



**12th International Conference on
Condensed Matter Nuclear Science**

ABSTRACTS

November 27 – December 2, 2005

Yokohama, Japan

New Energy Times Archives

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Sponsored by

International Society for Condensed Matter Nuclear Science

The Thermal and Electric Energy Technology Foundation

Japan CF Research Society

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Preface for abstract book of the ICCF12 Conference

The study of Condensed Matter Nuclear Science has continued to advance through 11 past conferences (ICCF1 at Utah, USA in 1989 to ICCF11 at Marseilles, France in 2004) and many new compelling scientific findings are becoming known. The historical 1989 claim of “cold fusion” had renewed hope of a portable clean nuclear reactor. The subsequent great wave of denial and hostility forced the claim and further research efforts out of mainstream science. Nevertheless, due to misconceptions and misinformation, very few people know that several hundred researchers from around the world have continued this research during the past 16 years. The efforts by this faint stream of research have now revealed that there exist new kinds of nuclear effects directly related to the nature of condensed matter. The nuclear effects in condensed matter are much more than real “cold fusion”, they include important nuclear effects such as transmutations and resulting release of energy as significant heat with minimal and safe radiation. Low levels of radiation are found in at least some reactions, but are usually absorbed within the cell itself so the system is categorically safe. Through discussions at international conferences (ICCF-1 through ICCF-11), a majority of researchers agreed that the name “cold fusion” was misleading. A new name, closer to the exact phenomenon, Condensed Matter Nuclear Science, is most appropriate.

The new field, Condensed Matter Nuclear Science (CMNS), treats nuclear effects in and/or on condensed matter, targeting its application for portable clean nuclear sources. This is an inter- and multi-disciplinary academic field, including nuclear physics, condensed matter physics, surface physics and chemistry and electro-chemistry. CMNS applications involve many other fields of science and technology (nuclear engineering, mechanical engineering, electrical engineering, laser science and engineering, material science, nano-technology, bio-technology, energy politics, etc.). To promote the development of CMNS and establish the academic field of CMNS, the field needs highly efficient, cooperative efforts of researchers and related people working in different fields. International linkage and collaborations are needed.

The full name of this conference is the 12th International Conference on Condensed Matter Nuclear Science. However, we have decided to keep the acronym ICCF12 for the Conference, considering our original standpoint and tradition.

The International Society for Condensed Matter Nuclear Science (ISCMNS) made a start in 2004 to promote the understanding, development and application of Condensed Matter Nuclear Science and has become a main supporting body of the ICCF series conferences since ICCF11. However, ICCF12 is sponsored by other societies like JCF (Japan-CF Research Society) and TEET (Thermal and Electric Energy Technology Foundation) and supported also by non-ISCMNS members. ICCF12 will provide an international scientific forum for direct interaction and stimulation among many scientists working in the CMNS field and participation and presentation of new-comers will be welcome.

The Conference site and date are: Shin-Yokohama Prince Hotel, Yokohama-city Japan on 27 November – 2 December 2005.

The following topics will be discussed at the conference:

- Excess Heat and Related Nuclear Products
- Nuclear Processes and Transmutations
- Materials and Condensed Matter Conditions
- Analyses and Diagnoses Techniques
- Innovative Approaches
- Theories on Condensed Matter Nuclear Effects
- Engineering, Industrial, Political and Philosophical Issues

For organizing and preparing ICCF12, the following members of Local Organizing Committee (LOC) and International Advisory Committee (IAC) have made contributions.

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Sponsors of ICCF12 are:

ISCMNS: International Society for Condensed Matter Nuclear Science

TEET: Thermal and Electric Energy Technology Foundation

JCF: Japan CF-Research Society

20 November 2005

LOC of ICCF12

12th International Conference on Condensed Matter Nuclear Science

Yokohama, November 27-December 2, 2005

Sunday, November 27

Tutorial Class

13:00–14:00	V. Violante (ENEA, Italy)	Condensed Matter Nuclear Effects (I) Heavy-water/D systems
14:00–15:00	G. H. Miley (University of Illinois, USA)	Condensed Matter Nuclear Effects (II) Ordinary-water/H systems
15:00–16:00	Y. Iwamura (Mitsubishi Heavy Industry, Japan)	Analyses in Transmutation Experiments
16:00–17:00	A. Takahashi (Osaka University, Japan)	Fusion Rate Formulas for Bosonized Condensates
		<i>Registration</i>
19:00-21:00		<i>Welcome Reception</i>

