiarities of the Cold Nuclear Fusion (CNF) process have been noticed during the experiments at this moment. First of them is connected with a ratio of generated tritium quantity to a number of irradiated neutrons. This quantity according to various results achieved by experimenters, lies within the 10^3-10^{11} range. The second peculiarity is an abnormally high, compared with calculating quantity of generated tritium, thermal outcome.

Reliable qualitative measuring these relations should have allowed one to measure conformance between the theoretical thinking and experimental data. With this purpose we conducted a preparatory work and started experiments on the device whose scheme is shown in the paper.

RUSSIA - FUTURE POWER ENGINEERING

Y.N. Bazhutov, G.M. Vereshkov, and Y.P Chertov, "Cold Nuclear Fusion is the Future of Power Engineering," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, a thesis of the report presented at the First All-Union Conference "Physics and Conversion" in Kaliningrad, 1991, p 141.

AUTHORS' ABSTRACT

Today there is a problem of creating autonomous, power producing, and ecologically safe sources of energy. A source working on the basis of Cold Nuclear Fusion reactions may become an optimal engineering choice considering its maximal energy production at minimal mass.

Experimental and theoretical research in the field of Cold Nuclear Fusion being conducted in the world, including Russia, reveals the possibility of creating a principally new type of energy source. It is suggested that it will possess a number of advantages comparing with already existing ones. Heavy water (D_2O), one litre of which contains 10^{13} Joules (i.e., extremely power-producing) may serve as its fuel and together with a conjecturally simple and inexpensive power source device evidently, will enable to provide energy-supply systems in many fields (including space stations).

The new source of energy must be also ecologically safe. As the first experiments by Fleischmann and Pons, and the Bombay Nuclear Centre [BARC] reveal, considerably suppressed neutron and gamma-quantum released (10^3-10^{11}) in experimental results of the fusion of deuterium nuclei makes devices radiationally safe. In addition, the contained nature of Cold Nuclear Fusion also makes its breakdown safe (unlike thermonuclear).

Authors of the report basing their conclusions on the original authors' model suggest a program of both theoretical and experimental study of the Cold Nuclear Fusion mechanism. The study of cold Nuclear Fusion mechanism will enable theoreticians to understand one of the most progressive kinds of energy of the future.

RUSSIA - TRITIUM PRODUCTION

V.A. Romodanov, V.I. Savin, Ya.B. Skuratnik, and V.V. Elksnin (SRI of SPA LUTCH, Podolsk, Moscow), "Reproducibility of Tritium Generation from Nuclear Reactions in Condensed Media," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, 1 ref.

AUTHORS' ABSTRACT

The powerful glow discharge which we used for the first time for investigating nuclear reactions in condensed media (NRCM) allowed us to obtain some reliable data on neutron and tritium generation and element transmutation.

One of the main features of our glow discharge system was application of higher plasma-generating gas pressures providing a relatively easy method to obtain high densities of the flux of the deuterium ions bombarding the sample under investigation.

In this work, on the basis of the proposed model and the results of practical activity in the NRCM field, we discuss the limits of the main parameters of the ion bombardment by using a glow discharge as an example and to specify the requirements for the parameters and materials used for the purpose of obtaining some reproducible results of tritium generation.

We have formulated some practical recommendations for the ion bombardment systems to obtain 100% reproducibility of tritium generation at a level of 1,000,000 - 10,000,000 atoms per second by means of NRCM. We have been discussing the methods of the ion-bombardment system modification to improve their efficiency when potentially using NRCM for practical purposes.

RUSSIA - TARGET MATERIAL CONCEPTS

V.A. Romodanov, V.I. Savin, Ya.B. Skuratnik, and S.G. Korneev (SRI of SPA LUTCH, Podolsk, Moscow), "Concept of Target Material Choice for Nuclear Reactions in Condensed Media," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, 2 refs.

AUTHORS' ABSTRACT

Most of the experiments on nuclear reactions in condensed media (NRCM) where palladium, nickel, or titanium are used as base materials, do not have high reproducibility. The results obtained when using other materials are even more contradictory, and there are not enough models where the dependence of the NRCM rate on the base material type is discussed.

In spite of great skepticism about good tritium generation results obtained by some groups of scientists, this problem is getting to be the major problem for understanding the NRCM mechanism. The most reliable results on measuring neutrons, gamma- and X-radiation, charged particles, helium-4 and helium-3, heat excess, and element transmutation do not considerably exceed the background noise level. However, some reliable data exceeding the background noise level by 2-5 orders of magnitude, have been obtained when using some methods of tritium generation on the gaseous discharge base. That allows us to begin studying the influence of different parameters of the deuteron and the base atom interaction process on the NRCM efficiency.

The possibility of choosing the most efficient materials is discussed on the basis of the model proposed before. The practical results obtained when using a powerful glow discharge have been considered. They verify the above-mentioned hypothesis and the features of realizing the promising properties of the materials for NRCM.

RUSSIA - TARGET MATERIAL CHOICE

V.A. Romodanov, V.I. Savin, Ya.B. Skuratnik, S.G. Korneev, and A.E. Glagolev (SRI of SPA LUTCH, Podolsk, Moscow), "Concept of Target Material Choice for Nuclear Reactions in Condensed Media," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, 1 ref.

AUTHORS' ABSTRACT

The so-called "cold fusion" problem still has many unresolved problems as a great number of experiments have negative results. However, many groups of scientists have been developing power devices using nuclear reactions in condensed media (NRCM) for their application for everyday life necessities and in industry.

