The 6th Meeting of Japan CF-Research Society

JCF6 ABSTRACTS

April 27-28, 2005

at Tokyo Institute of Technology

Japan CF-Research Society

http://wwwcf.elc.iwate-u.ac.jp/JCF/

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Program of JCF6 Meeting

(Japan CF-Research Society)

Date and Place: April 27-28, 2005, at The Centennial Hall, O-okayama campus, Tokyo Institute of Technology, Tokyo, Japan

Paper presentation: oral Presentation 20 min. + discussion 5 min.,

Language= English or Japanese

Book of Abstract: to be distributed at site, also to be available at JCF home page

April 27, (Wed), 2005

9:00-9:50 **Registration**

9:50-10:00 **Opening Address** (H. Numata, Tokyo Institute of Tech.)

Theory-1 (chairman: T. Sawada, Nihon U.)

10:00-10:25 **JCF-1** M. Fukuhara (Tungaloy Co.): Physical Roles of Electron and Neutrino for Cold Fusion

10:25-10:50 **JCF-2** H. Yamamoto: An Explanation of Earthquake by Anomalous Explosion of Hydrogen Dissociated from Water in Mantle

10:50-11:15 **JCF-3** A. Takahashi (Osaka U.): Fusion by 4d/TSC or 6d/OSC

11:15-11:40 **JCF-4** A. Takahashi (Osaka U.): Transmutations by Metal plus TSC or OSC

-----**lunch**(11:40-13:00)-----

Experiment-1 (chairman: Y. Iwamura, Mitsubishi H. I.)

13:00-13:25 **JCF-5** F. Celani et al. (INFN-LNF): Further Studies, about New Elements Production, by Electrolysis of Cathodic Pd Thin–long Wires, in Alcohol-water Solutions (H, D) and Th-Hg Salts. New Procedures to Produce Pd Nano-stuctures.

13:25-13:50 **JCF-6** Y. Toriyabe et al. (Hokkaido U.): Novel Reaction Induced by Light Water Critical Electrolysis

13:50-14:15 **JCF-7** M. Koda et al. : A Simple Method to Check the Purity of D_2O at Your Hand

14:15-14:40 **JCF-8** T. Mizuno et al. (Hokkaido. U.): Anomalous Energy and Elements Generation in Conventional Electrolysis

14:40-15:05 **JCF-9** S. Taniguchi et al. (Iwate U.): ICP-MS Analysis of Electrodes and Electrolytes after Light Water Electrolysis

-----**break** (30 min)-----

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Theory-2 (chairman: A. Takahashi, Osaka U.)

15:35-16:00 **JCF-10** H. Kozima (CF Res. Lab.): The Cold Fusion Phenomenon as a Complexity (1)

16:00-16:25 **JCF-11** T. Sawada (Nihon U.): Why the Nuclear Physicists Say "No" to the Cold Nuclear Fusion

16:25-16:50 **JCF-12** T. Sawada (Nihon U.): Seven Tools for the Research of the Cold Nuclear Fusion

16:50-18:00 **JCF Annual Meeting**

18:00-20:00 **Reception**

April 28 (Thu), 2005

Experiment-2 (chairman: T. Mizuno, Hokkaido. U.)

10:00-10:25 **JCF-13** K. Iizumi et al. (Yokohama N. U.): Heat Measurement during Plasma Electrolysis

10:25-10:50 **JCF-14** H. Numata et al. (Tokyo Institute of Tech.): Simulation Approach to Elucidate Evolution Mechanism of Vortex Appeared on Pd Surface after Long-term Evolution of Deuterium in 0.1MLiOD

10:50-10:15 **JCF-15** T. Aoki et al. (U. of Tsukuba): Preliminary Test for Decay Rate Measurement of Radioactivity Embedded in Host Materials

11:15-11:40 **JCF-16** S. Narita et al. (Iwate U.): Transmutation Test in Discharge Experiment with Pd/CaO/Pd Multi-layered Cathode

11:40-12:05 **JCF-17** H. Yamada et al. (Iwate U.): Search for Transmutation Products on Pd-foil Surface after Highly Pressurized Deuterium Permeation

-----**lunch**(12:05-13:30)-----

Theory-3 (chairman: H. Numata, Tokyo Institute of Tech.)

13:30-13:55 **JCF-18** H. Okumura et al. (Tokyo Institute of Tech.): Bose-Einstein Condensation and Nuclear Reaction in Solids

13:55-14:20 **JCF-19** N. Yabuuchi (High Sci. Res. Lab): The Imamura Experiment and Fusion Chemistry

14:20-14:45 **JCF-20** M. Ban et al. (Tokyo Metro. Indus. Tech. Res. Institute): Three Kinds of Frequency Characteristics by Matter Wave Resonant

14:45-15:10 **JCF-21** A. Takahashi (Osaka U.): Brief Review of EQPET/TSC Theory Versus Experiments

Adjourn

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Physical Roles of Electron and Neutrino for Cold Fusion

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Abstract

Physical roles of electron and neutrino for cold fusion of helium in solid lattice were investigated in terms of elemental particle physics. The Pd lattice for confinement of deuteron pairs plays the same role as magnetic field confinement in hot nuclear fusion, because the attractive interaction between deuterium atom and electron is mediated by massive photon with 5.2 k*eV*, under Heisenberg uncertainty relation, which is given by Yukawa formula [1]. Indeed, the palladium has strong rigidity because the dynamic interaction does not occur in solids lacking shear strength [2].

We investigated that a possible coexistence of an electron and an electron neutrino in nucleus, based on weak interaction in β-decay, and found one electron and one neutron exist in proton and neutron, respectively [3]. The electron and the neutrino are coupled as a *s*-wave boson in nucleus. When a helium atom is formed from two deuterons, two electrons in protons and two neutrinos in neutrons must be mediated by neutral boson Z^0, as a result of mediation of neutral pions [4]. Introduction of electron and neutrino leads to an acceleration of the fusion reaction. Formation of nitrogen in the earth's atmosphere was interpreted by endothermal nuclear transmutation of carbon and oxygen in carbonate lattice in the mantle, with help of enhanced attraction effect due to the excited electrons and plenty of neutrinos [5].

References

[1] H.Yukawa and S.Sakata, Proc.Phys.Math.Soc.Jpn.,**19**,1084(1937).
[2] H.Numata and M.Fukuhara, Fus.Tech.,**31**,300(1997).
[3] M.Fukuhara, unpublished.
[4] M.Fukuhara, Fus.Sci. & Tech., **43**,128(2003).
[5] M.Fukuhara, Nuovo Cimento, **C27**, 99(2004).