Monday, November 28

Registration

10:00-11:00 Mon-1 Akito Takahashi Progress for Condensed Matter Nuclear Science

Excess Heat & He

Session 1: Chair: S.Chubb / T.Mizuno

11:00-11:30	Mon-2	A. El-Boher	Progress in Electrolysis Experiments at Energetics Technologies
11:30-12:00	Mon-3	V. Violante	Progress in Excess of Power Laser Triggering
12:00-13:30			<i>Lunch</i>
13:30-15:00			Poster Presentation (Chair: H.Yamada)
	Mon-4	V.A. Kirkinskii	Calculations of Nuclear Reactions Probability in a Crystal Lattice of Lanthanum Deuteride

Mon-5	Vladimir I. Vysotskii	Observation, Investigation and Modeling of the Ordered Motion of the Hypothetical Magnetic-Charged Particles on the Multilayer Surface and the Problem of Stimulated Low-Energy Fusion
Mon-6	A. I. Goncharov	Theoretical Modeling of Electron Flow Action on Probability of Nuclear Fusion of Deuterons
Mon-7	J. C. Fisher	Neutron Isotope Reactions
Mon-8	Afonichev Dmitriy D	Mechanism of ^3T and ^4He formation via low energy nuclear reaction
Mon-9	Kohji Kamada	Quantum Theoretical Heating Mechanism of Deuteron Precipitates Imbedded in Al on Electron Bombardment Spin-Flip-Phonon- Maser Action of Deuteron Nucleus
Mon-10	Ken-ichi TSUCHIYA	Thermal conduction from the centers of the nuclear reactions in solids
Mon-11	H. Numata	Magnetic interaction of hypothetical particles moving beneath the electrode/electrolyte interface to elucidate evolution mechanism of vortex appeared on Pd surface after long-term evolution of deuterium in 0.1M LiOD
Mon-12	L H Jin	Heat Response Triggering by a YAG Frequency Double Laser in a D/Pd Gas-loading System
Mon-13	Farzan Amini	Production Method for Violent TCB Jet Plasma from Cavity
Mon-14	I. Chaudhary	Coupled-Channel Equations for the 3-Body and 4-Body Problems
Mon-15	Yu.N. Bazhutov	Nuclear Diagnostic of Cold Nuclear Transmutation at Electrolysis with Anode Gas Discharge in Water Solutions

Session 2: Chair: M.McKubre / S.Narita

15:00-15:30	Mon-16	Y. Arata	Essential Condition of the Solid- State Deuterium Nuclear Fusion ("cold fusion") Using Double structure Cathode("DS-cathode")
15:30-16:00	Mon-17	Scott R. Chubb	Why Particular Nano-Scale PdD Crystals Turn-on Faster
16:00-16:30	Mon-18	J. Dash	Seebeck Envelope Calorimetry with a Pd D ₂ O+H ₂ SO ₄ Electrolytic Cell
16:30-17:00	Mon-19	P. L. Hagelstein	Phonon-Exchange Models for Anomalies in Condensed Matter Systems with Molecular Deuterium
17:30-18:30	<i>Annual General Meeting of ISCMNS</i>		

Tuesday, November 29

Transmutation

Session 3: Chair: G.Miley / J. Kasagi

9:00-9:30	Tue-1	Y. Iwamura	Observation of Surface Distribution of Products by X-ray Fluorescence Spectrometry during D ₂ Gas Permeation through Pd Complexess
9:30-10:00	Tue-2	S. Narita	Discharge Experiment Using Pd/CaO/Pd Multi-layered Cathode
10:00-10:30	Tue-3	A. Takahashi	Time-Dependent EQPET Analysis of TSC
10:30-10:50		<i>Break</i>	
10:50-11:20	Tue-4	H. Yamada	Producing Transmutation Elements on Plain Pd-foil by Permeation of Highly Pressurized Deuterium Gas
11:20-11:50	Tue-5	Yeong E. Kim	High-Density Quantum Plasma Fusion Mechanism for Low-Energy Nuclear Transmutation Reactions
11:50-13:30		<i>Lunch</i>	
13:30-15:00		Poster Presentation (Chair: H.Numata)	
	Tue-6	Xing Z. Li	High Resolution Mass Spectrum for Deuterium(Hydrogen) Gas Permeating Palladium Film
	Tue-7	Hidemi Miura	Study on Formation of Tetrahedral or Octahedral Symmetric Condensation by Hopping of Alkali or Alkaline-earth Metal Ion
	Tue-8	Akio Takahashi	The Italy-Japan Project -Fundamental Research on Cold Transmutation Process for Treatment of Nuclear Wastes-
	Tue-9	I.Goryachev	Perspective Way to Utter Solution of the Problem of Radioactive Waste Remediation
	Tue-10	M. Fukuhara	Coupled Electron and Electron Neutrino in Nucleus and Its effect on D-D Cold Fusion into Helium in Pd
	Tue-11	Norio YABUUCHI	Two Types of Nuclear Fusion in Solids
	Tue-12	M. Ban	Tunnel Resonance of Electron Wave and Force of 1/f Fluctuation
	Tue-13	I. Savvatimova	Low Energy Nuclear Reactions Induced by D ₂ Gas Permeation through Pd Complexes. (Y. Iwamura 2004 effect).
	Tue-14	A. Kitamura	In-situ Accelerator Analyses of Palladium Complex under Deuterium Permeation