One of the most promising types of devices using NRCM are plasma devices, glow discharge devices, etc., because one can relatively easily change the operating plasma characteristics within a wide range. Having used a powerful glow discharge during such investigation for the first time, we reached the tritium generation rate about 1,000,000,000 atoms per second when the neutron-to-tritium yield ratio was from 0.000,000,1 to 0.000,000,001 and the heat yield exceeded the applied power by up to 100%. By extrapolating the obtained data, we have developed a conceptual design of an air heater having an output thermal power of 1-10 kW and capable of supplying major living space heating. The main advantage of the developed air heater is the fact that the generated heat exceeds the electric power consumption by 2-10 times. Such devices filled with deuterium every 1-3 years will be necessary in regions with sudden temperature differences and during the shortage of traditional power carriers and electric power.
We have been developing a power device with a modified Stirling engine (P ~ 10 Kw), which can be used in vehicles. Some nuclear safety and ecological problems of the proposed nuclear devices have been considered and are discussed.

UKRAINE - CONTROLLED RHEOLOGY

Yu.A. Kornienko (Avakuum Ltd., Keiv), V.I. Visotskii (Kiev St. Univ.), and R.N. Kuzmin (Moscow St. Univ.), "On the Possibility of the Cold Nuclear Fusion (CNF) Stimulation in the Microspace of the Deuterium-saturated Metal Under the Controlled Rheological Process," presented at the Russian Conference on Cold Fusion, Sept. 28-Oct. 2, 1993, 4 refs.

AUTHORS' INTRODUCTION

In previous experiments it was shown that one of the possible CNF realization mechanisms can be connected with the effect of the stationary (quasi-stationary) many-particle with $N \approx 10^3$ or the fluctuation-unstable with $N \approx 10$ to 20 Fermi-condensation of N deuterons in microspaces with optimal sizes (microspheres with radius $R_0 \approx 4$ to 7 Å microcracks with root-mean-square width $L_0 \approx 4$ Å).

The CNF effect is provided by the possibility of the inter deuteron Coulomb interaction being reduced or eliminated, and a process to obtain optimal structures under the optimal particles number. The "barrier elimination" d-d fusion effect can be realized only under the condition when the direct or indirect Coulomb interaction (including internuclear repulsion, exchange interaction, spin orientation averaging, and more

remote-actions induced by attraction) is a negligibly small perturbation.

EDITOR'S COMMENTS

As noted in the conference summary (see page 1), this paper provided a new practical use for cold nuclear fusion in the joining of two similar or dissimilar metals by atomic welding. Some 25 different metals have been identified that are suitable for joining by an announced but undisclosed means to promote atom welding at a metal-metal interface.

YUGOSLAVIA & FRANCE - SPIN-SPIN
Courtesy of Dr. Samuel P. Faile

R. Antanasijevic, I. Lakicevic, Z. Maric, D. Zevic, A. Zaric (Inst. Phys., Belgrade, Yugoslavia), and J.P. Vigier (CNRS/UPMC, URA 769, Gravitation et Cosmologie Relativistes, Paris, France), "Preliminary Observations on Possible Implications of New Bohr Orbits (resulting from electromagnetic spin-spin and spin-orbit coupling) in "Cold" Quantum Mechanical Fusion Processes Appearing in Strong "Plasma Focus" and "Capillary Fusion" Experiments," *Physics Letters A*, vol 180, no 1-2, 1993, pp 25-32, 10 refs, 9 figs. [Similar information was presented by Dr. Jean-Pierre Vigier on September 29, 1993 at the RCCF in Abrau Durso, Russia.]

AUTHORS' ABSTRACT

The theoretical interpretation of recently observed "excess heat" (i.e. break-even) in low intensity electrolytic and discharge experiments (with both deuterium and hydrogen) as resulting from a new type of non-nuclear quantum phenomena (i.e. spin-spin and spin-orbit couplings added to the usual Coulomb potential in specially structured dense media) leads to the prediction that "fusion ashes" of deuterium (or deuterium compounds now in vanishingly small quantities) will grow with the current intensity input, thus increasing the excess energy output. To test this prediction one can study the dynamics of fusion reactions in simple capacitor bank discharges into deuterated media, both in plasma focus (PF) and capillary fusion (CF) type experiments.

AUTHORS' CONCLUDING REMARKS

Despite the evidently encouraging evidence of break-even in present-day experiments, a considerable amount of work is necessary to understand the real physical nature of the new hydrogen energy and to develop the corresponding technology. We are still discussing on a semi-heuristic level but
(a) on the theoretical level one has still no generally accepted model of the origin of the excess heat observed in low intensity electrolytic and glow discharge experiments. In our opinion the detection of a soft X-ray spectrum would strongly enhance the validity of our "exotic" quantum chemistry interpretation, and
(b) on the experimental level one should pass from a low to a high energy input. To [determine] that effect our further investigations will be directed towards detailed studies of voltage, energy relationships, conductivity, the input current intensity dependence of the neutron yields, and the lowering thresholds in neutron detection.

EDITOR'S COMMENTS

Dr. Vigier was one of the first scientists to publicly accept the reality of light water excess heat (Third Annual Conference on Cold Fusion, Oct, 1992). He is now promoting the concept of a two-stage process with the lower levels of excess heat being produced by an exotic process such as the collapse of a hydrogen atom below its ground state. The higher bursts or levels of excess heat, Vigier attributes to some form of capillary cold fusion wherein the longitudinal forces (Ampére's Law) between charged particles become an important force. It is expected that a follow-on paper may issue from the same city (Belgrade) but from a different country, probably Serbia. Cold fusion isn't the only force for change in the world.

