FUSION facts

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

VOLUME 6 NUMBER 3 FUSION FACTS SEPTEMBER 1994

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A. WHATS HAPPENING?

Statement on the Status of "Cold Fusion" Magazine.

This statement is being released on 12 September 1994 by the former Editors of "Cold Fusion" Magazine (Eugene F. Mallove, Editor; Stu Norwood, Managing Editor; Contributing Editors: Lawrence Forsely, Jed Rothwell, and Christopher P. Tinsely):

Three issues of "Cold Fusion" Magazine have appeared: May, June, and July/August, 1994.

In June 1994, internal disagreements between the editorial staff and the publisher (Wayne Green, Inc. of Peterborough, New Hampshire) reached a point at which the editorial staff concluded they could no longer work within the Wayne Green, Inc. organization.

The editors wanted to continue with the excellent 80-page magazine format, supported by the cold fusion industry and the growing readership of the publication. The publisher wanted to reduce it to a newsletter with a fraction of the information content of the magazine. Consequently, all of the editors severed their relationship with Wayne Green, Inc. They are seeking financial backing to start a new magazine in the field of cold fusion.

Wayne Green, Inc. has issued a "Cold Fusion Update" newsletter designated as a September issue. The former editors have reviewed a copy of this newsletter and consider it to be entirely substandard in its presentation of information on the field of cold fusion. There is no designated editor of this newsletter, so we assume that Wayne Green is himself acting as Editor.

The former editorial staff had no ownership position in the magazine. The editors were paid as either salaried employees, or contractors. Consequently, despite the profound concern of the former editors for the rights of

those who in good faith subscribed to the magazine, the responsibility for subscription fulfillment resides with Wayne Green, Inc.

Those current subscribers of "Cold Fusion" Magazine -- or future subscribers of the planned new publication -- who wish to contact the former editorial staff of "Cold Fusion" Magazine may write to:

Cold Fusion Technology
P.O. Box 2816
Concord, NH 03302-2816, USA.

Correspondence may also be faxed to 603-224-5975. Editorial and news items for the new planned cold fusion publication are now being solicited. Potential investors in the new publication are also asked to contact us.

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CALIFORNIA - NICKEL FIBREX CATHODES

R. Bush and R. Eagleton (Phys. Dept., Cal. St. Polytechnic Univ. and Future Energy Applied Technology, Inc. (FEAT), "Calorimetric Studies For Several Light Water Electrolytic Cells with Nickel Fibrex Cathodes and Electrolytes with Alkali Salts of Potassium, Rubidium, and Cesium" Proceedings ICCF4, Vol 2: Calorimetry and Materials, pp 13-1 to 22, 27 figs, 27 refs, 1 table.

AUTHORS' ABSTRACT

Results will be reported for calorimetric studies with light water cells with alkali salts of K, Rb, and Cs employing nickel fibrex (fine nickel mesh) electrodes. Highlights: (1) An experiment showing that the light water excess heat effect is not the result of contamination by D_2O. (2) A sequence of six "transmission resonances" in a cell with two cc of D_2O added to 43cc of 0.57 M RbOH. (3)Heat bursts showing time-scale invariance for a Rb and two Cs cells. (4) Cu is shown to be a promoter, or co-factor, of the light water excess heat effect.

CALIFORNIA - CALORIMETRIC STUDIES

M.C.H. McKubre, S.Crouch-Baker, R.C. Rocha-Filho, S.I. Smedley, and F.L. Tanzella (SRI International, Menlo Park, CA), T.O. Passel and J. Santucci (EPRI, Palo Alto, CA), "Isothermal Flow Calorimetric Investigations of the D/Pd and H/Pd Systems," *J. Electroanal. Chem.*, vol 368, 1994, pp 55-66, 11 refs, 9 figs.

AUTHORS' ABSTRACT

Isothermal calorimetric studies of the D/Pd and H/Pd systems have been carried out at high deuterium (hydrogen) loadings (i.e., [D(H)]/[Pd] > 0.9) at approximately 30°C. Under these conditions, the generation of "excess power" was observed in a series of deuterium-based experiments, but not in a hydrogen-based experiment. The results of these experiments enable several (tentative) conclusions to be reached concerning the conditions necessary for the reproducible observation of this anomalous thermal effect.

DISCUSSION AND CONCLUSIONS

In this paper, we have described the observation of an (at present) unexplained power generation process occurring in an electrochemical cell employing a deuterated palladium cathode. Representative examples of results have been given from which a number of observations and conclusions may be drawn. Before describing these conclusions however, it is useful to discuss what constitutes in the context of the work carried out here, a "control" experiment, i.e. an experiment for which the outcome may be predicted in advance. Firstly, since, as a consequence of the results presented here, the origin of the excess power production process may not be elucidated (be it a real physical phenomenon or the result of a measurement artifact), a light water experiment does not constitute a control. The fact that no excess power was observed in the light water experiment performed here constitutes a result of equal importance to the observation of finite excess power production in the heavy water experiments. In this work, the role of control experiment is to demonstrate that, during the course of an experiment (and under certain reproducible conditions, the converse of which are described in detail below), a calorimeter will detect accurately the absence of excess power production, thereby reducing (but not eliminating) the probability that the observation of finite excess power production is due to a time-dependent variation in the calorimeter function. All the experiments reported here contain such "control" periods; in fact, in all cases they exceed in duration the periods of excess power production.

For the thermodynamically closed and intentionally isothermal systems described here, excess power was observed to be as much as 28% above the electrochemical input power or 24% above the total input power. When excess power was present, it was more typically in the range 5%-10%.

Excess power generation was observed when a minimum of three criteria were met: an average deuterium loading in the vicinity of unity; the maintenance of high loading for considerable periods of time relative to the time scale of the diffusional processes involving deuterium within the metal (several hundreds of hours for 3 mm diameter cathodes); the application of a current density in excess of a certain critical value. It should not be supposed that these criteria are completely independent. Thus, the threshold current density appeared to decrease with time, up to the point that, as a result of interfacial or external effects, high values of loading could no longer be attained or maintained.

With appropriate control of the interfacial conditions, it has been shown to be possible to load both hydrogen and deuterium into palladium to atomic ratios of approximately unity. Electrode surface pretreatment apparently plays a significant role in the ability to attain and maintain high loading under electrochemical conditions. Although helium implantation provides a suitable means of surface activation to facilitate loading, this process is not clearly superior to that involving an aqua regia rinse. Further, the presence of helium is not obviously implicated in the generation of excess power.

Negative excess power (i.e. time periods during which the measured total input power exceeded the measured output power) was never observed, except for times when a calorimeter was caused to depart significantly from its steady state condition (for example, following an increase in total input power or during periodic fluctuations introduced by non-constant recombination catalyst operation). As demonstrated in the P13-P14 and P15-P16 series experiments, excess power was observed synchronously in series cells. That is, cells subjected to the same current from the same source and monitored in a multiplexed manner to the same electronics, were observed to yield excess power in one cell but not in the other. **It is very difficult to attribute such an observation to an instrumental artifact.**

Subject to satisfying the three criteria listed above, a level of experimental repeatability has been demonstrated, both within and between individual cells. All the heavy water experiments which have met the three criteria produced excess power (data for P16 are not shown here). It is worth noting, however, that excess power in these four experiments was not produced in exactly the same amounts, or at exactly the same times, in response to the same stimuli. However, we could not reproduce exactly the electrochemical conditions of cathodic overvoltage, loading, or the interfacial impedance. **Clearly there are issues of interfacial contamination which arise in experiments**

with sustained high current electrolysis that await resolution.

CALIFORNIA - OVERVIEW OF EXCESS HEAT

Michael McKubre, Steven Crouch-Baker, Alan Hauser, Nada Jevtic, Stuart Smedley, Francis Tanzella (SRI International, Menlo Park CA), "An Overview of Excess Heat Production in the Deuterated Palladium System," ©EPRI, published by the Am. Inst. of Aeronautics and Astronautics, Inc., 6 refs, 4 figs.

AUTHORS' ABSTRACT

An experimental program sponsored by the Electric Power Research Institute (EPRI) was undertaken at SRI International to explore the central idea proposed by Fleischmann et al. that heat, and possibly nuclear products, could be created in palladium lattices under electrolytic conditions. Unaccounted excess heat has been observed in these experiments in an accurate and stable isothermal mass flow calorimeter. The appearance of excess power is apparently to be correlated with three criteria: the degree of deuterium loading (specified as the atomic ratio D/Pd), the time for which high loading is maintained, the interfacial current density. The correlation between excess heat production and the three variables, loading, time and current density, is being explored in experiments ongoing.