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An Explanation of Earthquake by Anomalous Explosion of Hydrogen Dissociated from Water in Mantle

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Key words: hydrogen explosion, atomic hydrogen, BlackLight process

Introduction

The mechanism of earthquake is currently explained by the plate-tectonics theory which claims that the earth's surface is covered with a series of crustal plates that can store elastic energy caused by relative movement of each plate. But recent observations of slow slip of crustal plates dismiss the capability of elastic energy storage in it. It is known that water injection into deep well can cause earthquake. Water can be dissociated into atomic hydrogen by metals in a very hot condition at the mantle. Boiled water type nuclear power plants have been experiencing powerful hydrogen explosions at the end of steam pipe lines where mixture of atomic hydrogen and oxygen dissociated from water by neutron irradiation tend to build up. The magnitude of explosion is so powerful and can not be explained by current combustion theory. It was reported that these mysterious explosion can be explained by R. Mills' BlackLight process(1).

Extra energy generation from hydrogen

It seems there are two paths to generate extra energy from hydrogen. One is the fusion(cold) and the other is the transition of hydrogen's electron to lower orbits. There are several scientists who claim that an electron with lower energy states than the ground electronic state is possible in the hydrogen atom. According Dr. Randlle Mills, one of these scientists, it is postulated that hydrogen atoms can achieve these lower states by a resonant collision with a near by atom or combination of atoms having the capability to absorb the energy to effect the transition(2). Mills names this reaction the BlackLight process.

BlackLight process by atomic hydrogen

3 body reaction of atomic hydrogen can make BlackLight process.

$$H + H + H \rightarrow H[n=1/2] + 2\,H^{+} + 2\,e^{-} \quad \text{----\{1\}}$$

H[n=1/2] designates a hydrogen whose electron orbit is shrunken to 1/2 the radius of a normal one and these will be shrunken further as reaction continues. This reaction releases energy somewhat between chemical and nuclear reaction.

Hydrogen explosion underneath earth's crust

Earth's crust is divided into several separate solid plates. Subduction occurs when two plates collide and the edge of one dives beneath the other. The crust contains water and when it contacts with hot magma, metals in magma such as iron produce atomic hydrogen according to the following reaction.

$$3\,Fe + 4\,H_2O \rightarrow 8\,H\cdot + Fe_3O_4$$

Just collision of atomic hydrogen thus produced can not make molecular hydrogen unless there is heat absorber at the collision spot. It can be reasonably postulated that in high pressure(1GPa) and very hot(1500K) condition of mantle, atomic hydrogen gas can be accumulated underneath the crust. The atomic hydrogen gas is stable but once it is triggered to ignite, the reaction {1} starts and generates far bigger energy than just burning hydrogen, resulting in earthquake.

Reference

(1) Yamamoto, H, Revisiting Anomalous Explosion of Hydrogen and Oxygen Mixture from a View of Cold Fusion, Proceedings of the 5th Meeting of Japan CF Research Society, p89-92, 2003
(2)Mills, R, The Grand Unified Theory of Classical Quantum Mechanics, Blacklight Power Inc., (1999)

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JCF6abs1

Fusion by 4d/TSC or 6d/OSC

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Mechanisms of deuteron cluster fusion in metal-deuterium/hydrogen systems have been modeled by EQPET/TSC theories[1,2] which gave consistent explanations to major experimental results of LENR/CMNS. In this study, more simple treatment of semi-classical models is extended for minimum size state of squeezing motion for 4d/TSC(Tetrahedral Symmetric Condensate) and fusion rates are given by STTBA (Sudden Tall Thin Barrier Approximation). Maximum 4D fusion rate for PdD lattice was estimated as 23 keV/Pd-atom and 46 MW/cc-Pd, which is comparable to 24.8keV/Pd-atom by the super-wave electrolysis experiment by El Boher et al[3].

Defect/Void of Pd atom in PdD lattice may provide site for formation of 6d/OSC(Octahedral Symmetric Condensate). Semi-classical modeling of squeezing motion for 6d/OSC is shown. 6D to $^{12}C^*$ to $^4He + ^4He + ^4He + 71.4MeV$ (hence 23.8 MeV/^{4}He) is the predominant fusion process for 6d/OSC in PdD lattice with defect/void. And 6d/OSC may be seed for M + 6D capture to make A+12 and Z+6 transmutation as Iwamura reported[4].

Ash of 4d/TSC or 6d/OSC fusion is predominantly amount of ^{4}He and reaction rate is high enough to explain major excess heat plus helium results claimed by CMNS experiments.

1. A. Takahashi: ^{3}He/^{4}He production ratios by tetrahedral symmetric condensation, Proc. ICCF11, Marseilles, November 2004, see http://www.iscmns.org/
2. A. Takahashi: Deuteron cluster fusion and related nuclear reactions in metal deuterium/hydrogen systems, Recent Developments in Physics, Transworld Research Network, India, 6(2005): ISBN 81-7895-171-1
3. El Boher et al: Proc. ICCF11, Marseilles, November 2004, see http://www.iscmns.org/
4. Y. Iwamura, et al: Proc. ICCF11, ibid.

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JCF6 abs2

Transmutations by Metal plus TSC or OSC

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TSC(Tetrahedral Symmetric Condensate) and OSC(Octahedral Symmetric Condensate) may squeeze as small as 10-20 fm diameter at minimum size state[1-3], and can make penetration, like “neutron”, through electron clouds of host-metal nucleus to approach and make direct nuclear reactions with host-metal nucleus.

Transmutation reactions by 4p/TSC + M(host-metal nucleus) interaction are analyzed for Ni + H systems. Reaction rates and products are shown for Ni + p to Ni + 4p reactions with various nickel isotopes. Especially, Ni + 4p capture goes out to fission of very clean products.

Transmutation reactions by 4d/TSC + M interaction are analyzed for Cs + 4d (or ^{8}Be*) reactions. Transmutation rate for Cs-to-Pr is estimated for the condition of Iwamura experiment[4]. Transmutation reactions for radio-active Cs isotopes (^{135}Cs and ^{137}Cs) are discussed.

Transmutation reactions by 6d/OSC + M interaction are briefly discussed. Defect/void of PdD lattice will incubate 6d/OSC and its squeezing motion to reach at minimum size of about 20 fm in diameter and form ^{12}C* compound nucleus. Then M + ^{12}C* capture process is foreseen.

1. A. Takahashi: ^{3}He/^{4}He production ratios by tetrahedral symmetric condensation, Proc. ICCF11, Marseilles, November 2004, see http://www.iscmns.org/
2. A. Takahashi: Deuteron cluster fusion and related nuclear reactions in metal deuterium/hydrogen systems, Recent Developments in Physics, Transworld Research Network, India, 6(2005): ISBN 81-7895-171-1
3. A. Takahashi: Fusion by 4d/TSC or 6d/OSC, this meeting
4. Y. Iwamura, et al: Jpn. J. Appl. Phys., 41(2002)4642

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JCF6, 26-27 April 2005, TIT Tokyo (Japan)

Further studies, about new elements production, by electrolysis of cathodic Pd thin–long wires, in alcohol-water solutions (H, D) and Th-Hg salts. New procedures to produce Pd nano-stuctures.