E. SHORT ARTICLES FROM READERS

THE COMPLEX NEW SCIENCE OF COLD FUSION
By Hal Fox, Editor

A. THE COULOMB BARRIER - A STATIC CONCEPT

As a high school student my physics teacher demonstrated how a rod of sealing wax could be charged by rubbing it with fur or how a glass rod could be charged by rubbing it with wool (or was it the opposite?). He also demonstrated how two pith balls hung by threads could be charged by contact with one of the charged rods (glass or sealing wax). The pith balls repel with like charges and attract with unlike charges. We apply this static concept to two charged particles in a plasma and plot the magnitude of the repelling force between like charges as a function of the distance between the two charges. This plot provides us with a graphical depiction of the Coulomb barrier except if these charged bodies are hydrogen nuclei then we must also include other forces when the nuclei get very close together. The end result is a hill-shaped plot with a sharp rise near the origin and a monotonic decreasing function on the downhill side away from the origin. To get two charged nuclei together, **to overcome the Coulomb barrier**, we can appeal to the concept of momentum and velocity. If the two charged particles are properly aligned and moving at sufficient velocities relative to each other, then the momentum

forces of the two charged nuclei can **overcome the Coulomb barrier**, collide, and possibly fuse.

Under some conditions, we find that two charged particles appear to collide and fuse even though their energy levels are below the energy levels required to overcome the repulsive force of the Coulomb barrier. Scientists have labeled this concept as **tunneling**. The term tunneling is meant to convey an idea of getting through the Coulomb barrier without having the energy to "go over the top." The term provides no conceptual idea as to how a low-energy particle manages to avoid the physical restraints of the mutual repulsion between charges.

The **Coulomb barrier is a static concept.** The idea of providing sufficient momentum between two charged particles is **a dynamic concept.** In a gas plasma (high temperatures, ionized atoms) the fusion of two nuclei is well-studied. For deuterium-deuterium fusion, in such an environment, it is known that about one-half of such fusion events produce neutrons, one-half produce tritium, and one in a million produce helium-4.

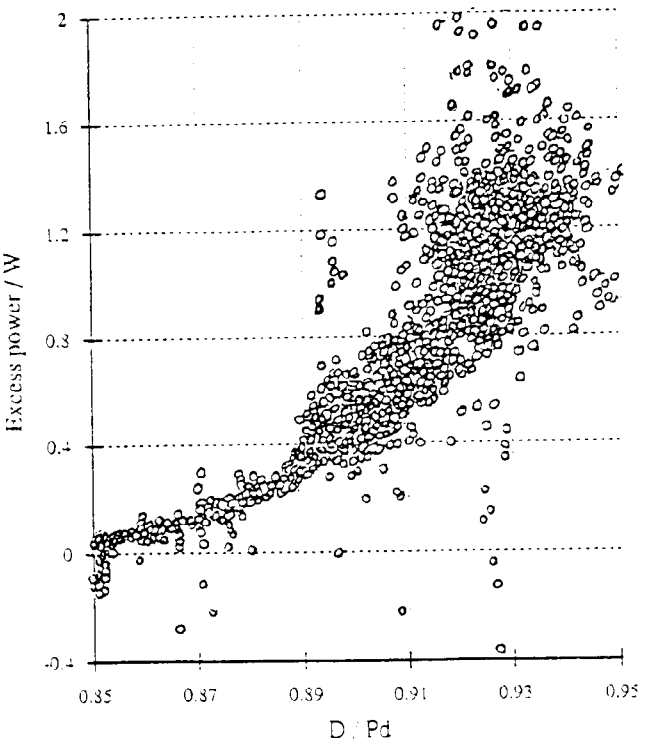
Consider the concept where hydrogen atoms are in close proximity to a metal lattice. It is an experimental fact that a hydrogen isotope does not enter into a palladium lattice without being separated from its electron -- in other words, the penetrating hydrogen is an ion, a charged proton, deuteron, or triton (for the three well-known isotopes of hydrogen.) It is a well-studied experimental fact that these hydrogen ions diffuse into a palladium lattice; that they occupy certain positions within the metal lattice (in the octahedral or in the tetrahedral sites); that the rate of diffusion can be measured; and that a typical hydrogen ion spends much more time located at a site than is spent in moving from one site to another site in the diffusion process.

B. POSSIBLE DEUTERON FUSION

Many papers have been written to show that the probability of two deuterons fusing when statically located within a palladium lattice is extremely low. From a static viewpoint, the distance between two such deuterons is considered much too far to permit fusion to occur. It is a well-established experimental fact, based on hundreds of experiments, that excess heat in a lithium, palladium, deuterium system does not occur until the ratio of deuterons to palladium atoms exceeds 0.85 and that the excess heat increases non-linearly with a further increase in the d/Pd loading ratio. See Fig. 1.