RESULTS AND DISCUSSION

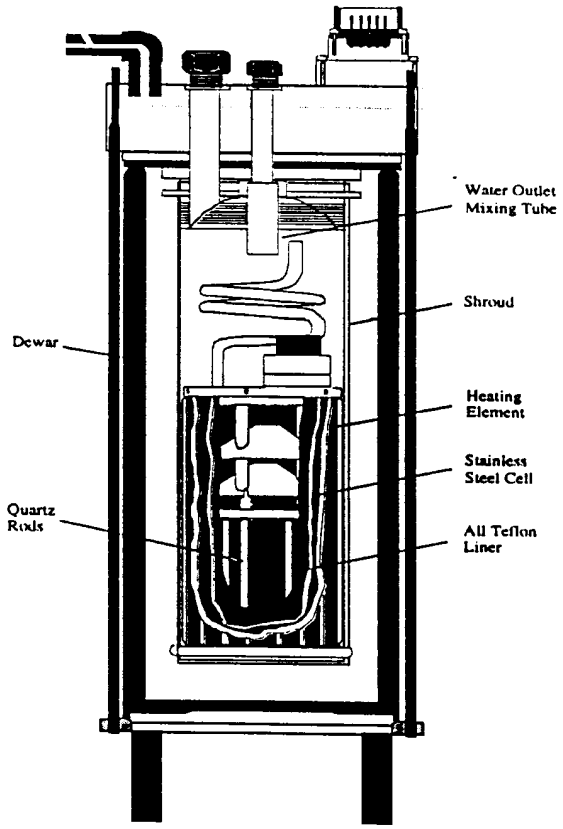
For the thermodynamically closed and intentionally isothermal systems described here, the output power was typically observed to be in the range 5-10%, in a calorimeter with a precision of better than ±0.5%. The experiments exhibited internal repeatability when three criteria were achieved:

1) The average loading (D/Pd) approached unity.
2) This high loading was maintained for considerable periods (hundreds of hours for 3-mm diameter cathodes).
3) The interfacial current density exceeded a certain critical value.

Some degree of experimental reproducibility between cells was observed. Five experiments were performed in an attempt to replicate a prototype experiment, with only minor variations in electrode and electrolyte treatment. All the heavy water experiments produced excess power, reproducing, in general form, the observation of excess heat in the prototype experiment. A light water replicate produced no measurable excess power. However, excess power in the D_2O experiments was *not* produced in exactly the same amounts, or at exactly the same times, in response to the same stimuli. Nor, however, could we reproduce exactly the electrochemical or loading conditions encountered within each cell.

Excess power was observed asynchronously in cells run electrically in series. That is, cells subjected to the same current from the same source and monitored in a multiplexed manner to the same electronics were observed to yield excess power in one cell but not in the other. It is very difficult to attribute such an observation to an artifact of the common instrumentation.

Further experimentation is underway in order to identify the source of the anomalous excess heat.



Labyrinth Flow Calorimeter

CALIFORNIA - TRANSMUTATION & RADIOACTIVITY

R. Bush and R. Eagleton (Phys. Dept., Cal. State Polytechnic Univ. and ENECO), "Evidence for Electrolytically Induced Transmutation and Radioactivity

Correlated with Excess Heat in Electrolytic Cells With Light Water Rubidium Salt Electrolytes," Proceedings ICCF4, Vol 3: Nuclear Measurements, pp 2-1 to 19, 6 refs, 12 figs.

AUTHORS' ABSTRACT

Two separate mass spectrometric analyses, SIMS and ICPMS of 1.0 amu discrimination preceded by an ion-exchange column separation of strontium and rubidium, performed by two independent laboratories on the pre-run and post-run cathode material from a light water based rubidium carbonate cell and a rubidium hydroxide cell provide strong evidence for the electrolytically induced transmutation of rubidium to strontium originally hypothesized by Bush in connection with his CAF hypothesis ("Cold Alkali Fusion"). The SIMS analysis showed that the abundance ratio of Sr^{86} to Sr^{88} shifted from the normal abundance ratio of about 0.12 in the pre-run cathode sample to essentially the same value, 2.6, as the natural abundance ratio of Rb^{85} to Rb^{87}, where the latter are the respective parent isotopes hypothesized by Bush. Proof that this shift by a factor of about 22 from the natural abundance ratio for the strontium isotopes could not have been a spurious SIMS result due to rubidium hydride formation was demonstrated by additional mass spectroscopy, ICPMS, preceded by an ion-exchange column separation of the strontium and the rubidium. In the ICPMS tests, the post-run cathode material from both cells demonstrated a shift in the strontium isotope abundance ratio by an amount that is more than 600 standard deviations away from the normal ratio (pre-run sample). In addition, for a third rubidium carbonate cell, strong preliminary evidence is presented for electrolytically induced radioactivity. The experimental work provides strong initial support for Bush's LANT hypothesis ("Lattice Assisted Nuclear Transmutation").

CALIFORNIA - NUCLEAR PROLIFERATION

Joseph Peter Guokas (J&J Manufacturing, Verdugo City, CA), "Cold Fusion and Nuclear Proliferation," Proceedings ICCF4, Vol 4: Theory & Special Topics, pp 39-1 to 8, 18 refs.

AUTHOR'S ABSTRACT

"Cold fusion" anomalies are reviewed for their possible impact on nuclear proliferation. Even without a consensus regarding the processes generating the anomalies, some observed properties of "cold fusion" experiments suggest reasons for concern.

Reactions of most concern would generate fissile material from nuclear source material by either: (a) generating free neutrons, or (b) directly transferring neutrons to nuclear source material nuclei. Such reactions will impact nuclear proliferation only if their reaction rates are orders of magnitude above those reported thus far in "cold fusion" experiments.

The "cold fusion" literature is reviewed for indicators of reactions (a) and (b), and indicators of potential for higher reaction rates. Of particular interest are high-Z anomalies, chain reactions, conditions for changing branching ratios, isotopic changes, bursts, and neutron activation.

Also examined are the proliferation implications of recent theories and experiments suggesting "cold fusion" may generate neutron traps of high cross section.

COLORADO - IMPROVING CELL DESIGN

H.E. "Chip" Ransford, III and S.J. Pike (Nova Res. Group, Inc., Denver, CO), "Apparatus for Safely Extending Cold Fusion Investigations to High Temperature, Pressure and Input Power Regimes," (final abstract signigicantly changed from preprint material reviewed in *Fusion Facts* Jan. 94), Proceedings ICCF4, Vol 2: Calorimetry and Materials, July 1994, Hawaii, pp 20-1 to 6, 1 fig, 5 refs.

AUTHORS' ABSTRACT

To assure continued and expanding funding in an increasingly cost-conscious, results-oriented world economy, "cold fusion" needs solid proof of commercial feasibility. Excess heat calculations are of little use in convincing nonscientific skeptics. Heat alone, at low temperatures, does not have the "medium of exchange" value of electrical power. Proof of commercial viability has three critical dimensions which must meet certain minimums:

· The temperature must reach 175 to 200°C - high enough to allow reasonably efficient (in the range of 15-20%) conversion to mechanical/electrical power.

· The system power levels must reach at least 5 to 10 kw of thermal output to demonstrate conversion to self power plus provide useful electrical energy for other functions.

· The system must operate continuously for weeks to months with short lag times to start up or shut down.

To date, world wide, most cold fusion investigations have been attempts to confirm and expand understanding of the Fleischmann-Pons Effect (FPE) at its basic levels. This research to corroborate FPE - with notable exceptions - has three common characteristics:

· Most FPE experiments have been conducted at or near ambient conditions of temperature and pressure, many in open cells.

· The experiments have been small in scale with minimal standardization of design.

· These experiments produced small thermal outputs and low excess energy ratios.

Despite the many technical (and other) obstacles in this field, the research now has clearly revealed these empirical facts:

· Nuclear reactions can indeed occur in electrolytic systems;

· The energy released in these reactions occurs primarily as heat;

· The major by-product in Palladium-Deuterium systems is ordinary helium;

· Excess energy ratios exceeding 10:1 are possible;

· The energy density can exceed three kilowatts per cubic centimeter;

· The reaction rate increases nonlinearly with increasing temperature.

These results hint at the potential power yields from cold fusion. They also show that safety precautions developed for electrochemical research can no longer be considered sufficient for FPE studies. The various accidents and events arising from open cells have led Fleischmann, Pons and others to issue warnings emphasizing the danger of closed systems.

However, if cold fusion is to ever reach its potential, closing and pressurizing the research cells is necessary. This calls for a much greater ability to contain and control cold fusion events. Safety must be the highest priority in the laboratory and thus, in the design and construction of experimental equipment. Good design must allow for radioactive products, high pressures and high temperatures, coolant circulation and the ability to easily maintain experimental protocols.