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ABSTRACT
It were continued, at National Institute of Nuclear Physics, Frascati National Laboratories-Italy, the systematic studies about detection of new elements, some even with isotopic composition different from natural one, after prolonged electrolysis of Pd wires.
The electrolytic solution adopted is the, unusual, used from our experimental group since 1999.
In short, it was a mixture of both heavy ethyl alcohol (C_2H_5OD at 90-95%) and water (D_2O, at 10-5%), with Th salts at micromolar concentration and Hg at even lower concentration (both of spectroscopic purity). The liquid solutions, before use, are carefully vacuum distilled (and on line 100nm filtered) at low temperatures (30-40°C) and analysed by ICP-MS. The pH was kept quite mild (acidic at about 3-4).
The cathode is Pd (99.9% purity) in the shape of long (60cm) and thin wires (diameter only 0.05mm). Before use, it is carefully cleaned and oxided by Joule heating in air following a (complex) procedure from us continuously improved (since 1995). Before and after use, some pieces of it, about 50% of total length, are ICP-MS analysed.
The anode is a Pt wire (purity>99.99%), 0.250mm diameter.
The cell adopted is usually a borosilicate chemical glass (like SCHOTT-DURAN, Germany), filling volume about 750cc. Recently (since July 2004) an ultra-pure quartz cylinder (volume about 1050cc) was adopted in order to rule out possibilities of corrosion effects from the cell.
The sample older and details of cell are made only of PTFE, as detailed at ICCF10 and ICCF11.

In respect to previous experiments, we made the following progress:

a) It was studied, for long time and at a current density about 2 times larger than usual adopted, a solution of light ethyl alcohol and water instead of heavy one. It was used the usual borosilicate glass cylinder.
b) It was made a very long experiment (8 months) using the quartz cylinder, "heavy" solutions.
c) It was developed an innovative circuitry (under patent procedures) aimed to produce nano-structures at Pd cathode surface during electrolysis. Experiment planned to "emulate" the Y.

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Arata procedure of Pd nano-particles. Experimentally proved by D_2 gas excess loading in respect to thermodynamic limit values.

d) It was developed, very recently, a procedure to promote nano-structure since the beginning of experiment, even in a gas atmosphere. It was experimentally demonstrated, for the first time in the world, the effect of “confinement” of D_2 gas (the so called ”Preparata effect”): increase of loading, over thermodynamic equilibrium, due to a voltage drop longitudinal to wire length. Work in progress.

During the Workshop it will be shown, in details, some of key results obtained.

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Novel Reaction Induced by Light Water Critical Electrolysis

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Since Ohmori et al. reported the nuclear transmutation reaction in his light water electrolysis system[1], many researchers still have claimed various kinds of low energy nuclear reactions. Yet, it is quite difficult to replicate that reaction on normal electrolysis condition. If we increased current density (or cell voltage) to achieve the transmutation, the normal electrolysis would brake down, and then Plasma Electrolysis would start.

It is well known that, plasma electrolysis can produce a large amount of excess heat, and nuclear transmutation products. In most cases, this electrolysis, however, cannot continue over 30 min due to the breakage of the cathode material with rare nuclear transmutation products. Therefore Ohmori et al. proposed a new type of electrolysis which is referred to as Critical Electrolysis.[2, 3]

In this study, tungsten and nickel electrodes were electrolyzed in 1M K_2CO_3 or Na_2CO_3 solution for 15 days at the critical region, just before plasma region. After electrolysis we analyzed the electrode and the deposition by EDX; Energy Dispersive X-ray Spectrometry, and detected the amazingly strong platinum peaks from both samples. Though we have not checked the isotopic yield of this platinum, this element probably originates from the counter electrode. In general, the platinum anode cannot be dissolved and electro-deposited in alkali solution, especially K_2CO_3 or Na_2CO_3. Nevertheless, the experimental result suggests this novel reaction might be occurred in a certain condition.

Consequently, when we discuss the nuclear transmutation reaction during electrolysis, we should consider the effect of the counter electrode.

References

1) T. Ohmori and M. Enyo, Proceedings of ICCF4, Vol.1, N2.3, 1993

2) T. Ohmori et al., Proceedings of JCF4, 22, 2003

3) T. Ohmori et al., Proceedings of JCF5, 36, 2004

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A Simple Method to Check the Purity of D_2O at Your Hand

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*Independent researcher/music composer, **Kagoshima University
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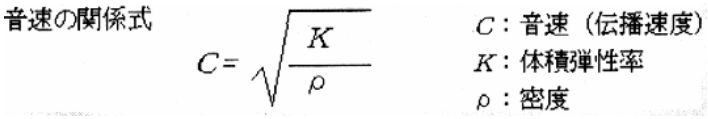
(1) Problem or issue to be solved:
In our community it has been known that, if the D_2O in experiment is impure less than about 95%, the experiment turns out all in vain, at large. However, there given is no practical method and mean to measure the purity of D_2O instantly in situ. The wanted method (or needle/probe-like device) must be able to check it instantly, in situ as well as without withdrawing and/or contaminating the sample.
(2) Method and its theory of operation:
Since the sound velocity of liquid at given temperature is given likewise;



Sound speed C is inverse proportional to density ρ if volume elasticity K remains same. It could be supposed K is common for H_2O and D_2O, measuring the C allows to suppose ρ , and hence purity of D_2O, i.e. mixture ratio of D_2O and H_2O. Known C of D_2O and H_2O are 1360m/s and 1524m/s at 300K, the ratio makes good reverse-approximation of their densities 1.105 and 1.000, correspondingly.
(3) Device to be proposed;
A pencil-like device having ultrasound reflector (steel ball) at top and ultrasound transducer (PZT disc) coaxially located about 1cm off, is devised to measure in-situ sound (3MHz ultrasound) echo return time/phase, using laborastory available pulse generator and digitizing oscilloscope. The system and components are in final stage of development.
(4) Limitation of this method:
Since the sound speed in liquid also depends on temperature and pressure, they must be accurately measured and included in density estimation process. Also it depends on salt or other soluble organic and inorganic materials therein, it is only applicable to fresh D_2O (and H_2O, too) only.
(5) Conclusion:
Authors expect this method offers another small-but-effective tool for our community to maintain quality of experiment.

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Anomalous energy and elements generation in conventional electrolysis

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We have experienced an explode energy release during conventional electrolysis experiment. The cell was a 1000 cc Pyrex glass vessel that has been in use for 5 years. It contained 700 cc of 0.2M K_2CO_3 electrolyte; a platinum mesh anode; and a tungsten cathode wire 1.5 mm in diameter, 29 cm long, with 3 cm exposed to the electrolyte. Electrolyte temperature was 20 deg C. The cell was placed inside a constant temperature air-cooled incubator (Yamato 1L-6) with the outer door open, and the inner Plexiglas safety door closed. The experimental setup is described in Ref. 1 and 2.