If the excess heat is to be attributed to the fusing of deuterium atoms, then it is a reasonable speculation that the fusion does not occur because adjacent deuterons fuse, **but that it is a result of an itinerant or "hopping" deuteron that fuses with another deuteron when the traveling deuteron moves through or near to a site that is already filled.**

Fig. 1 Variation of Excess Power with Loading



Graph courtesy of Dr. Michael McKubre

PARTICLE PHYSICS

From the point of view of particle physics, we can speculate that the experimental evidence for the **hopping** motion of a diffusing deuteron is such that a deuteron spends a much longer time in a site than in transition between sites. The charged deuteron is strongly urged to diffuse through the metal lattice by the electrical forces (potential) within the environment of an electrochemical cell. Because of this electrical potential, the diffusion process is deemed to be accelerated. It would be reasonable to assume that the **hopping or traveling** deuteron can gain considerable momentum in its **hopping motion**. The experimental evidence is that this pause, jump, pause motion is characterized by a much longer time in pause than in transitions between two acceptable sites. If, as shown by an elegant experiment by Miles et al., the excess heat is characterized by the production of helium-4, we would expect that the most likely nuclear reaction is the fusing of deuterons. Takahashi (and others) have shown that energetic neutrons are produced that are consistent with the concept of deuteron-deuteron fusion. In fact, Takahashi has shown that more complex fusions appear to take place and can be explained by multi-body fusion of

deuterons. Takahashi makes an excellent point when he reminds us that excess heat is developed when the electrochemical system is characterized by three plasmas: a palladium plasma, a deuteron plasma, and an electron plasma. McKubre has provided considerable experimental evidence and has plotted excess heat as a function of the d/Pd loading ratio (Fig. 1) and also excess heat as a function of current density. Both are significant experimental facts.

WAVE PHYSICS

In contrast to particle physics, consider the case when the deuterons are considered as waves rather than point particles. Leaf Turner suggested in 1989 that an ordered array of palladium atoms interlaced with deuterons could be considered as a comb filter and that this array could establish a resonant condition for a traveling deuteron wave such that the resonance condition could greatly enhance the probability of fusion. This idea is a powerful concept and has led Bush and Eagleton to a sequence of theoretical considerations and experimental findings that appear to substantiate the concept of establishing resonant conditions in a palladium lattice. These resonant conditions could be considered as a catalytic mechanism for nuclear reactions.

THE DEAD GRADUATE STUDENT

Many nuclear physicists, armed with vast amounts of data on deuteron-deuteron fusion within a gas-plasma environment, have proclaimed that a Pons-Fleischmann type of electrochemical cell **must produce enormous amounts of neutrons and tritium to explain the amount of excess heat reported.** This brought about the mystery of the missing dead graduate student and the question "Where is the nuclear ash? The logic is: if the excess heat is real the amount of neutrons being emitted would kill the attending graduate student, so where is the body? The logic traps in this line of reasoning are the following:

1. There is no evidence that fusion within a metal lattice should obey the statistics of gas-plasma nuclear physics. Experimental evidence has shown that in an electrochemical cell tritium is produced from one thousand to 10 million times more often than neutrons (far from the 50/50 production in a gas plasma). Furthermore, the production of tritium plus neutrons accounts for only a few percent of the excess heat. Thus there is no dead graduate student.

2. The "nuclear ash" refers to by-products of nuclear reactions. By some strange logical processes, nuclear physicists seem to ignore the fact that **heat is a nuclear byproduct** and is much simpler to measure than neutrons. If deuteron-deuteron fusion is occuring within or near the surface of a metal lattice, and if the tritium/neutron ratio is highly different, then maybe it is possible for the one-in-a-million d + d --> helium-4 reaction to predominate. This reaction has only two types of nuclear byproducts: helium-4 and heat. Miles has measured helium-4 in amounts roughly commensurate with the amount of heat measured.

However, new science is not that simple. As pointed out by Bush and Eagleton (and others) there are other nuclear reactions that can account for the production of excess heat without the production of tritium or neutrons (atritonic and aneutronic reactions.) For example, the Pons-Fleischmann electrochemical cells work best with a palladium, lithium, heavy water combination. A known nuclear reaction is lithium-6 + deuterium --> berillium-8 (highly unstable) --> 2 helium-4 plus heat. Although Miles et al. measured helium-4 roughly commensurate with excess heat, they did not differentiate between a d+d and a lithium-6 + d nuclear reaction. Which one was it?

C. NUCLEAR FUSION PROBABILITIES

In the particle-beam, gas-plasma world of nuclear physics the probabilities of many types of nuclear reactions have been well studied. One of the measures by which the probability of fusion can be expressed is by **nuclear cross-section**. In gas-plasma physics the more likely fusion events involve deuterium-deuterium and deuterium-tritium and possibly tritium-tritium. These are the gases used in the highly complex (and highly expensive) hot fusion devices, such as a Tokamak. Because of the vast amounts of experience obtained in such high-temperature plasmas and usually within some confining magnetic fields, the various probabilities of nuclear reactions is well known.

While there is no evidence that the probabilities of nuclear fusion within a metal lattice should be equal to the probabilities of nuclear fusion within a high-temperature gas plasma, this concept has been accepted without question by many cold nuclear fusion (CNF) opponents. As stated above, CNF in an electrochemical cell does not follow the experimental findings of gas plasma physics. **There is now no reasonable doubt that nuclear events occur within or near the surface of some metal lattices. Experimental reports from laboratories in 30 countries attest to a new science rich in phenomena.**

The so-called cold fusion phenomena includes new and traditionally unexpected experimental observations, discoveries, and phenomena including the following:

1. Metal lattice nuclear physics is dissimilar to gas plasma nuclear physics.

2. Excess heat is produced by nuclear reactions and/or heretofore unrecognized chemical reactions in several different types of reactors including heavy-water, light-water, glow-discharge, electric-sparking, tungsten bronze crystals, molten salts, and capillaries.