ILLINOIS - NUCLEAR REACTION PRODUCTS

George H. Miley (Fusion Studies Lab., Urbana, IL), "Comments About Nuclear Reaction Products," Proceedings ICCF4, Vol 2: Calorimetry and Materials, pp 9-1 to 12, 11 refs, 4 tables.

AUTHOR'S INTRODUCTION

If a nuclear reaction occurs, it should be possible to experimentally detect reaction products and thus identify the reaction itself. This has been discussed in earlier reviews, and there have been numerous attempts to detect various products, ranging from neutrons, tritium, helium and gamma rays to sundry isotopes of palladium. While some results have been reported, problems of background interference and low levels of product concentrations, coupled with difficulty in reproducibility, have prevented general agreement on the identification of the products, i.e. on the reaction(s), involved. This problem is further complicated by the numerous reactions that might be considered and by the absence of a definitive identification of the nuclear products or consensus on a reaction theory. To illustrate the many possibilities involved, we will briefly survey reaction products that might occur through two-body reactions and conclude with some concerns about multi-body reactions that have been proposed.

MASSACHUSETTS - LATTICE-INDUCED REACTIONS

Peter L. Hagelstein (Massachusetts Inst. of Tech., Res. Lab. of Electronics, Cambridge, MA), "Lattice-induced Atomic and Nuclear Reactions," Proceedings ICCF4, Vol 1: Plenary Sessions, pp 11-1 to 26, 10 figs, 28 refs.

AUTHOR'S ABSTRACT

A new theory for a variety of atomic and nuclear reaction mechanisms resulting from the decay of a highly excited lattice is introduced.

In our previous work on neutron transfer reactions, we found that large energy transfer between a lattice and nuclei

could occur through the frequency shift of a highly excited continuum phonon mode across a band gap that is caused by the neutron transfer. Here, we generalize the energy transfer mechanism to include impurity continuum phonon modes due to the presence of vacancies; processes that change the number of vacancies can, in principle, stimulate the transfer of energy with the lattice.

A consequence of this is that a metal hydride lattice with host vacancies that has very high excitation of gap-jumping phonon modes will be unstable against decay by a variety of atomic and nuclear processes. Coulomb-induced recoil reactions of nuclei with electrons and nearby nuclei that cause vacancy production are found to occur with very high predicted reaction rates.

A lattice with a large number of highly excited phonon modes that can decay sequentially will most likely decay with a "burst" of emitted decay products, as a high order multi-step quantum process. A theory for this type of high-order decay is outlined.

The predictions of this theory may apply to many of the anomalous phenomena claimed to occur in experiments performed on metal deuterides, including neutron production, tritium production, gamma emission and host lattice activation.

MASSACHUSETTS - NEUTRON TRANSFER

Peter L. Hagelstein and Sumanth Kaushik (Massachusetts Inst. of Tech., Research Lab. of Electronics, Cambridge, MA), "Neutron Transfer Reactions," (final abstract significantly changed fron preprint material review in *Fusion Facts* Dec. 93), Proceedings ICCF4, Vol 1: Plenary Sessions, July 1994, Hawaii, pp 10-1 to 30, 45 refs, 2 tables.

AUTHORS' ABSTRACT

A new model is proposed to treat configuration mixing between bound and continuum neutron states in a lattice; the Hamiltonian for this model is of the form of the Anderson Hamiltonian. In condensed matter physics, the Anderson model describes (among numerous other effects) electron hopping in semiconductors; the neutron model presented here predicts neutron hopping in lattices containing a mixture of isotopes. This result is new.

The Anderson model treats the mixing between localized states embedded in a continuum. In the neutron model, the localized states are energetically far removed from the continuum; consequently, the neutron model treats a much simpler mathematical problem.

Brillouin-Wigner theory is applied to a restricted Fock space version of the model containing states with 0 and 1 neutrons free. This leads to perturbative results that describe the effects of continuum neutron mixing to lowest order. The resonant scattering of virtual neutrons is predicted to lead to neutron delocalization, as long as the interaction perturbs either the linear momentum or total angular momentum of the nucleons.

Delocalized neutrons can be captured, with the reaction energy going into gammas and other incoherent decay products: such reactions are predicted by this model. Delocalized neutrons can be captured accompanied by energy exchange with the lattice. Formulas describing this type of reaction are derived, and the resulting rates estimated.

MASSACHUSETTS - ISOTOPIC FUEL LOADING

Mitchell R. Swartz (JET Technology, Weston MA), "Isotopic Fuel Loading Coupled to Reactions at an Electrode," Proceedings ICCF4, Vol 2: Calorimetry and Materials, pp 33-1 to 7, 13 refs, 3 figs, 1 table.

AUTHOR'S ABSTRACT

The quasi-one-dimensional (Q1D) model for an electrode filled by an isotopic fuel may offer insight into both competitive gas-evolving reactions at the surfaces of the electrode and the impact of the ratio of the applied electric field energy to thermal energy [k_B*T] which appear decisive in controlling the loading. The Q1D model develops a solution separable into components determined by three non-dimensional factors, $\Lambda_{Pd.D}$ the loading flux ratio, Ψ_{fus} the fractional amount of intrapalladial deuterons which actually contribute to the desired reactions, and ζ the electric order/thermal disorder ratio. The derived fusion flux equation links the deuteron loading flux from the solution into the metal and gas evolving reactions to potential reactions at that site.

MASSACHUSETTS - CAPILLARY FUSION

Peter Graneau (Ctr. for Electromag. Research, Northeastern Univ., Boston), "Capillary Fusion," invited paper for the

Annual Conference of the Society for Scientific Exploration, Austin, Texas, June 8-11, 1994.

AUTHOR'S ABSTRACT

Non-thermal fusion reactions in pinched deuterium plasma filaments were first observed in the Berkeley Radiation Laboratory soon after the war. Subsequently the U.S. government funded non-thermal filament fusion projects for four decades. In particular, plasma focus and solid deuterium fiber fusion methods produced up to 10^{12} neutrons per capacitor discharge with currents of the order of one mega-ampere. Capillary fusion in deuterium-rich liquids was discovered and researched in Germany during the 1965-75 period. With only 1000 A pulses, the neutron yield was 10^5 per capacitor shot, suggesting that the mechanical confinement of the plasma filament is more effective than magnetic pinch confinement. Capillary fusion experiments with reinforced tubes are being resumed in Canada.

MINNESOTA - HYDROGEN IN METALS

R.A. Oriani (Dept. of Chem. Engr. and Mat. Sci., The Univ. of Minnesota, Minneapolis), "The Physical and Metallurgical Aspects of Hydrogen in Metals," Proceedings ICCF4, Vol 1: Plenary Sessions, pp 18-1 to 52, 8 figs, 145 refs, 6 tables.

AUTHOR'S ABSTRACT

To attempt to optimize the anomalous phenomena that today go under the label "cold fusion," the experimentalist should be aware of the many aspects of the behavior of hydrogen in metals and of its entry into and egress from metals. This paper discusses the equilibrium characteristics of the isotopes of hydrogen in metals. The first section discusses the thermodynamics of the terminal solutions of metal-hydrogen systems including the enthalpies of solutions, H-H interactions, effect of third elements, distribution of isotopes between the phases, site occupation, and the molar volume of hydrogen in metallic solutions.

The mobility of hydrogen in a metal lattice is a very large subject. This discussion is restricted to the kinetics of hydrogen diffusion, at and above room temperature, with respect to the variation with temperature, hydrogen concentration, isotopic mass and concentration of third elements. A distinction is made between the effects on the mobility and the effects associated with the non-ideality of the solution. The decrease of the diffusivity due to attractive interactions with lattice defects such as those generated by cold work are discussed in terms of trapping theory. Brief consideration is given to diffusion of hydrogen along grain boundaries and along dislocation cores as well as to diffusion motivated by gradients of electrical potential, of temperature and of mechanical stress.

When hydrogen is absorbed from the molecular gas at fixed pressure and temperature, the overall driving force can be expressed in terms of thermodynamic parameters; the kinetic impediments to the ingress of hydrogen control the rate of entry and these are discussed. When hydrogen is presented to the metal by electrochemical means, or by partially dissociated hydrogen gas, the driving force for entry into the metal cannot be expressed thermodynamically, although the concept of input fugacity is often used. This concept is discussed and incorrect inferences sometimes made from it are pointed out. The entry and the egress of hydrogen produces mechanical stresses in the metal which modify the thermodynamics of metal-hydrogen systems. They necessitate a distinction to be made between coherent and incoherent phase diagrams, and change the driving force for the exchange of hydrogen between the metal and the environing gas phase. More importantly, the generated stresses can relax by producing dislocations, grain rotation, cracks and microvoids. Examples of these phenomena are discussed. The generation of such lattice defects interacts in complicated ways with the intrinsic decohesioning effect of dissolved hydrogen to seriously affect the mechanical properties of metals. Some implications of these considerations for cold fusion research are pointed out.