The event occurred in the first stage of the experiment before plasma normally forms. Soon after ordinary electrolysis began, voltage was increased to 20 V and current rose up to 1.5 A. Within 10s later, the cell temperature steeply rose up to 80 degree and a bright white flash was surrounded around the cathode. The light expanded to the solution and at the same instant the cell exploded. The explosion blew open the Plexiglas safety door and spread shards of Pyrex glass and electrolyte up to 5 ~ 6 m into the surrounding area.

The effluent hydrogen and oxygen were mixed in the cell headspace. (Note that the inverted funnel described in Ref. 1 was not in use during this experiment.) There were 2 ~ 3 cc of hydrogen at the time, although this is an open cell so only minimal amounts of gas remain in the headspace. Oxygen gas and hydrogen gas were also mixed in with the electrolyte solution. It is likely that the platinum mesh anode catalyzed the hydrogen and oxygen to recombine rapidly in the electrolyte, triggering the explosion in the headspace.

The vessel was old and may have had a scratch on the inner surface. It is possible that the tungsten cathode may have been exposed to the gas in the headspace.

The input voltage and current were 15V and 1.5A; that means 22.5W. The input power was supplied for 10s; total input was roughly calculated as 300J. However, the heat out was 800 times higher than the input power by the remaining output data. There were many elements deposited on the electrode surface. The major element was Ca, S and the total mol was roughly estimated as 10^{-6}.

If we can assume the reaction would be occurred by the TSC mechanism, then the reaction products by a typical isotope of tungsten can be shown by follows.

$$^{182}W + 4\,^{1}H \rightarrow {}^{130}Te + {}^{56}Fe + 128.6MeV$$
$$\rightarrow {}^{136}Xe + {}^{50}Cr + 117.4MeV$$
$$\rightarrow {}^{138}Ba + {}^{48}Ti + 117.4MeV$$
$$\rightarrow {}^{142}Ce + {}^{44}Ca + 107.2MeV$$
$$\rightarrow {}^{154}Sm + {}^{32}S + 79.2MeV$$
$$\rightarrow {}^{158}Gd + {}^{28}Si + 72.7MeV$$

However, it is still difficult to explain the reaction by mechanism, because the absence for heavier pair elements.

References

1,Tadahiko Mizuno, Tadayoshi Ohmori, Tadashi Akimoto and Akito Takahashi; “Production of Heat during Plasma Electrolysis in Liquid”, Jpn. J. Appl. Phys. Vol.39 (2000) pp.6055-6061.

2,Tadahiko Mizuno, Tadashi Akimoto, Kazuhisa Azumi, Tadayoshi Ohmori, Yoshiaki Aoki and Akito Takahashi, “ Hydrogen Evolution by Plasma Electrolysis in Aqueous Solution”; Japanese Journal of Applied Physics Vol. 44, No. 1A, 2005, pp.396-401.

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ICP-MS Analysis of Electrodes and Electrolytes after Light Water Electrolysis

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Abstract

In the light water electrolysis experiment, various elements have been observed on the metallic electrodes and in the solution after electrolysis. It is thought that those elements may have been formed in a certain nuclear reaction on the surface of cathode and anode during the electrolysis. In this study, light water electrolysis was carried out with Pd cathode and Pt anode, then, the electrodes and the light water electrolyte were analyzed after electrolysis. The cells used for the experiment were made of the quartz glass. These have a cylindrical shape with volume capacity of 550 ml. A Pd foil of 0.1×5×10mm as the cathode and 0.1×5×10mm Pt as the anode were employed for this experiment. The electrolyte solution was 0.1M-HNO_3/H_2O and 0.1M-H_2SO_4/H_2O. The volume of electrolyte solution was 500 ml. The electrolysis was carried out for 14 days at a constant direct current of 2 Amps. The constituting elements on the Pd and Pt electrodes and the solution were identified by means of Inductively Coupled Plasma-Mass Spectrometry (ICP-MS).

Several elements were commonly observed on the surface of electrodes and in the electrolyte. Particular interest is that clear signals of Rb and Ba were observed although it was still possible to be impurities of the electrode. Such elements detection suggests that a transmutation takes place in this experiment.

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The Cold Fusion Phenomenon as a Complexity (1)

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(Abstract)

The complexity, or the science of complex systems, treats such problems as why is it that simple particles will spontaneously organize themselves into complex structures like stars, galaxies, snowflakes, and hurricanes and Coulomb lattices of neutron and proton clusters surrounded by a dilute neutron gas in the neutron star matter, as what is the cause of $1/f$ – fluctuation and as what the edge of chaos means.

The cold fusion phenomenon (CFP) has revealed its nature as a complexity as shown by such various experimental results as the "**stability effect**" in the nuclear transmutation and the "**inverse-power law**" in the excess power generation. [1–3] The complexity of the cold fusion phenomenon originates in the non-linear interactions between millions of agents (component particles in the cold fusion materials) and is magnified by enormous energy difference (about an order of 10^8) of the cause (atomic) and the effect (nuclear). Details of the non-linear interactions of the agents in the cold fusion materials are outlined as follows. One of the most important agents is the ambient thermal neutron, without which no CFP occurs at all. The neutrons interacting with lattice nuclei with the nuclear force (the strong interaction) seem to work as catalysts to induce essential effects inducing several necessary conditions for CFP. The second of them is an existence of a transition-metal hydride and/or deuteride in which the lattice nucleus should has excited neutron levels at around the zero-level and the hydrogen isotope should have wide-spread wave functions in the compound. The third of them is the proton (deuteron)–nucleus interaction (the strong interaction) in the compound with a large number of hydrogen isotopes regularly arranged in interstitial sites. This interaction makes possible formation of the neutron bands below zero that induces high-density neutrons localized in boundary/surface layers and neutron drops in them. Some numerical relations obtained in experiments of CFP are reproduced theoretically with use of models based on the above theoretical concepts.

[1] H. Kozima, "Cf-Matter and the Cold Fusion Phenomenon" *Proc. ICCF10* and "Cold Fusion Phenomenon and Solid State-Nuclear Physics" *Proc. ICCF11* (to be published); [2] H. Kozima, "Quantum Physics of the Cold Fusion Phenomenon" in *Developments in Quantum Physics,* pp. 167 – 196, ed. F. Columbus and V. Krasnoholovets, Nova Science Publishers Inc., N.Y. 2004, ISBN 1-59454-003-9; [3] H. Kozima, "The Cold Fusion Phenomenon" *Rep. Fac. Science, Shizuoka Univ.* **39**, 29 – 90 (2005).