3. An increasing variety of elemental transmutations are being reported in a variety of CNF reactors.

4. Neutrons, tritium, heat, gamma rays, X-rays, and other evidence of nuclear reactions are reported in over 1,000 technical papers.

5. The reports in peer-reviewed papers differ little from similar technical reports given in over a dozen national and international conferences on cold fusion.

6. No comprehensive theory has been developed and published that explains all of the observed phenomena.

7. Many of the observed phenomena appear to be more closely related to catalytic processes than to plasma-type fusion processes. Terms such as **nuclear catalysis, lattice-assisted nuclear reactions, SURFDYN (surface dynamics), catalytic nuclear reactions, etc.** are appearing in the cold fusion literature.

8. Many historic observations, previously denied by the scientific community, are being recalled or reported. These events include transmutations in electrochemical devices and even in biological entities.

9. As contrasted to hot-plasma-devices, many cold fusion devices provide more power out than provided as input power. The commercialization of cold fusion is now being seriously considered.

10. Scientists are learning much more about the structure and capabilities of condensed matter and embedded plasmas with the result that many new concepts, discoveries, devices, and theories are proliferating.

D. NUCLEAR CATALYSIS OR PROTON CAPTURE

In experiments with heavy-water electrochemical cells, isotopic changes have been reported in lithium and in palladium. In light-water cells the alkali-metal electrolytes have been reported to produce heavier elements on the surface of the nickel cathode. In gas-plasma reactors, such as the Karabut, Kucherov, Savvatimova glow-discharge devices, measurable atomic changes in and around the palladium cathode have been reported. In all cases, these experimental observations have been replicated, in most cases, by several different research groups. The result had led some scientists to suggest that the so-called cold nuclear phenomena could be called modern-day alchemy.

The concept that nuclear reactions can be catalyzed or assisted in or near a metal lattice such that protons or deuterons are captured by atoms having relatively high masses is being seriously investigated. These experimental observations imply that massive elements can be arranged on the surface of a catalytic substance, such as nickel, and permit or enhance the capability of such a massive element capturing or absorbing a proton, deuteron, or triton. The conditions for such nuclear activity include a suitable metal lattice (such as Pd or Ni); suitable elements freed from chemical combination in an electrolyte (usually alkali metals); a suitable level of electron flow out of the cathode; a buildup of massive elements (specifically alkali elements) on or near the surface of the cathode; suitable temperature ranges (usually near room temperature); control of impuritites; and appropriate time-current relationships.

It is reported by at least ten groups in at least four countries that the use of a nickel cathode, a platinum anode, an alkali-metal electrolyte, combined in an electrochemical cell is the easiest and most dependable experimental method. This type of cell produces measurable excess heat and dramatic differences in the before and after assay of elements on the surface of the nickel cathode after prolonged electrolysis. The reports indicate that these elemental changes are entirely unexpected and unexplained by chemical reactions.

The experimental results can be explained by the unusual concept (or speculation) that in such an environment protons or deuterons produced at or near the surface of the cathode are being absorbed (captured, attracted, lured, drawn) by the nucleus of the heavier elements arrayed on or near the surface of the cathode.

If one catalogs the type of nuclear reactions that could possibly be involved in such a scenario while observing all of the known laws of physics (conservation of mass, energy, spin, etc.) the number of possible nuclear reactions number over 300 - **very few of which produce neutrons as a nuclear ash.** This then is one of the reasons to suggest to the diligent neutron searchers that it may prove improvident to search for duck eggs in the henhouse.

If you consider that the P-F effect has engendered a host of critics (most of whom are fighting the straw-man concept of heavy neutron production) the following concepts should elicit a host of objections:

1. Most so-called cold fusion devices produce transmutation of heavy elements.

2. Metal lattices do not obey the expected gas-plasma statistics.

3. Only a very few catalyzed nuclear reactions produce neutrons.

4. **Cold fusion is a much more promising method of producing commercial power than gas-plasma hot fusion.**

We trust that the ensuing debate will observe the same level of courtesy, professionalism, logic, honesty, and scientific inquiry that was the result of the March 1989 announcement of cold fusion. In the same logical fashion, we expect that the DOE will immediately grasp the importance of this new science and that the patent office will speed the process of the protection of inventor's rights by approving cold fusion patent applications.

ADDENDUM TO "An Elementary Model of Deuteron Behavior in Deuterium-loaded Titanium or Palladium That May Account for Cold Fusion Phenomena."
By David Moon

The following is a addendum to the article "An Elementary Model of Deuteron Behavior..." printed in the June issue of *FF*, pp 11-14. I've decided to attend to the obvious concern about the need for 14 MeV neutrons, as well as n/t ratios closer to $\sim 10^{-5}$, if secondary t-d fusions occur after creation of MeV-level tritons, [example: d + ^{48}Ti → ^{49}Ti (~0.12 MeV) + p (~5.8 MeV)]. These notes attempt to address this difficulty, and also try to apply the theory to other CF data reported in recent articles.

On page 13, a diagram was given that described the collective deuteron wave pulse invading the volume of a palladium (or titanium) atom. At the higher end of the energy range of the invading train of deuterons the following reactions could occur:
[A-1]: d + ^{108}Pd → ^{109}Pd + p(~3.9 MeV), followed by
[A-2]: p(~3.9 MeV) + d → t(~3.9 MeV) + β^+ (5.47 MeV).