OHIO - GLOW DISCHARGE RESEARCH

Elliot B. Kennel, Arnold G. Kalandarachvili (Space Exploration Assoc., Cedarville), "Investigation of Deuterium Glow Discharges of the Kucherov Type," Proceedings ICCF4, Vol 4: Theory & Special Topics, pp 41-1 to 3, 2 refs, 2 figs.

AUTHORS' ABSTRACT

Recent experiments with deuterium glow discharges by Y. Kucherov et al. have yielded extremely intriguing results, including the production of anomalous nuclear radiation and excess heat. Among the experimental observations are:

a. Gamma radiation, neutrons and charged particles are produced in a simple deuterium glow discharge.

b. The nuclear radiation is often accompanied by excess heat.

c. The cathode surface is contaminated with elements as ^{6}Li, ^{11}B, C, Na, Mg, Al, Si, S, Ca, Ti, Cr, Fe, Ni, Zn, Ge, Ga, Br, Sr, and Mo, possibly suggesting that the palladium cathode is transmuted during the course of this experiment.

d. The observed signatures of the anomalous reactions can be reproducibly achieved provided that the system is extremely clean and free from contaminants such as oxygen.

Our group set out to duplicate these results. Initial experiments focused on confirming the nuclear character of the results. Later efforts will attempt to verify the presence of excess heat, and to determine possible means to extend the temperature regime and lifetime.

The experiment has been run with apparent gamma emission under the following conditions:

1. The palladium cathode is known to be of very high purity; i.e., Johnson Matthey Lot #01334 or equivalent.

2. The electrode geometry is well defined--metal leads to the cathode and anode are insulated, allowing the current density to be precisely regulated.

3. The glow discharge is not able to contact materials other than alumina, palladium (cathode), or niobium (anode), thus reducing the likelihood that surface sputtering from contamination sources such as stainless steel can occur.

4. Gases are of high purity 99.999% (DeLille).

TEXAS - HEAT & SUB-SURFACE CHANGES

J. O'M. Bockris, R. Sundaresan, Z. Minevski. & D. Letts (Dept. of Chem., Texas A&M Univ., College Station, Texas), "Triggering of Heat and Sub-surface Changes in Pd-D Systems," Proceedings ICCF4, Vol 2: Calorimetry and Materials, pp 1-2 to 46, 36 refs, 29 figs, 1 table.

AUTHORS' ABSTRACT

More than four years after the first reports of chemically stimulated nuclear reactions, the triggering of heat evolution and the production of associated nuclear debris is still a highly uncertain matter. This is so both as to the duration of the switch-on time and, indeed, whether a given electrode will commence to show nuclear activity within 500 hours of the beginning of electrolysis.

In the present study, 3 methods of triggering anomalous heat are described: the changes in the surface of palladium during the evolution of D_2 or H_2 are described as a function of potential, temperature and time.

Finally, these results are brought up against the present theories of heat production in metals.

UTAH - TRITIUM & HIGH D LOADING

Fritz G. Will (Dept. Chem. and Fuels Engr., Univ. Utah, Salt Lake City), Krystyna Cedzynska (Inst. of General Food Chem., Tech. Univ. of Lodz, Poland), Denton C. Linton (Dept. Phys., Univ. Utah, Salt Lake City), "Tritium Generation in Palladium Cathodes with High Deuterium Loading," (final abstract significantly changed from preprint material reviewed in *Fusion Facts* Feb. 94) Proceedings ICCF4, Vol 1: Plenary Sessions, July 1994, Hawaii, pp 8-1 to 10, 5 figs, 12 refs.

AUTHORS' ABSTRACT

Tritium up to fifty times background has been observed upon electrolyzing 1N D_2SO_4 in four out of four cells when using Pd cathodes "of a certain type". No tritium was detected in four control cells, containing H_2SO_4 in H_2O, employing Pd cathodes cut from the same wire spool. Tritium amounts were from 7×10^{10} to 2.1×10^{11} atoms, corresponding to average generation rates from 1×10^{5} to 4×10^{5} atoms/sec/g Pd. In all cases, D/Pd and H/Pd loadings of 1 ± 0.05 were attained. A cyclic loading/unloading regime rather than the usual continuous constant current regime was applied to attain these high loadings. Tritium analysis was performed in Pd, electrolyte and the gas head space of the sealed cells. Maximum tritium concentrations of 8.9×10^{10} atoms/g Pd, 180 times the detection limit, were found in the D-loaded Pd cathodes, none in the H-loaded Pd. Also, no tritium within detection limit was found in 150 unused Pd pieces. Of these, 13 were cut randomly from the same wire spool as the four D-loaded Pd cathodes. The probability that the tritium in the latter was due to random spot contamination is computed as 1 in 2,380. It is concluded that the tritium was generated by nuclear reactions in the Pd. However, no tritium was detected in four D-loaded Pd cathodes of a different type in spite of attaining loading D/Pd = 1. Different metallurgical history and impurity contents may play an important role.

UTAH - NO EMISSIONS FOUND

Steven E. Jones, David E. Jones, David S. Shelton, and Stuart F. Taylor (Depts. of Phys. & Chem., Brigham Young Univ., Provo, Utah), "Search for Neutron, Gamma and X-ray Emissions from Pd/LiOD Electrolytic Cells: A Null Result," Proceedings ICCF4, Vol 3: Nuclear Measurements, pp 26-1 to 14, 13 refs, 5 figs.

AUTHORS' ABSTRACT

We have conducted a series of experiments using state-of-the-art neutron, gamma and x-ray detectors to search for evidence for nuclear reactions occurring in Pd/LiOD electrolytic cells. No evidence for primary or secondary emissions from nuclear reactions was obtained in extended experiments.

D. NEWS FROM ABROAD

CHINA - LOADING RATIO CONTROL

G.S. Huang, D.W. Mo, W.Z. Yu, M.Y. Yao, and X.Z. Li (Dept. Phys., Tsinghua Univ., Beijing, China), B.Y. Liaw (Hawaii Natural Energy Inst., Sch. of Ocean and Earth Sci. and Tech., Univ. of Hawaii at Manoa, Honolulu, HI), "The Measurements and the Control of the Loading Ratio of Deuterium in Palladium," Proceedings ICCF4, Vol 1: Plenary Sessions, pp 20-1 to 10, 12 refs, 5 figs, 2 tables.

AUTHORS' ABSTRACT

It is important to find the condition under which the loading ratio may be greater than threshold, namely D/Pd $\simeq$ 0.84, for anomalous effects to be seen in the Pd-D system. We found that loading deuterium is more difficult than hydrogen in gas phase, similar to the case of electrolysis. We have tried different procedures such as heating, vacuum degassing, annealing, surface cleaning, glow discharge and cryogenic treatment. The loading ratio was monitored by electrical resistance method and verified by weighing method as well. The preliminary results showed that the glow discharge was not effective to enhance either the loading ratio or the loading speed.

CHINA - COLD FUSION IN CHINA

Xing Zhong Li (Dept. of Phys., Tsinghua Univ., Beijing, China), "Searching for Truth with High Expectations - 5 Year Studies on Cold Fusion in China," Proceedings ICCF4, Vol 4: Theory & Special Topics, pp 32-1 to 6, 22 refs.

AUTHOR'S ABSTRACT

The "cold fusion" research in China is reviewed for the past five years. Emphasis is focused on the attempt to set up the Chinese based reproducible experiments and the study on the key parameter which is supposed to control the reproducibility. Theoretical effort in understanding these phenomena is described as well

CHINA - EMISSIONS FROM GLOW DISCHARGE

Z.Q. Ma, Y.T. Chen, G.S. Huang, W.Z. Yu, D.W. Mo, and X.Z. Li (Dept. of Phys., Tsinghua Univ., Beijing, China), "The Analysis of the Neutron Emission from the Glow Discharge in Deuterium Gas Tube," Proceedings ICCF4, Vol 3: Nuclear Measurements, pp 7-1 to 5, 3 refs, 4 figs, 2 tables.

AUTHORS' ABSTRACT

This paper corrects an important mistake. The high energy component of the neutron emission from the glow discharge in deuterium gas tube is not as what previously reported. However, the low energy nuclear radiation might be still anomalous.