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Why the nuclear physicists say “no” to the cold nuclear fusion

Tetsuo Sawada (Nihon University)

As a particle physicist, I am sympathetic to the arguments by the nuclear physicists that at ordinary temperature (T= 300ºK say), which corresponds to the kinetic energy kT = 0.025 eV., cannot overcome the huge Coulomb repulsive potential whose height is around 1 MeV.. If one dares to compute the penetration factor P by using the one-dimensional WKB approximation, one will obtain P = 10^{−92} ~ 10^{−105}, and which means that the cold nuclear fusions “never” occur. Answers by some of the cold fusionists against such an argument surprised me. They proposed to abandon the quantum theory if it contradicted to the cold fusion phenomenon. However we cannot accept such a proposal, since the quantum theory (including the quantum field theory) is the well established theory and gives an excellent agreement with the experiment, for example the g-factor of the electron, which is the ratio of the magnetic moment and the angular momentum in the unit of Bohr magneton, QED predicts g−2=11596521764.1□10^{−12}, whereas we know by experiments g−2=1159652188.4(4.3)□10^{−12}. In view of such agreement, we must not alter the quantum rule in order to “explain” a single phenomenon. Another proposal is to regard the cold nuclear fusion as the reaction of the nucleus with the environmental neutron. By comparing reaction rate of the cold fusion, the required neutron density is around 10^{+8}/cc.. Since we know experimentally the density of the environmental neutron is less than 10^{−3}/cc, I cannot see any positive reason to insist on such a model of the cold fusion. The third answer is the chemically assisted nuclear cold fusion. They claim that the back ground lattice-electron system must alter the nuclear system drastically from what is expected in vacuum. They seem to expect the cooperative phenomena in order to explain how the electron volt world can have influence on the nuclear mega electron volt world. However most of the nuclear physicists know this cannot happen. A definite example will be helpful. Let us consider the reaction d+d→α, which cannot occur in vacuum because the energy conservation and the momentum conservation are not compatible. To recover the compatibility the reaction must proceed under the influence of the external potential and receive the momentum transfer $\Delta p = \sqrt{(2MQ)}$. In our case, Q=23.7 MeV. and M is the α mass. From the uncertainty principle $\Delta p \cdot \Delta r \approx 1$, the required spread of the external potential Δr is around 0.5fm.. It is evident that the superposition of the waves whose characteristic wave lengths are 1 Å, cannot form the concentrated external potential of the fm. size. It is interesting to consider what type of the external potential is acceptable. There are three types of external potential to which the nucleus can respond, they are electric, magnetic and nuclear. Among three possibilities, only the magnetic field produced by the monopole can distinguish the fuel nuclei with magnetic moments from the product α which does not have the magnetic moment. By simulating the world of nuclei plus monopole inside the computer, it is comfortable to see how the Coulomb barrier is overcome when the zero energy deuteron approaches to the bound system (*e-d) and the cold fusion proceeds.

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Seven tools for the research of the cold nuclear fusion

Tetsuo Sawada (Nihon University)

When the nuclear potential V(r) is given, we can in principle reconstruct the nuclear physics by solving the Schrödinger equation of the A- nucleon system. At present, because of limitation of the computer, we can do such a job only for small nuclei : A©13. It is not difficult to compute not only the binding energy of the small nuclei but also the transition amplitude of the reaction such as $t + d \rightarrow n + \alpha$. If we include the hyperon (Λ and Σ) as the ingredient, we can also reconstruct the nuclear physics of the hyper-nucleus, although the information on the potential between Λ-N or Σ-N is necessary. Since both potentials of $\Lambda(\Sigma)$-N and N-N are short range and similar, we cannot expect the qualitative difference between the reactions $t + d \rightarrow n + \alpha$ and $(\Lambda d) + d \rightarrow \Lambda + \alpha$, where (Λd) is the hyper-nucleus in which one of the neutron of the triton is replaced by the Λ-particle. The Coulomb barrier prevents also for the very low energy deuteron to approach to (Λd) and to fuse to become α. We can go one step further by including the magnetic monopole *e as the ingredient of the nucleus rather than Λ(or Σ) of the hyper-nucleus. The nuclear reaction mentioned above must be changed to $(*e\text{-}d) + d \rightarrow *e + \alpha$. $*V(r) = -*e\,\kappa(e/2m)\,(\boldsymbol{\sigma}\cdot\mathbf{r})/r^3$ is the potential between the monopole and nucleon necessary in evaluating the binding energy and the transition amplitude of such a system. From the charge quantization condition of Dirac, $*ee = 1/2$ and the g-factor is $\kappa = 2.8$ and -1.9 for proton and neutron respectively. Contrarily to other $\Lambda(\Sigma)$-N or N-N potentials, the *e-N potential *V(r) is the long range potential and it behaves as $\sim -1/r^2$ for large r. It is this property which makes it possible for the nuclear cold fusion to occur, because the Coulomb barrier is altered drastically. The potential of the incident deuteron of $(*e\text{-}d) + d$ becomes $e/r + *V(r)$, which has a peak at r=35fm. and the peak value is around 20keV.. Therefore we conclude that if a magnetic monopole is available we can construct the nuclear fusion reactor which operates at ordinary temperature. Although it is interesting to consider whether all the cold fusion occurs with the intervention of the magnetic monopole, it is not easy to prove it. However if the nuclear reaction is the two-body to one-body type such as $d + d \rightarrow \alpha$, we can show this is in fact the case. Since the monopole is the rare particle, the cold fusion occurs in a sporadic way and looks non-reproducible. In order to avoid such situation it is necessary to do the cold fusion experiments in conjugation with the monopole detection. Since we cannot continue the try and error type experiments for another 15 years, following tools will become useful in the future studies. They are : (1) Quantum mechanics (2) Magnetic monopole detector (3) Device to collect the flux of the magnetic charge (4) Apparatus to decelerate the magnetic monopole and to trap it (5) Apparatus to concentrate the hydrogen isotope (6) Device to monitor the heat production (7) Device to check the produced He(4).

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HEAT MEASUREMENT DURING PLASMA ELECTROLYSIS

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Since 1989, many people have reported on the excess heat production during water electrolysis. However, most of them had not enough reproducibility, and a theory for the excess heat has not been established, yet. Mizuno et al reported the excess heat during their plasma electrolysis [1]. In this study, we have developed, a flow calorimetry system using a flow cell system, and the heat balance during the plasma electrolysis has been discussed.

The anode was a platinum mesh (99.99% purity, 55meshs) with 2cm diameter of a cylindrical shape. The cathode was tungsten rod (Φ1.0mm, 99.95% purity) and was placed at the center of the cylindrical anode. The electrolysis was conducted at the constant voltage of 95~125V. Electrolyte was 0.2M K_2CO_3 light water solution and it was circulated in this system passing through a reservoir. The flow rate of electrolyte was fixed at 571~831ml min^{-1}. The temperature difference between inlet and outlet of the electrolyte was measured by the Pt resistance thermometers. Hydrogen and oxygen that generated during electrolysis were collected in the reservoir and measured the rate of gas generation.