At lower input power it was hypothesized that d-d fusion occurs inside the metal's electron cloud. This reaction was proposed to be the main heat-producing reaction, where the electron cloud carried away the 23.85 MeV:
[B]: d + d → ^{4}He + 23.85 MeV

The following corrections and extensions need to be made concerning reactions [A-1,2] and [B]. For reactions [A-1,2], an important omission was made--that of secondary t-d fusions:

[C]: t (<3.9 MeV) + d → ^{4}He (<3.9 + 3.5 = <7.4 MeV) + n(14 MeV)

The ratio for n (14 MeV) / t (<3.9 MeV) ≈ 10^{-4} to 10^{-5}. Thus, a triton rate of 10^9/sec would result in a neutron rate of 10^4 to 10^5 per second.

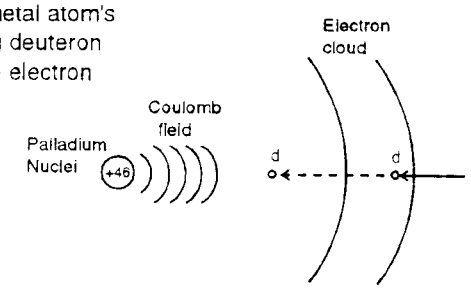
This n/t ratio of ~ 10^{-5} equals the ratio given by Dr. A. Takahashi, where ~10^6 n and ~ 10^{11} tritium were measured over ~7 days. (However, 14-MeV neutrons were not mentioned.)

The following conclusion must be made: Generally, reactions [A-1] and [A-2] can only account for MeV-level charged particles (such as at NRL, G. Chambers et al.) but not for the accumulation of tritium in most CF experiments where measured. This is because (1) n/t ratios are usually on the order of ~10^{-8} and (2) 14-MeV neutrons do not usually appear.

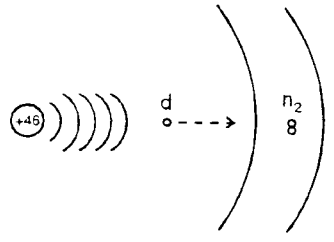
Therefore, the following reactions are proposed to account for low-energy tritium, with accompanying low-level neutrons (n/t ≈ 10^{-8}):
[D-1]: d + e$^-$ * $\xrightarrow[\text{capture}]{\text{electron}}$ n_2 (dineutron)
[D-2]: d + n_2 * → t + n [~4.0 MeV]
* Designates "inside metal's electron cloud." (see Fig. 1)

Fig. 1

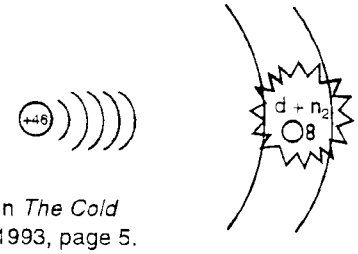
a.) Leading deuteron of deuteron-wave pulse reaches inside metal atom's volume; a trailing deuteron reaches only into electron cloud.



b.) Deuteron inside electron cloud captures electron, converting to a dineutron.**



b.) Rebounding deuteron meets N_2 inside electron cloud: d + N_2 → t + n, energy yield ~ 4.0 MeV.



** Ref. to n_2 by J. Yang in *The Cold Fusion Newsletter*, July 1993, page 5.

At this point, a speculation must be given by necessity. Since the appearance of tritium is accompanied by few neutrons, the tritium forms at low energy, not at MeV energy, which would result in a higher count of 14-MeV neutrons from t-d fusion. Therefore, it is proposed that most of the d + n_2 interactions occur inside the electron cloud and that the electron cloud carries away most of the 4.0-MeV energy release. Thus, the tritium and neutron move away from each other at very low energy.

In the rarer event that d + n_2 occurs outside the metal's electron cloud, distribution of the ~4.0 MeV may be according to the normal momenta analysis. In other words, d + n_2 → t (~1.0 MeV) + n (~3.0 MeV).

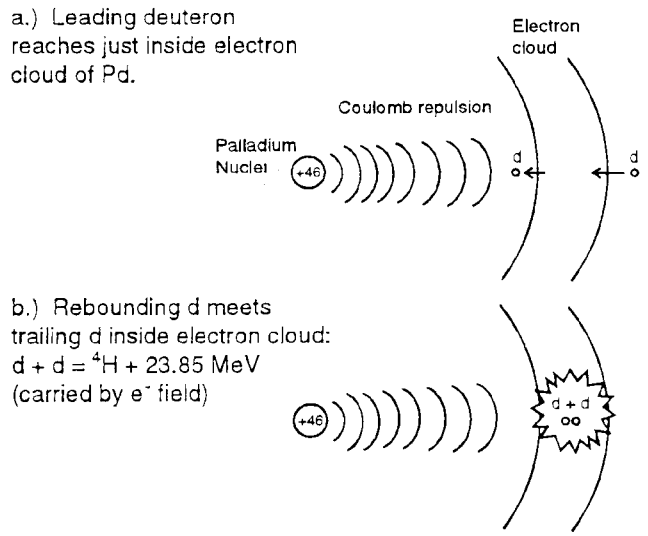
The energy release of 4.0 MeV was estimated by assigning 2.23 MeV consumed in the n_2 breakup (the same as the p-n binding energy). This may only be good for an approximation:

d + n → t + 6.26 MeV
n_2 → n + n - 2.23 MeV
d + n_2 → t + n + 4.0 MeV

The low-energy neutron formed in this reaction inside the metal's electron cloud will likely be quickly thermalized and captured by surrounding d or Pd nuclei, thus maintaining a **low n/t ratio (~10^{-8})**.