FRANCE - PALLADIUM-HYDROGEN SYSTEM

Claudia Bartolomeo, M. Fleischmann, G. Larramona, S. Pons, Jeanne Roulette, H. Sugiura (IMRA Europe, S.A. Science Centre, France), G. Preparata (Uni. of Milan, Italy), "Alfred Coehn and After: The α, ß, γ of the Palladium-Hydrogen System," Proceedings ICCF4, Vol 1: Plenary Sessions, pp 19-1 to 47, 18 figs, 27 refs, 2 tables.

AUTHORS' ABSTRACT

The Pd-H and Pd-alloy-H systems have been investigated for more than 100 years and, following the discovery of D, these studies have been extended to the Pd-D and Pd-alloy-D systems. The bulk of these investigations have dealt with:

(i) the behavior of H and D in the dilute α-phase

(ii) the thermodynamics of the transition to and the structure of the ß-phase.

It is frequently asserted that these studies give no support for the notion that D dissolved at high activities in Pd and Pd-alloys can take part in novel nuclear reactions: these assertions are made notwithstanding the fact that there is no satisfactory model which can explain the properties of these strange materials.

The major illustration of the unsatisfactory nature of the currently accepted models is provided by the investigations of Alfred Coehn: a series of experiments carried out in the late 1920's and early 1930's showed that hydrogen in palladium is present as protons and experiences the full changes of the Galvani potential within the metal. We will trace the fate of this generic observation and indicate its importance to the development of the investigation of anomalous nuclear processes in host lattices.

We will illustrate also that these anomalous nuclear processes take place under conditions which have not been covered by the conventional studies of the "hydride phases," (i) and (ii). Recent measurements of the loading of the host lattices with H and D as well as of diffusion of H and D under the extreme conditions used in these studies indicate that a third, γ-phase is formed. The significance of this phase for the observation of anomalous nuclear processes will be discussed. It will be shown that the experiments of Alfred Coehn can be developed to give new insights into the behavior of the "hydride phases."

ITALY - LATTICE PARAMETERS

L. Bertalot, F. DeMarco, A. DeNinno, R. Felici, A. LaBarbera, F. Scaramuzzi and V. Violante (Ist. Strutturn della Materia del C.N.R., Frascati, Italy), "Deuterium Charging in Palladium by the Electrolysis of Heavy Water: Measurement of the Lattice Parameter," Proceedings ICCF4, Vol 2: Calorimetry and Materials, pp 29-1 to 7, 8 refs, 3 figs.

AUTHORS' ABSTRACT

We report on X-ray diffraction measurements performed during the charging of a palladium anode by the electrolysis of a LiOD-heavy water solution to determine the lattice parameter. In this way we are able to study the dynamics of the process and to determine the D/Pd final ratio of the sample. Up to now we have studied three samples, which have shown very different behaviors. The estimated deuterium concentration was then checked by degassing the anode in a known volume.

ITALY - Pd MEMBRANE BEHAVIOR

L. Bertalot, F. De Marco, A. De Ninno, R. Felici, A. La Barbera, F. Scaramuzzi, V. Violante (CRE ENEA, Frascati, Italy), "Behavior of a Pd Membrane During Deuterium Electrochemical Loading: Excess Heat Production," Proceedings ICCF4, Vol 1: Plenary Sessions, pp 4-1 to 4, 3 figs, 2 refs, 1 table.

AUTHORS' INTRODUCTION

At ICCF3 a new approach to the study of the dynamics of D in Pd had been presented, with the concurring evidence of heat excess production (1). The method consisted in the use of an electrolytic cell with a special configuration, with the cathode acting as a membrane between the electrolyte and an ambient in which gaseous D_2 could be collected. The permeation of D through the membrane could be related to the appearance of heat excess production. In 1993 new experiments have been performed with the same kind of apparatus, and are reported here: a further evidence of heat excess has been detected, and a correlation between the pressure of D_2 on the gas-side of the cathode and the phase of the palladium deuteride is proposed.

The same type of apparatus is used in two other experiments:

- in the first one, in collaboration with ISM/CNR of Frascati, the surface of the cathode immersed in the electrolyte is investigated during electrolysis with the help of a X-ray spectrograph, in order to study the variation of the cell parameter, and thus to follow in real time the D-charging (see the same authors, this Conference).

- another experiment, which will be started at the beginning of 1994, will be performed in collaboration with a Group of INFN of Bologna. The measurement of the heat excess (and related parameters) in one of our cells will be performed while the cell is sitting inside a quite sophisticated neutron detector mounted in the Gran Sasso National Laboratory of INFN, where the level of neutron background is 10 times less than at the sea level (2): the possible correlations between charging of D in Pd and heat excess production on one side and the emission of neutrons on the other side will be investigated, with the expectation of giving a clear answer to this still obscure issue in Cold Fusion research.

ITALY - ELABORATION ON LANT

W.J.M.F. Collis (Boglietto, Italy), "LANT and the Piantelli Effect," to be published in Cold Fusion Source Book, International Symposium on Cold Fusion and Advanced Energy Sources 1994, Minsk, Belarus, Hal Fox, Editor.

The changing of bodies into light, and light into bodies is very conformable to the course of nature, which seems delighted with transmutations. Sir Isaac Newton, 1704

AUTHOR'S ABSTRACT

Robert Bush has published (in Cold Fusion Source Book) a paper citing the recent 1992 work of Piantelli in support of his LANT hypothesis. The LANT model predicts that the source of excess heat is due to fusion of protons with the lattice atoms. Such lattice atoms not only include alkali metals but other metals such as nickel, iron, rhodium, etc. Bush applies three different versions of LANT to see which set of rules most accurately predict a suitable lattice element for producing excess heat. It is important to realize that these models are highly speculative working hypotheses, whose objects are merely to identify appropriate cold fusion materials.

ITALY - REPORT ON ICCF-4

Emilio del Guiduce (Sezione de Fisica Teorica, Dip. Fisica, Univ. degli Studi di Milano), "Fusione Fredda: A Congresso alle Hawaii," 21mo Secolo Scienza e Tecnologia, vol 5, no 1-2, 1994, pp 21-23, in Italian.

This article gives a rundown of activities and announcements at the December 93 ICCF-4, held in Maui, Hawaii. It mentions several papers that were of particular interest, including Pons and Fleischmann's "Heat after Death" paper. Also mentioned in a boxed section was the May Minsk Conference on Cold Fusion. In an accompanying article, the Siena experiment was reviewed in which the hydrogen/nickel systems were so successful.

JAPAN - ION IMPLANT GIVES EXCESS HEAT

Courtesy of Dr. Peter Glück

K. Kamada (Nat. Inst. Fusion Sci., Nagoya), H. Kinoshita and H. Takahashi (Dept. Engr., Hokkaido Univ., Sapporo), "Anomalous Heat Evolution of Deuteron Implanted Al on Electron Bombardment," *Research Reports NIFS 281*, May 1994.

AUTHORS' ABSTRACT

Anomalous heat evolution was observed in deuteron implanted Al foils on 175 keV electron bombardment. Local regions with linear dimension of several 100nm showed simultaneous transformation from single crystalline to polycrystalline structure instantaneously on the electron bombardment, indicating the temperature rise up to more than melting point of Al from room temperature. The amount of energy was more than 180 MeV for each transformed region. The transformation was never observed in proton implanted Al foils. The heat evolution was considered due to a nuclear reaction in D_2 molecular collections.

DR. GLUCK'S COMMENTS

The first author's previous paper (presented in *Fusion Facts*, vol 4, no 7, Jan. 1993, p 13 and commented item p 22) has demonstrated that such seemingly simple systems can provide essential information for understanding the nature and mechanisms of the nuclear reactions due to solid state effects. This paper raises the question: why here the heat effect appears only for deuterium and not for hydrogen (protium) while in similar (?) cases of gas/metal systems, as that of Dufour and Piantelli, excess heat is obtained for both. And what is the role of the matrix material aluminum, nickel, stainless steel, etc. in these reactions: participant, catalyst, support?

Other Publications of Dr. Kamanda:
"Electron Impact H-H and D-D Fusions in Molecules Embedded in Al. Experimental Results," *Japan J. Appl. Phys.*, vol 31, 1992, pp L 1287-1290.

"Hydrogen Implantation Effects in the Subsurface Layer of Aluminum-bubble Pressure and Surface Modifications," *J. Nucl. Mat.*, vol 169, 1989, pp 141-150.

JAPAN - TRAPPED NEUTRON CATALYZED MODEL

Hideo Kozima and Seiji Watanabe (Dept. Phys., Facul. Sci., Shizuoka Univ.), "T-D and D-D Collision Probability in the Trapped Neutron Catalyzed Model of Cold Fusion," to be published in Cold Fusion Source Book, International Symposium on Cold Fusion and Advanced Energy Sources

1994, Minsk, Belarus, Hal Fox, Editor, 6 mms pages, 12 refs, 1 fig.