Figure 1 shows the cell voltage and the current as a function of time. The cell voltage was controlled by a step function with 20 sec interval. At the beginning, the current increased with the cell voltage; however the current decreased with the increase of the cell voltage from 80 to 130V. Plasma discharge might start in this region, and the bright plasma was observed above 130V when the cell voltage was increasing. It was observed above 90V when the cell voltage was decreasing. When the plasma stopped at 90V, the current increased from 2A to 13A. Plasma would have a role of an electrical resistant effect. Table 1 shows typical results of the heat balance during the plasma electrolysis. In these case, the heat balances were from 90% to 93%. In our 18 runs, the difference between plasma and normal electrolysis could not be detected by the heat balance.

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Table.1 Heat balance during plasma electrolysis in 0.2M K_2CO_3 light water solution.

Cell voltage [V]	Cell current [A]	Electrode Length [cm]	Flow rate [ml min^{-1}]	discharge Voltage [V]	HB [%]
95	2.2 ~ 2.9	2	818	125	90
105	2.4 ~ 3.4	2	813	130	92
122	2.5 ~ 3.7	2	824	122	93

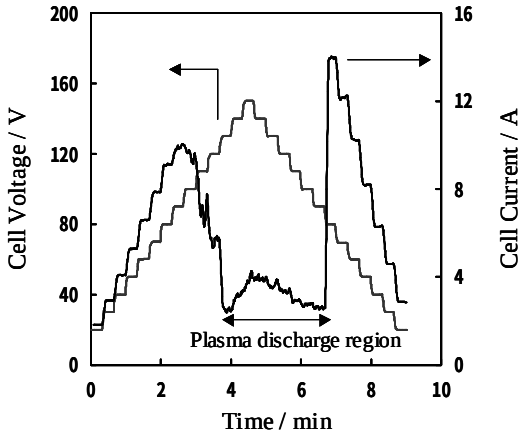

Fig.1 Trend of input voltage and current during normal and plasma electrolysis in 0.2M K_2CO_3 light water solution.

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Simulation approach to elucidate evolution mechanism of vortex appeared on Pd surface after long-term evolution of deuterium in 0.1MLiOD

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Abstract

Long-term electrolysis for well annealed thick Pd rod (9.0 mm φ) in 0.1MLiOD was performed. High count rate of neutron appeared after the current increased to c.a. 100 mA/cm^2 and the temperature rose to 50 ˚C [1-2)]. Microscopic observation of post electrolysis Pd showed that long-term electrolysis did not resulted in any cracking but surface voids, two long faults, voids arranged in a straight line and peculiar surface traces: vortex. In-situ measurement of the hydrogen/deuterium evolution of the Pd-H (D) system[3)] and the measurement of solid-state properties of post electrolysis Pd[4)] revealed the micro structural model inside the solid, which improves reproducibility of cold fusion related phenomena. An important process in that model is the motion of deuterium from a vessel to other ones, which might occur the observed vortex patterns on post electrolysis Pd surface. However, there has been remained unsolved yet a phenomenological explanation for the process of the vortex formation.

The lattice gas cellular automata method is utilized for simulating the Poiseuille flow with the boundary conditions incorporating the motion of the hypothetical particle fluid. The Poiseuille flow and the flow pattern of the vortex have been obtained in a simple 2D flow. More precise 2D model simulating the vortex pattern will be presented adopting the advanced Inflow and Outflow boundaries under particle generation and disappearance conditions[5)].

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Preliminary Test for Decay Rate Measurement of Radioactivity Embedded in Host Materials

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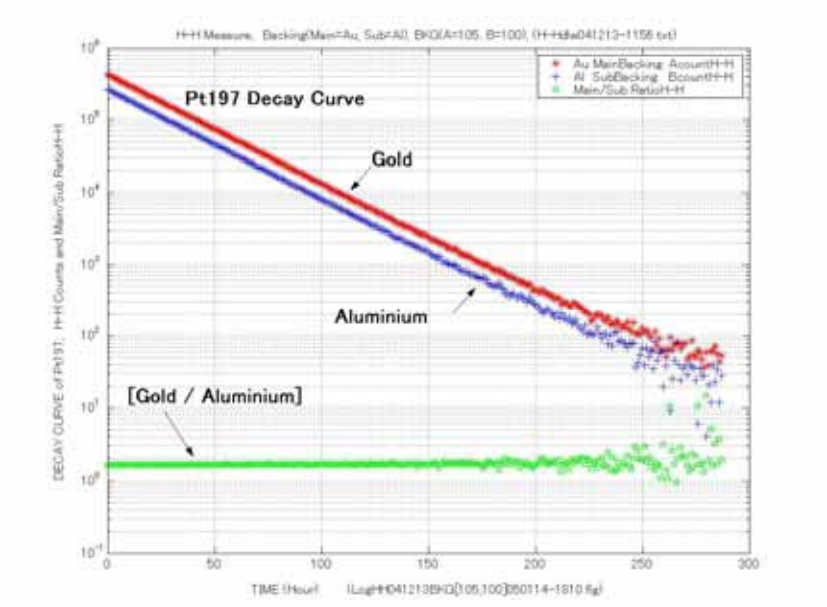
1. Introduction: Preliminary test for observing small change of beta-decay rate of radioactivity ^{197}Pt, embedded in different host materials Au and Al, was made. A ^{197}Pt nucleus decays to a ^{197}Au nucleus with half life of 18.3 h[1]. Natural abundance of stable ^{197}Au is 100%. If a parent ^{197}Pt nucleus is put as close as possible to daughter Au nuclei, some unknown quantum mechanical effects might accelerate or decelerate the beta-decay rate. The effect may arise from leakage of wave functions of both parent and daughter nuclei, statistics the nuclei obey, position periodicity of daughter nuclei and so on. It may be interesting to compare the decay rate of ^{197}Pt embedded in Au foil to that of embedded in another host (Al) foil.

2. Experimental setup: Two pieces of Pt wires with 1 mm diameter and 4 mm length were irradiated by neutrons to produce the parent nucleus ^{197}Pt. The wires were set in sputtering negative heavy ion source. The ^{197}Pt activity was extracted and analyzed through a magnet and was implant it into Au an Al host foils, respectively. Implantation energy was 147 keV. Then the foils were fixed at the end edges of a Cu bar separately. Two small NaI(Tl) detectors, that were shield heavily, were set just in front of the foils. Signals of detectors were accumulated by two electronic counters A and B. The Cu bar was rotated 180 degree forward and backward every 30 minutes so that both counters collected the signals from the Au foil and Al foil, alternatively. Life time measurement was controlled by a personal computer.

3. Conclusion: No definite decay rate change was observed in this preliminary measurement.



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Transmutation Test in Discharge Experiment with Pd/CaO/Pd Multi-layered Cathode

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Abstract

Among the experimental approaches for the study of low energy nuclear reaction in condensed matter, permeation of D through Pd/CaO complex sample is widely recognized as well-established technique in which some specific transmutation reactions (e.g. Cs→Pr) have been demonstrated[1,2]. Although the reaction mechanism has not been clarified theoretically, it has been claimed that sufficient D flux in the permeation through the sample and the multi-layered structure of the sample, especially for existing CaO layer, are necessary for triggering the phenomenon in the method. Considering those essential keys, in this study, we perform the discharge in deuterium gas using cathode with multi-layered structure of Pd/CaO/Pd on which Cs are deposited.