From reports given in recent articles (in *The Cold Fusion Newsletter, 21st Century Science, and Technology*, and *Fusion Facts*), it is beginning to look like He-4 may yet come closer to correlating with excess heat. However, there still seems to be a general shortage of He-4 in many experiments using precise calorimetry. To review, the mechanism producing He-4 in this theory was given as:

Fig. 2



In the original theory, this d - d fusion was proposed to be the primary heat-forming reaction. If other reactions must be found to account for any short-fall in He-4 (with respect to heat), then the best this theory can offer, so far, is the following:

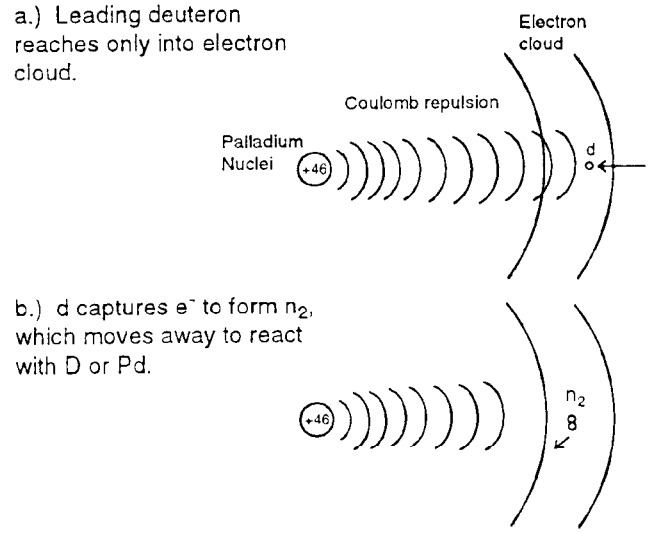


Fig. 3

The low-energy dineutron may react with any Pd nucleus to form another isotope plus a neutron:

n_2 + ^{102}Pd → ^{103}Pd + n , 5.38 MeV
n_2 + ^{104}Pd → ^{105}Pd + n , 4.86 MeV
n_2 + ^{105}Pd → ^{106}Pd + n , 7.31 MeV
n_2 + ^{106}Pd → ^{107}Pd + n , 4.30 MeV
n_2 + ^{108}Pd → ^{109}Pd + n , 3.92 MeV
n_2 + ^{110}Pd → ^{111}Pd + n , 3.49 MeV

Dr A. Takahashi had a neutron spectrum that included a peak in the region of 3 to 7 MeV (*21st Century Science and Technology*, spring 1993, p 70). This range could be explained by these n_2 + Pd reactions. (However, he reported a neutron flux of only 1-2 n/sec.) Also, at Nagoya, a Chinese team reported a neutron emission between 2.5 - 7.0 MeV (*The Cold Fusion Newsletter*, July 1993, p 12). These n_2 + Pd reactions, in which MeV-level neutrons evidently form, probably cannot be a primary source for the excess heat in CF experiments, since a heat/neutron ratio of ~1 would result.

Another interesting possibility is the capture of the dineutron by Pd. For example, n_2 + ^{110}Pd → ^{112}Pd + 11.84 MeV. Then Pd-112 undergoes beta decay:

^{112}Pd - ß⁻ → ^{112}Ag - ß⁻ → ^{112}Cd

Roger Stringham of E-Quest Sciences in Palo Alto, CA, has had fascinating results in acoustically-driven fusion using Pd

foils in D_2O, (see *The Cold Fusion Newsletter*, July 1993, p 14). He has observed unmistakable heating, plus helium-4 production. In addition, "isotopic shifts of palladium atoms are observed to have occurred."

The above reactions involving oscillating trains of deuteron waves--which generates the invading deuteron wave pulse--might also account for the events observed at E-Quest Sciences. In fact, the general model of a "collective, coherent oscillation of deuteron waves" that has been the mechanism in this CF theory can also be extended to the phenomenon of sonoluminescence, which seems to be closely related to the remarkable events observed at E-Quest

F. MEETINGS AND MISCELLANEOUS

4th INTERNATIONAL CONFERENCE ON COLD FUSION
December 6-9, 1993
Hyatt Regency Maui, Hawaii

Participation is open to all interested scientists and technologists. In particular, the following are encouraged to attend: nuclear and solid-state theoreticians, advanced energy technologists and long range utility planners. There will also be an exhibit of scientific instruments and supplies by various manufacturers.

The proposed agenda is as follows: Morning sessions will be devoted to one keynote presentation and a number of shorter, invited presentations. Afternoon presentations will be divided into a number of subject-organized parallel sessions. Papers reporting the results of simultaneous measurement of different kinds are particularly encouraged. Subject areas to be covered include: Materials and Fundamentals, Calorimetry, Nuclear Measurements, Solid-state Theory, Electrochemical Studies, and Safety Issues.

The co-chairs are Dr. T.O. Passell (EPRI) and Dr. M.C.H. McKubre (SRI) who can be reached at (415) 855-2070 and (415) 326-6200 respectively, for technical information.

The registration fee of $300 covers conference proceedings, continental breakfasts, three luncheons, and an evening reception. To register, contact Linda Nelson, Conference Coordinator (EPRI) at (415) 855-2127 or Fax (415) 855-2041. Hotel reservations can be made with the Hyatt Regency Maui (mention ICCF-4 conference to obtain the special group rate), call for information: (808) 661-1234 or Fax (808) 667-4499. Reservation deadline Nov. 6, 1993.