AUTHORS' ABSTRACT

Elastic scattering and fusion cross sections of a triton, a neutron and a deuteron generated by the trapped neutron catalyzed mechanism of the Cold Fusion against deuterons in a lattice of metal hydrides are estimated to explain the anomalous phenomena observed in those samples. In an optimum situation where the high energy bombarding particle propagates along a line through occluded deuterons, the effective fusion reactions will occur to generate a plenty of reaction products to explain the neutron bursts and the extraordinary excess heat generations observed sometimes in the experiments.

JAPAN - ELECTRICAL DISCHARGE IN WATER

Takaaki Matsumoto (Dept. of Nuclear Eng., Hokkaido Univ., Sapporo, Japan), "Cold Fusion Experiments by Using Electrical Discharge in Water," Proceedings ICCF4, Vol 3: Nuclear Measurements, pp 10-1 to 6, 4 refs, 2 figs.

AUTHOR'S ABSTRACT

This paper describes that cold fusion can be easily induced by electrical discharge in water. AC shots of about 100 V were applied to wire electrodes of palladium, platinum and nickel. Cold fusion reactions were observed by a system of a microtelescope and VTR, and nuclear emulsions. The VTR system has successfully recorded explosive cold fusion reactions on the surface of the metals. With the nuclear emulsions, several traces indicating cold fusion were found. Tiny ball lightening was observed, related to strange traces of combined rings. Implosive cold fusion is also described.

JAPAN - ELECTRODES CATHODICALLY POLARIZED

S. Nezu and T. Sano (IMRA Material R&D Co., Ltd., Japan), "Measurements of Hydrogen Loading Ratio of Pd Electrodes Cathodically Polarized in Aqueous Solutions," Proceedings ICCF4, Vol 2: Calorimetry and Materials, pp 31-1 to 8, 4 refs, 4 figs, 1 table.

AUTHORS' ABSTRACT

Various palladium and palladium alloy electrodes were prepared in order to compare their hydrogen loading ratios to be attained by cathodic polarization in alkaline aqueous solutions, 1 M LiOH or LiOD. Details of the loading ratio measurements are presented. No significant difference in H/Pd value was observed between the examined samples with different material processing histories. On the other hand, the deuterium loading was very sensitive to the processing conditions. The determined D/Pd values are scattered over the experimental error in the measurement system. The loading ratios of Pd-Ag and Pd-Ce alloys were lower than those of Pd for both H/Pd and D/Pd. The loading ratios of Pd-Rh alloys were higher than those of Pd.

JAPAN - TRITIUM AND HEAT

Reiko Notoya, Yohichi Noya, and Toshiyuki Ohnishi (Hokkaido Univ., Sapporo), "Tritium Generation and Large Excess Heat Evolution by Electrolysis in Light and Heavy Water-Potassium Carbonate Solutions with Nickel Electrodes," *Fusion Technology*, vol 26, no 2, 1994, pp 179-183, 11 refs, 1 fig, 2 tables.

AUTHORS' ABSTRACT

The generation of tritium was quantitatively measured in an electrolytic cell with a nickel cathode and a platinum anode in potassium carbonate-light and heavy water solutions. Simultaneously, the evolution of a large amount of excess heat (70 to 170% for the input power) was observed during electrolysis of these solutions. The tritium generation by electrolysis provides some of the most conclusive evidence for so-called cold fusion, along with the calcium generation described in the previous paper. On the basis of the current experiments and the knowledge of the kinetics of a hydrogen evolution reaction in an alkaline solution, the nuclear reactions taking place are worth mentioning.

RUSSIA - RESULTS NEGATIVE

A. Bertin[1], M. Bruschi[1], V.M. Bystritsky, M. Capponi[1], S. De Castro[1], B. Cereda[1], V.D. Dougar-Jabon [2], A. Ferretti[1], D. Galli[1], B. Giacobbe[1], V.I. Kirpal[3], A.I. Knyazev[3], I.M. Kravchenko[3], U. Marconi[1], I. Massa[1], A.N. Melyantsev[3], S.I. Merzlyakov, C. Moroni[1], M. Piccinini[1], M. Poly[4], L.A. Rivkis[3], N.V. Samsonenko[2], N. Semprini-Cesari[1], V.N. Shvetsov, V.T. Sidorov, V.N. Smirnov, S.I.Sorokin[3], R. Spighi[1], E.P. Starshin[3], V.A. Stolupin, A.V. Strelkov, S. Vecchi[1], A. Vezazani[1], M. Villa[1], A. Vitale[1], J. Wozniak[5], G. Zavattini[1], N.I. Zhuravlev, A. Zoccoli[1], (group under

auspices of Joint Inst. for Nuclear Research, Lab. of Nucl. Prob., Dubna, Russia), "On the Reproducibility of Results on Low-Temperature Nuclear Fusion in Systems of Na_xWO_3," to be published in Cold Fusion Source Book.

AUTHORS' ABSTRACT

Experiments on verification of possibility of the low-temperature dd-fusion in Na_xWO_3/deuterium systems were carried out. Within the limits of statistical errors, the excess of neutron yield above the background level under the interaction of deuterium with oxide tungsten bronze was not found. The experimental results are also not evidence in favor of a suggestion that a "hot" dt -fusion can be possible in a system of such type.

At the 90% confidence level the upper limit estimation of intensity of a hypothetical neutron source owing to dd- and dt-fusions in monocrystals of oxide tungsten bronze was less than 5×10^{-3} s^{-1}. The discrepancy between obtained results and the ones published by other groups probably is due to the particularities of the experimental methods and a possible difference in the structure of the used samples.

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and...

A. Bertin, M. Bruschi, V.M. Bystritsky, M. Capponi, S. De Castro, B. Cereda, V.D. Dougar-Jabon, A. Ferretti, D. Galli, B. Giacobbe, U. Marconi, I. Massa, A.N. Melyantsev, S.I. Merzlyakov, C. Moroni, M. Piccinini, M. Poly, L.A. Rivkis, N.V. Samsonenko, N. Semprini-Cesari, V.N. Shvetsov, V.T. Sidorov, R. Spighi, E.P. Starshin, V.A. Stolupin, A.V. Strelkov, S. Vecchi, A. Vezazani, M. Villa, A. Vitale, J. Wozniak, S. Zavattini, N.I. Zhuravlev, A. Zoccoli, (group under auspices of Joint Institute for Nuclear Research, Lab. Nucl. Prob., Dubna, Russia), "Search for Reactions of Low-Temperature Nuclear Fusion During Saturation Ti and ZrNbV with Deuterium-Tritium Mixture," to be published in Cold Fusion Source Book.

AUTHORS' ABSTRACT

Results of experimentally verifying low-temperature nuclear fusion phenomena in metal/hydrogen systems are presented. Titanium and intermetallic compound ZrNbV were selected as saturated substances. Samples were saturated with a deuterium-tritium mixture.

Excess of neutron outcome over the background level was not found within the limits of measurement error. The hypothesis of possible existence of "hot" nuclear fusion in metal/hydrogen systems has not experimental verification either.

and ...

A. Bertin, M. Bruschi, V.M. Bystritsky, M. Capponi, S. De Castro, B. Cereda, A. Ferretti, T. Florkowski, D. Galli, B. Giacobbe, U. Marconi, I. Massa, A.N. Melyantsev, C. Moroni, M. Piccinini M. Poly, L.A. Rivkis, V.I. Sakharov, N. Semprini-Cesari, R. Spighi, V.A. Stolupin, S. Vecchi, A. Vezazani, M. Villa, A. Vitale, J. Wozniak, G. Zavattini, A. Zoccoli (group under auspices of Joint Inst. for Nuclear Research, Lab. Nucl. Prob., Dubna, Russia), "Experimental Estimation of the Upper Limit for the Rate of Tritium-Yielding Low-Temperature Nuclear DD-Fusion in Metal/Deuterium Systems," to be published in Cold Fusion Source Book.

AUTHORS' ABSTRACT

No tritium yield from the low-temperature nuclear dd fusion reaction is found within the measurement error in titanium of different modifications and intermetallic compounds ZrNbV, $LaCo_5$, $LaNi_{4.9}Al_{0.1}$, $MM_{0.7}Ti_{0.3}Mn_2$. The upper limit estimates for the rate of the dd fusion reaction with tritium production in titanium and intermetallic compounds are found at the 90% confidence level:

$$\lambda_f(\text{Ti}) \leq 2 \times 10^{-23}\ s^{-1} \times (dd)^{-1};$$

$$\lambda_f^{\text{eff}}(\text{Ti, intermet.}) \leq 6 \times 10^{-24}\ s^{-1} \times (dd)^{-1}.$$

RUSSIA - Cs_2CO_3 SOLUTION IN H_2O

Yu.N. Bazhutov, Yu.P. Chertov (Sci. Res. Center of Phys.-Tech. Prob., Moscow), A.A. Krivoshein (The Inst. of Atomic Energetics, Obninsk, Moscow region), Ya.B. Skuratnik, N.I. Khokhlov, (Karpov Inst. of Phys. Chem., Moscow), "Excess Heat Observation During Electrolysis of Cs_2CO_3 Solution in Light Water," Proceedings ICCF4, Vol 2: Calorimetry and Materials, pp 24-1 to 4, 2 refs, 1 fig, 1 table.