The multi-layered sample is prepared in the following procedure. On the Pd substrate (12.5mm x 12.5mm x 0.1mm in size, >99.95% in purity), ∼2nm CaO layer and ∼40nm Pd layer are formed by sputtering. Then, the Cs is deposited onto the sample surface by electrolysis. Using the sample as a cathode, the discharge is carried out in deuterium atmosphere for 1-150 hours. In the previous study, we observed gamma ray radiation during the discharge[3], then also in this experiment, we attempt to detect such anomalous radiations by NaI(Tl) scintillation counter. It is possible that the elements on the cathode surface and cathode material itself (i.e. Pd) are diffused by sputtering in the discharge, so that small amount of the elements produced by nuclear reactions can be almost flown away from the sample. In order to detect such elements, some pieces of Au foil are placed around the cathode. After discharge, the composition of the cathode and the Au foils is analyzed by ICP-MS and TOF-SIMS.

We will discuss the possibility that the transmutation reaction of Cs to Pr just as observing in the permeation experiment occurs in the discharge method. In addition, a quantitative considerations for the yield of the transmutation products for the deuterium dynamics will be made.

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Search for Transmutation Products on Pd-foil Surface after Highly Pressurized Deuterium Permeation

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Deuterium and hydrogen permeation experiment has an advantage of minimizing contamination to the palladium sample, which is preferably used in investigating small amount of elements. We have reported[1] that the count intensity for Fe sometimes increased significantly after the highly pressurized hydrogen permeation for samples with 0.1 and 0.3 mm thickness, which might imply the pressure effect. Furthermore, the report has suggested that several other elements were produced by a nuclear transmutation and that the reaction could occur in hydrogen system. In this present investigation, we have performed a test for highly pressurized deuterium permeation with Pd foil and have searched for nuclear products as a result of low energy reaction.

The Pd foil samples of 0.1x12.5x12.5 mm in size were washed by aqua regia and set up into a holder placed between an upper and lower stream chambers. Deuterium gas was introduced into the upper chamber with the pressure ~10 atm, and it moved downstream passing through the sample at 70 ℃. The lower stream chamber was evacuated to prevent the Pd sample from being contaminated from the atmosphere. After the deuterium gas permeation for ~7 days, the sample was taken out and the gas remained in the sample was unloaded. We have analyzed the sample surface of pressurized side by time-of-flight secondary ion mass spectroscopy (TOF-SIMS) and inductively coupled plasma mass spectroscopy (ICP-MS). We have compared the composition of the sample before experiment (control sample) with that after experiment to search for newly produced elements during the gas permeation process. Remarkable increase in the counts for Mg and Ba were found after the deuterium permeation using ICP-MS.

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New Energy Times Archives

Bose-Einstein condensation and nuclear reaction in solids

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Abstract

Many experimental results of the workers in the world suggest that the cold fusion may happen in the solids in room temperature. However, it is not completely understood now. The purpose of this study is to give a theoretical explanation for the mechanism of cold fusion. In the beginning, Bose-Einstein condensation (BEC) in solid is considered, because deuterons are highly condensed at defects in some metals. By using Kim-Zubarev theory [1], the wave function, the d-d fusion rate of condensed deuterons in crystalline solid and critical temperature Tc of BEC are obtained. [2] Furthermore, the thermal conduction from a reaction center is estimated as a function of position and time. The calculated results show the rapid temperature relaxation. Within 10^{-10} sec, temperature outside of the reaction core is reduced to the initial value. When the void contains 5 deuterons, reaction rate is 10^{9} sec^{-1}. [2] This means that temperature reduces to the initial value earlier than the inverse of the reaction rate. Therefore, continuous reaction will not make thermal explosions. If the number of deuteron clusters is very large, recovery from the initial temperature is not so rapid. However, if the temperature is higher than Tc, probability of the ground state occupation becomes zero. And the reaction will not continue. From the above discussions, we can conclude that static nuclear reactions induced by BEC without any explosions are possible in Pd in room temperature.

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The Iwamura experiment and fusion chemistry

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Abstract

In the experiment conducted by Iwamura, et al., the passage of ^{2}D gas through a multilayered palladium membrane yielded the following two results:

$$^{133}Cs_{55} \rightarrow {}^{141}Pr_{59} + \Delta E \qquad (1)$$

$$^{88}Sr_{38} \rightarrow {}^{96}Mo_{42} + \Delta E \qquad (2)$$

That is to say, the experimental results indicated that elemental transmutation occurred at low energy levels, with the release of middle-level nuclear energy.

One possible explanation for these two facts is nuclear fusion by atomic nuclei having low binding energy. If this is so, the question then raised is, what are nuclei that have low binding energy? The answer is that they may be either halo nuclei or liquid-crystal nuclei. Such theoretical inquiry into the nature of nuclei can be expected to yield favorable results.

The author has previously described both halo and liquid-crystal nuclei; in this paper those earlier observations are extended to the methods of Iwamura, et al.

The peripheral equipment which induces nuclear fusion is also discussed. Such equipment must enable the existence of a state having a field current of large amounts of deuterium caused by the passage of deuterium. A multilayered membrane of palladium, which serves as the deuterium-storage metal, must also be present. The paper describes how these two main features are what enable the equipment to function as a fusion device. The conclusion is reached that, as a result, radiation of middle-level nuclear energy and transmutation is brought about by low energy.

Examination of reaction formulae (1) and (2) reveals that each atomic number increased by 4 and atomic weight by 8. Accordingly, because the equipment brought about the reaction through the passage of deuterium, it is possible that the $2 \cdot 2^{2}D$ reacted immediately. Reaction by liquid-crystalline $^{4}He_{2}$, which has a weakly reactive, large nuclear radius, instead of $2 \cdot 2^{2}D$ is also conceivable. Reaction formulae (1) and (2) would thereby change as follows:

$$^{133}Cs_{55} + 2 \cdot 2^{2}D\ (2 \cdot {}^{4}He_{2}) \rightarrow {}^{141}Pr_{59} + \Delta E \qquad (3)$$

$$^{88}Sr_{38} + 2 \cdot 2^{2}D\ (2 \cdot {}^{4}He_{2}) \rightarrow {}^{96}Mo_{42} + \Delta E \qquad (4)$$

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Three kinds of frequency characteristics by matter wave resonant

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Abstract

The cause of Cold fusion is considered as the change that the material wave resonates. The function is thought about by the characteristic which appears to the investigation about the example of direct current circuit. Electric noise changing 3 kinds in the same condition of the direct current circuit, the case which appears is found. At that time, the noise was captured from the electrical discharge part.