CALL FOR PAPERS - MINSK CONFERENCE

A bilingual, international conference on cold nuclear fusion and affiliated energy systems will be held during the last week in May, 1994, in Minsk, Republic of Belarus. The major purpose of the conference is to provide an opportunity for international laboratories (both corporate and academic) to present papers and to display working cold fusion devices in the exhibit hall through the use of actual working devices or by video presentations.

Because there has been an active anti-cold nuclear fusion sentiment in much of Europe, there has been little opportunity for the scientific and engineering communities to study the scientific validity of cold nuclear fusion. In addition, the economic conditions in the former communist-controlled states has reduced the opportunities for many research groups in these countries to meet with their peers in hard-currency countries.

Papers accepted for the conference will be published in English and Russian editions of proceedings to be provided to attendees at the beginning of the conference. Presentations of the papers can then concentrate on the latest developments and the answering of questions. This decision was made by the organizing committee to provide suitable background information on cold nuclear fusion to potential European attendees who have not had access to the few international publications that have accepted articles on cold fusion.

Papers from scientists in Russian-speaking countries will be submitted to the organizing committee in Minsk. Papers written in English will be submitted to Hal Fox, P.O. Box 58639, Salt Lake City, UT 84158. The following schedule for papers will be followed:
Abstracts to be submitted as soon as possible but not later than December 10, 1993.
Notification of acceptance will be announced by January 2, 1994.
Papers must be received by January 31, 1994.

Members of the organizing committee may invite papers from selected scientists. Some tutorial and review papers will be sought. A total of about 70 papers will be selected and published in the proceedings. The proceedings are expected to provide a tutorial overview of the new science of cold nuclear fusion for a multi-disciplinary audience and provide the latest experimental and theoretical findings.

Subjects of interest to the conference are:
Cold Nuclear Fusion (CNF) Devices
Theories and Models
Measurement of nuclear byproducts including excess heat.
Engineering topics for the commercialization of CNF (such as heat transfer, thermo-electric devices, and production of mechanical motion).
Papers summarizing national work on CNF in Japan, China, Italy, U.S., and the Commonwealth of Independent States (CIS), and other nations.

Conference costs for hard-currency countries:

$250 Conference Attendance. Authors of Accepted Papers must include the check for the conference when submitting the paper. Page costs for pages in excess of 6 pages (including figures) will be $100 per page.

Hotel and Meals will cost $50 to $100 per day.

Transportation costs (airline fares from U.S. to Minsk range from $1,000 to $1,500).

Translation costs, if handled by the organizing committe staff, will be $20 per page. Authors are urged to submit their papers in both English and Russian. Words on Figures may be in English.

DEMONSTRATIONS AND EXHIBITS

Corporations and Institutions are encouraged to buy exhibit space (a single booth would be about 3 meters wide) to demonstrate devices, show videos of operating devices, or advertise their products. Please inquire about booth space as soon as possible, limited space is available. Exhibit booth costs will be about $100 per meter frontage.

Exhibits of working devices should not include closed, pressurized, electrochemical cells. Demonstrations (actual devices to be displayed) of operating devices or videos for the following types are solicited:

1. Pons-Fleischmann type.
2. Light-water electrochemical cells.
3. Molten-salt reactors.
4. Low-pressure deuterium gas palladium cathode reactors.
5. Bronze Crystal devices or other capillary CNF devices.
6. Yamaguchi-type Pd-sandwich devices.
7. Proven Over-unity Space Energy Devices.
8. Advanced thermo-electric and thermal engine systems.
9. Manufacturer's displays of equipment e.g. calorimeters, mass-spectometers, etc.

RADIO, TV, AND PUBLICATIONS MEDIA

The organizing committee will make a special effort to invite members of the media to come to the conference and view a variety of "enhanced energy devices" actually operating or to see videos of such devices in operation.

PUBLICATIONS BOOTH

A booth will be established to sell conference-related books and publications. Authors or organizations are asked to furnish publications to be sold at the conference. A 25% commission will be retained and used to buy CNF literature for participating CIS institutions. Copies of proceedings of previous conferences will be especially welcome. Both English and Russian publications are requested.

JOURNALS - PLEASE COPY

We request all scientific journals to publish this call for papers and announcement of the conference.

Reality is not self evident.
One of Murphy's Laws

Corollary:
A fish would be the last person to discover water.

COLD FUSION IMPACT BOOK

Enthusiasm is contagious. Cold Fusion Impact in the Enhanced Energy Age is full of enthusiasm about a great discovery that has the potential to make the world a better place. For four years Hal Fox has been gathering an impressive collection of cold fusion literature. He is an authority in the subject and is now sharing with the reader his far reaching vision of all the changes that low-cost, clean, abundant energy will bring to the whole world. Written in a simple, non-technical style, Cold Fusion Impact is a clear and concise book that everyone needs to read. It is addressed to the layperson that needs to understand and be ready for the changes that will certainly come as a consequence of the commercial-ization of enhanced energy systems. Now available in Russian. Soon to be available in Spanish.

The book is sold with an updated diskette filled with over 4 years worth of scientific bibliography covering research papers, articles and books primarily on cold fusion, with some other energy research also. The bibliography sells separately for $25. You can buy both for only $25, through this publication. Write to us at *Fusion Facts* for your copy.

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