AUTHORS' ABSTRACT

There were carried out series of experiments with initiation of cold fusion reaction by 0.74 M Cs_2Co_3 in H_2O electrolysis with Ni - cathode and Pt - anode. The electrolyses were conducted with constant currents (100, 200, 300, 400, 500, 920 mA). The heat calibration was carried out using joule heat source for each electrode current. Duration of these series of experiments was about 30 days. The excess heat was steadily observed at all currents (except 100 and 200 mA). It was estimated as (20 - 30)%. Tritium was not found in the electrolyte probes.

RUSSIA - ERZION NUCLEAR TRANSMUTATION

D.S. Baranov, Yu.N. Bazhutov, V.P. Koretsky (Scientific Res. Cntr. of Physical Technical Problems "Erzion" Moscow, Russia), Yu.M. Plets, G.P. Pohil, E.M. Sakharov (Nuclear Phys. Inst., Moscow State Univ., Moscow, Russia), "Investigation of the Erzion-Nuclear Transmutation by Ion Beams," Proceedings ICCF4, Vol 3: Nuclear Measurements, pp 20-1 to 2, 2 refs.

AUTHORS' ABSTRACT

The studies of nuclear transmutation were conducted in the copper-beryllium target. This target was irradiated by xenon nuclei (E=120keV). According to Erzion Model xenon nucleus can carry heavy neutral hadron (enion) which must catalyze nuclear transmutation. Expected gamma-rays were measured during the experiment with NaJ crystal material. Beta-activity decay or target was measured after accelerator runs.

RUSSIA - TESTING OF ERZION MODEL

D.S. Baranov, Yu.N. Bazhutov, N.I. Khokhlov, V.P. Koretsky, A.B. Kuznetsov, Y.B. Skuratnik, N.N. Sukovatkin (Scientific Res. Cntr. of Physical Technical Problems "Erzion" Moscow, Russia), "Experimental Testing of the Erzion Model by Reaction of the Electron Flux on the Target," Proceedings ICCF4, Vol 3: Nuclear Measurements, pp 8-1 to 4, 3 refs, 1 fig.

AUTHORS' ABSTRACT

Nuclear transmutation was investigated in the irradiated samples of LaSm, LiSn, LaNd alloys. The electron irradiation was provided on Sr-Y radioactive source. Beta and gamma activity on LaSm target was recorded. It was demonstrated that the activity may be explained by production of Promethium isotopes. This process was predicted by the Erzion model.

RUSSIA - BRONZE CRYSTAL REACTIONS

K. Kaliev, N. Svedlov, Yu. Istomin, E. Golikov, V. Butimov, D. Babaeva, G. Vasnin, V. Fyodorov (Inst. of High-Temp, Electrochemistry, Russia), "The Initiation of Reproducible Nuclear Reactions in the Structures of the Oxide Tungsten Bronze," Proceedings ICCF4, Vol 3: Nuclear Measurements, pp 21-1 to 7, 6 refs, 3 figs.

AUTHORS' ABSTRACT

The possibility of control emission of neutrons at interaction deuterium with oxide tungsten bronzes by electrolysis in the electrolyte based on heavy water is shown.

RUSSIA - POLARIZATON REVERSE

V.M. Bystritsky, V.A. Stolupin, A.V. Strelkov (Joint Institute for Nuclear Research, Dubna), G.V. Fedorovich (Dept. Theoret. Prob., Rus. Acad. Sci.), V.D. Dougar-Jabon, V.I. Kariaka, B.A. Kondratov, N.V. Samsonenko, and S. Valenzuela (Rus. Friendship Univ., Moscow), "Search of Neutrons During Polarization Reverse in Ferroelectrics," to be published in Cold Fusion Source Book, International Symposium on Cold Fusion and Advanced Energy Sources 1994, Minsk, Belarus, Hal Fox, Editor.

AUTHORS' ABSTRACT

There are strong grounds (both theoretical and experimental) to believe that the phenomenon of the enhancement of the dd - fusion rate during electrolytic infusion of deuterons into metallic Ti or Pd electrodes connects with the crack and break formation in the cathode material. To put this another way, the physical mechanism of cold fusion in electrolytic cells is the same as the one in the case of a destruction of deuterated crystals. A model of that mechanism (the stochastic acceleration of particles in the field of intensive oscillations that are generated at the crack boundary) has been proposed. The analysis of the model allows to make some conclusions which are of interest for the following investigations. It has been found that, for deuterium-contained crystals, the emission of high-energy electrons and an electromagnetic radiation (in the range from visual light to X-rays) are the indicator of creating conditions for enhancement of the nuclear fusion

rate. It was noted in connection with this that the phenomenon of light and high-energy electron emission are involved in the process of polarization reversal of ferroelectrics. The direct evidences are found for the nuclear fusion in deuterated ferroelectrics during changes of their crystalline structure in the processes of phase transition and polarization reversal.

RUSSIA - TRANSMUTATION BY CATALYSIS

Yu.N. Bazhutov, G.M. Vereshkov (Scientific Res. Cntr. of Physical Technical Problems, "Erzion" Moscow, Russia), "A Model of Cold Nuclear Transmutation by the Erzion Catalysis (The Erzion Model of "Cold Fuzion"), Proceedings ICCF4, Vol 4: Theory & Special Topics, July 1994, Hawaii, pp 8-1 to 8-6, 17 refs.

AUTHORS' ABSTRACT

Cold nuclear transmutation model by erzion catalysis is proposed for explaining experimental data on so called cold fusion phenomenon. The erzions are the hypothetic massive stable hadrons which existence and fundamental characteristics were predicted in cosmic rays experiments. According this model the erzions are presented in the matter in extremely little quantity (10^2 - 10^7)sm^{-3} and they are in bounded state. At definite conditions the erzions became released and provide multicycle nuclear transmutation room temperature. With the help of the Erzion Model one can explain abnormal effects of cold fusion.

RUSSIA - NEW ELECTRIC TRANSMISSION

Y. Egorov, "Can't it exist?" *Izobretatel i Ratsionalizator*, 1992, no 5-6, p 1.
Translated/Summarized by Igor Goryachev

According to the information published in Russian magazine *Inventor and Developer*, a new opportunity to transmit electric energy has been discovered. As it was demonstrated by scientist Vladislav Avramenko at the Russian (former All-Union) Electro-Technical Institute in Moscow, it is now possible to transmit electric energy through just a single wire (instead of two) almost without any loss of energy (similar to superconductivity at room temperature). The article does not disclose the details of the method. The article says that the primary power source generates electric energy in oscillating form in the range of sound frequencies. This energy is then transmitted in a regular way to a small monovibrator (which is the inventor's secret). Only one wire goes out of the monovibrator. The wire extremity is connected by means of this single wire to a small (match-box size) box. The box has a regular double contact outlet thus providing power supply for electric bulbs and other devices. It is disclosed that the energy transmission through a single wire occurs when the appropriate frequency (not specified) has been adjusted at the input to the monovibrator. If the single wire has been cut there is no need to solder the ends of the wire: it is sufficient to tie the separated ends with a bow knot in order to restore the line. They measured the loss of energy in the single wire when transmitting relatively high power over the distance of 100 meters. It was reported to be almost zero.

The phenomenon disclosed contradicts contemporary accepted science. But the article claims it works!

EDITOR'S COMMENT

This information, if accurately presented, suggests that some type of scalar-wave transmission might be involved. A normal electric sonic frequency signal would be unlikely to travel (or be guided) along a conductor of 100 m without significant losses.

RUSSIA - WEAPONS OF UFOS?

Y. Egorov, "Energy Generator as Blaster," *Izobretatel i Ratsionalizator*, 1992, no 5-6, p 30.

According to the information published in Russian magazine *Izobretatel i Ratsionalizator* (Inventor and Developer) the scientists at one of the secret Russian Research Institutes are experimenting with a device capable of trapping zero-point energy. They created plasma convertors (blasters) generating kilowatts of energy at efficiencies as high as 150%. The scientists themselves refer to an invention of Tesla and Morrey, who are believed to have created a generator of free energy that powered a car, using no other fuel. The publication states that perpetual motion has been realized at last, but the scientists didn't want to disclose the secret of their invention, for the time being.