When noise of these 3 kinds changed, we see that there were the respective another resonance in the electron wave of the discharge section. The phase transition aroused as extending between three steps.

The kind of resonance is increasing by the special crystal structure when the electrode of carbon graphite is used. There is non-isotropic degree of elasticity in the crystal. The carbon graphite electrode expects to be the promoter of Cold fusion. The example which carries out a phase transition to a carbon tube or fullerene is found.

If the frequency characteristic of an electric circuit is investigated, in the theory of the Fourier transform, power-spectrum density and spectrum can change mutual. The kinetic energy of the electron expected value can be converted from the function of the current in which the frequency is assumed to be a variable.

The frequency response appears when the expected value of energy is provided from the perturbation method of the quantum mechanics to time, and it is converted into the current.

When thinking that three kinds（White noise, 1/f square noise, and 1/f noise）are power Spectrum, three kinds of the quantum resonance is clarified.

A black body is radiated when heated by the electric power with the white noise. There is a resonance in the cavity radiation, and the standing wave of material has occurred in the cave.

The phase synchronizes continuously in the electron wave generated in 1/f square noise. However, the phase doesn't synchronize in the electron wave in the white noise according to the theory of Rayleigh distribution.

The wave packet and the standing wave come up in the well potential barrier between the electrodes when resonating. The electrical discharge part is subdivided when an easy condition is given to the harmonic component of the standing waves and the number of barrier rows increases. When the wave packet is spread in this electrical discharge part, quantum resonance of 1/f square noise occurs.

The harmony oscillators can be considered the barrier row. Any condition is still indistinct, but the output becomes 1/f noise when wave packet is spread by harmonic oscillator. The phenomenon is an effect of integral calculus which virial theorem explains.

The quantum resonance of three steps starts in the electrical discharge part if there is a particle that moves freely even though any of the solid solution, the solution, the solvent, and the gas. It is the cause by which it starts not only a phase transition but cold fusion. The promoter of cold fusion is expected with harmony generator of carbon graphite electrode.

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JCF6abs3

Brief Review of EQPET/TSC Theory Versus Experiments

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Brief review of theoretical results by EQPET (Electronic Quasi-Particle Expansion Theory) and TSC (Tetrahedral Symmetric Condensate)[1,2] are given in comparison with major experimental results of CMNS (Condensed Matter Nuclear Science).

Summary results are listed in Table-1.

Table-1: Summary Results, experiment vs. theory

Item	Experiment Author/ Method / Results	EQPET/TSC Models
Screening of d-d fusion	Kasagi/ D-beam, PdDx/Us= 310+-30eV Takahashi/3D,TiDx/ <dd> =1E9 in range	Us=360eV, by dde*(2,2) (1E13)τ with τ = 0.1 ms
^{4}He/^{3}He production	McKubre/Electrolysis/ 30 +- 13 MeV/^{4}He Arata/nano-Pd, El./ [^{3}He]/[^{4}He]=0.25	23.8 MeV/^{4}He by 4D → ^{4}He + ^{4}He +47.6MeV [^{3}He]/[^{4}He]=0.25, for H/D=0.6
Max. Heat	El Boher/ Super-wave El./ 24.8keV/Pd Gain = 25	Minimum state 4d/TSC 23 keV/Pd 46 MW/cc-Pd by 4d/TSC
Transmutation	Iwamura/ Pd-complex, gas/ Cs to Pr Miley/Ni-H, electrolysis/ fission-like FP	4d/TSC or ^{8}Be* capture to Cs FP by Ni+4p/TSC

We find considerable consistency between theories and experiments.

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Reasons for Establishing the Japan CF-Research Society

This society shall be called (in Japanese) "the CF Research Society" and (in English) "the Japan CF-Research society," abbreviated (in both cases) JCF. CF stands for Condensed-matter (solid state) Fusion, Coherently-induced Fusion, or Cold Fusion. All the terms refer to a nuclear reaction inside a solid state body. The term CF is also meant, in the broader sense, to include the science and technology associated with the phenomenon. The main goal of the society is to investigate the nuclear reactions that occur in the solid-state and, ultimately, to develop techniques to extract useable energy from these reactions.

We do not think it is necessary for us to reiterate the reasons why associations of this type play such a important role in promoting sound development in science and technology. We have long been concerned that cold fusion, like any other area of science, needs an organization to collect and disseminate data and promote general interest in the field. Despite this pressing need however, no organization like the CF research society has been formed until now, for two main reasons: First, because the existence of the so-called cold fusion reaction has not been widely recognized, and very few scientists and researchers concentrate on it as their main occupation. Second, because cold fusion research requires an interdisciplinary, multidisciplinary approach involving scientists for many different fields, who would not normally meet together or form a society.

In recent years, a great deal of experimental data has indicated that new phenomena exist, which originate in condensed (solid-state) matter when various physical and chemical conditions are satisfied, giving rise to, for example, coherently induced nuclear fusion. This process is intrinsically different from the nuclear reactions heretofore discovered, which are random rather than coherent processes. CF has characteristics peculiar to the solid-state environment. It has given rise to an effusion of new discoveries in physics, chemistry, material science and nuclear engineering. Cold fusion research crosses traditional academic domains and requires an interdisciplinary approach, so we hope that researchers from many fields will join us in these efforts. It is hoped that opening up the field will be the most significant outcome of the establishment of this CF Research Society. Another significant goal of the Society is to enhance Japan's role as a focal point of research in this area, and to act as a clearing house for international cooperation and information exchange.

(The CF society is an unofficial organization, without legal standing.)

March 29, 1999

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Activity of JCF

1. Name of the Society: CF(Nuclear Reaction in Solid)-Research Society for Japanese. English name is Japan CF-research Society(JCF).

2. Aims: contribute to science and technology development by studying CF phenomena, exchange information between JCF members and organize meeting for CF-research.

3. Activities:
(1) Studies on works in CF-research field.
(2) Information exchange between members and foreign activities.
(3) Organize and implement meetings and conferences.
(4) Publish reports
(5) Collect academic materials(papers and documents) on CF-research.
(6) Others

4. Members:
(1) Member(Normal): CF-researchers and related person
(2) Cooperational Member: Company and organization which financially assist JCF
(3) Fellow: Senior researcher who made great contribution to JCF and has been selected by JCF

5. Fee:
(1) Registration fee: 10,000 yen for member(free for student)
(2) Annual fee: 5,000 yen for member(2,000 yen for student)
(3) Fund by Cooperational Member: 50,000 yen per stock

6. Directors:
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7. Fields:
consists of combined fields interdisciplinarily and multidisciplinarily in the following fields; nuclear physics, fusion science, radiation physics, condensed-matter physics, surface and catalysis science, metallurgy, hydrogen science, electro-chemistry, calorimetry, accelerator and beam science, laser science, nuclear and quantum science and engineering, molecular dynamics, acoustics, etc.

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