RUSSIA - GLOW DISCHARGE

A.B. Karabut, S.A. Kolomeychenko, I.B. Savvatimova (Sci. Indust. Assc. "Luch" Podolsk, Moscow Region),

"Registration of Nuclear Radiation in Glow Discharge Experiments," to be published in Cold Fusion Source Book, International Symposium on Cold Fusion and Advanced Energy Sources 1994, Minsk, Belarus, Hal Fox, Editor.

AUTHORS' ABSTRACT

The experimental results of the nuclear product registration are presented in this paper. In our previous experiments with glow discharges in deuterium excess heat release, neutron, gamma and charged particle emission have been observed. Recently we modified the experimental facilities. New measuring techniques were added. New data on emission of radiation (neutrons, gamma and x-rays, heavy charged particles, fast electrons) and on electric processes near the cathode provide clearer understanding of the specific nuclear processes involved into the reported observations. A possible mechanism for the initiation of these reactions is suggested.

D. SHORT ARTICLES FROM READERS

SOME COMMENTS ON COLD FUSION CALORIMETRY

By H.F. Poppendiek (Thermonetics Corp., San Diego, CA),

INTRODUCTION

Cold fusion researchers evaluate the electrochemical processes that may be operative in a reaction vessel on the basis of the generation of chemical species such as tritium and the heat that is developed in excess of the electric input power dissipation in the cold fusion system, itself.

This letter has been written to discuss some aspects of cold fusion calorimetry, namely, some elementary principles that are involved, possible measurement errors that can occur and a brief discussion of Seebeck Envelope calorimeter designs.

FUNDAMENTALS

Consider a thermopile system mounted on either the inside or outside surfaces of a conducting metal envelope; the envelope completely surrounds a cold fusion reaction vessel. Further, consider small ports in the envelope making it possible to 1) add electric currents to the electrode system as well as to a calibration heater and to 2) add and remove chemical gases to and from the reaction vessel. At steady state, the cold fusion heat release can be expressed as

$$q_{\text{cold fusion}} = q_{\text{cal}} - q_{\text{electrical}} \pm q_{\text{gas convection}}$$

where,

$q_{\text{cold fusion}}$, heat release rate for a cold fusion process

q_{cal} , heat release rate measured by the Seebeck Envelope calorimeter

$q_{\text{electrical}}$, heal release rate in teh reaction vessel because of the electrical power dissipation

$q_{\text{gas convection}}$, the net enthalpy increase or decrease in the gas flows through the calorimeter.

If there are transient phenomena in the reaction vessel, the heat balance equation must include a thermal storage term and if the liquid in the reaction vessel boils, the corresponding latent heat being transferred must also be considered.

The Seebeck Envelope Calorimeter (SEC) is based on an elementary principle: All of the heat produced or absorbed by any reaction within the calorimeter must pass through its walls, which incorporate heat flux transducers. Therefore, the calorimeter "envelope" measures the total heat flowing into or out of the system being studied. The calorimeter envelope is quite thin so time constants are low. The transducers are thermopiles which generate a DC millivoltage directly proportional to the heat flow. In a properly designed calorimeter, the millivolt output signal is affected only by the rate of heat flow. These desirable properties markedly simplify operating procedures compared with classical calorimetry methods and make possible a whole spectrum of experimental investigations. Because of the low time constant of the calorimeter sensor envelope (of the order of a minute or two), it is possible to investigate transient cold fusion processes, particularly if the reaction vessel is in direct contact with the thermopile envelope. Such special designs have been produced by Thermonetics for cold fusion researchers.

Steady state calorimeter calibrations are normally performed by passing an electric current through an electrical resistor in the calorimeter. Powers are determined using laboratory volt and ammeters of the percent type. Care must be taken to illuminate heat conduction losses through the resistance heater lead wires; guard heating can be used to accomplish this requirement.

The metal envelope of the Seebeck Envelope Calorimeter can be cooled using convenient fluids (usually water or air). The cooling fluid flow rates and inlet fluid temperatures must, of course, remain invariant with time, using

appropriate flow and temperature controls, repetitively. Otherwise, false output signals would result.

CALORIMETER DESIGNS

Thermonetics has fabricated and calibrated a number of cold fusion calorimeters having different designs and sizes for the cold fusion industry. These systems have operated at temperatures below 80°C, although one type can be used at 260°C. Current calorimeter sizes have ranged from 100cc to 30,000cc; larger sizes can readily be fabricated.

High temperature calorimeters have also been designed and tested in the laboratory; they can operate at temperature levels up to 800°C. Such units can be used with molten salt systems.

Recently, a Thermonetics calorimeter was used in the investigation of zero-point energy fundamentals. It is thought that the Seebeck Envelope Calorimeter can have application in a variety of energy evaluation programs being pursued by universities, national laboratories and the energy industry.

E. LETTERS FROM READERS

LETTER FROM EDWARD LEWIS

Hello. I am writing concerning the planning for the ICCF5 and the future meetings of cold fusion researchers. I would like to suggest to the cold fusion researchers that the planning for these things be more democratic and based on consensus. Consensus and democratic decision making would probably be much more beneficial for the researchers, and people would be happier probably, and the innovation of science may accelerate.

No one has the expertise to decide about things like agenda and goals for the researchers, and who they communicate with. Maybe even no one has the right to try to plan for them all. Cold fusion is similar to many other anomalous phenomena that has been studied by groups for a while. It would be best for people to decide for themselves that which they want to do, and for group activity to be achieved by discussion and vote. This is facilitated by modern communication technology, and democratic organization may best use the technology for human benefit.

So I would like to suggest that each step of planning for CF conferences be done according to the results of detailed surveys -- things like location, site selection, agenda, etc.; and that the CF researchers receive information about the work of others and the resources available so that they may vote according to their wishes.

I am sending along an article about my suggestions. If you want to, you may publish it or this letter, or circulate them. I'd like people, especially those in the ICCF committees and those who are affected, to consider this idea.

Thank you for your work and the newsletter.

EDITOR'S COMMENTS:

Edward Lewis also enclosed a three-page paper (summarized below with comments):

"Suggested Priorities for an Agenda for CF Researchers", August 3, 1994

Lewis suggests three priorities as an agenda:

1. That the organization of the conferences and the conference committees be more democratic and that the policy and goals and group actions be decided upon by consensus.

2. A second priority of researches should be to teach the public about the new phenomena, and especially to teach those of college and pre-college age, especially children, because these are the people who will apprehend and comprehend the new phenomena.

3. A third priority is to learn about similar and possibly associated anomalies such as plasmoids, EVs, Ball Lightning, super conductivity, etc. and include in conferences.

Comments: The ICCF meetings have been sponsored by a volunteer group in each case. In 1990 in Utah by National Cold Fusion Institute (now closed); in Como, Italy by an affiliation of Italian academic and professional organization; in Nagoya, Japan in 1992 by a similar consortium and with some corporate support; in Kauai, Hawaiian Islands in December, 1993 sponsored by Electric Power Research Institute; and now with considerable Technova support in Monaco in 1995. Therefore, part of the conference organizing process has to be with agreement of a government, industry, or consortium that volunteers or agrees to undertake the enormous amount of work and the risk of setting up and running a conference.

It is a wonderful idea to have researchers teach the public. Under normal science, this would be accomplished by the usual procedure to teach post-docs, doctoral students, and others who, would, in turn teach teachers and others. With the dedicated anti-cold fusion effort (such as "if you so much as have a graduate student working on cold fusion, you will **get no grants out of Washington")** the normal procedure of education was greatly curtailed. However, *Fusion Facts*, and other newsletters have sought to provide this type of service. Now that the first cold fusion patent has issued, the logjam at the patent office is likely to be eradicated and many patents will be issued. The *New Energy News* is also trying to help educated the public about cold fusion and other enhanced energy devices.

Edward Lewis makes a good point in his article about other groups who have formed professional associations and hold annual conferences. True. The cold fusion community will do the same in the near future. These other anomalies were not seen as a threat to the $500 million per year of tax-payer money being spent on **hot fusion**. It is an accepted fact that the dedicated hostility of the pathological skeptics have slowed the development of cold fusion, especially in the United States. We are grateful to stalwarts like George Miley, editor of *Fusion Technology*, Mitch Swartz, editor of Cold Fusion Times, Gene Mallove, editor of "Cold Fusion" magazine. These are they who are making a difference in the world-wide acceptance of cold nuclear fusion.

We appreciated Edward Lewis' letter and paper. Any who would like a copy, please contact Edward H. Lewis at 5719 S. Harper Avenue, Chicago, IL 60637.

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