Tue-15	J Tian	Heat Response Triggering by a YAG Frequency Double Laser in a D/Pd Gas-loading System
Tue-16	G. Conforto	Coherence between application and fundamental research
Tue-17	R.M. Montereali	A Novel LiF-based Detector for X-ray Imaging in Hydrogen Loaded Ni Films under Laser

Session 4 Chair: A.Lipson / Y. Iwamura

15:00-15:30	Tue-18	Talbot A. Chubb	Plan to Study the Interface between Insulators and Transition Metals
15:30-16:00	Tue-19	Xing Z. Li	Multiple Scattering of Deuterium Wave Function near Surface of Palladium Lattice
16:00-16:30	Tue-20	Savvatimova I.B	The Structural, Chemical and Isotopic Composition Change of the Materials Irradiated By Low Energy Ions in Glow Discharge
16:30-17:00	Tue-21	Vladimir I.Vysotski	Experimental Observation and Combined Investigation of High-Performance Fusion of Iron-Region Isotopes in Optimal Growing Microbiological Associations
17:00-17:30	Tue-22	A.B.Karabut	Research into Low Energy Nuclear Reactions in Cathode Sample Solid with Production of Excess Heat, Stable and Radioactive Impurity Nuclides
17:30-18:00	Tue-23	Y. Toriyabe	Elemental Analysis on Palladium Electrodes after Pd/Pd Light Water Critical Electrolysis

International Advisory Committee

Wednesday, November 30

Nuclear Physics Approach

Session 5: Chair: P.Hagelstein / A.Takahashi

9:00-9:30	Wed-1	A.G. Lipson	Reproducible Nuclear Emissions from Pd/PdO:Dx Heterostructure during Controlled Exothermic Deuterium Desorption
9:30-10:00	Wed-2	A.S. Roussetski	Correct Identification of Energetic Alpha and Proton Tracks in Experiments on CR-39 Charged Particle Detection during Hydrogen Desorption from Pd/PdO:Hx Heterostructure
10:00-10:30	Wed-3	George H. Miley	On Aspects of Complex Nuclei in LENR Relative to Transmutation Reactions and X-ray Emission from Localized Clusters
10:30-10:50		<i>Break</i>	

10:50-11:20	Wed-4	J. Kasagi	Kinematical Measurements for the D+D p+t Reaction in Metal at Ed ~ 10 keV: Are Target Deuterons in Motion before Collide?
11:20-11:50	Wed-5	Yeong E. Kim	Unifying Theory of Nuclear Fusion Based on Quantum Plasma Fusion Mechanism for Low-Energy Nuclear Reaction and Transmutation Processes in Deuterated Metals, Acoustic Cavitations, and Deuteron Beam Experiments
11:50-18:30		<i>Lunch & Tour</i>	
19:00-21:00		<i>Banquet</i>	

Thursday, December 1

Material Science

Session 6: Chair: E.Storms / K.Ota

9:00-9:30	Thu-1	A.G. Lipson	Evidence of Supersoichiometric H/D LENR Active Sites and High Temperature Superconductivity in a Hydrogen-Cycled Pd/PdO
9:30-10:00	Thu-2	Francesco CELANI	New procedure to make active, fractal like, surfaces on thin Pd wires
10:00-10:30	Thu-3	M. McKubre	Using Resistivity to Measure H/Pd and D/Pd Loading; Method and Significance
10:30-10:50		<i>Break</i>	

Excess Heat

10:50-11:20	Thu-4	Tadahiko Mizuno	Anomalous Energy Generation during Conventional Electrolysis
11:20-11:50	Thu-5	Pierre Paul CLAUZON	Abnormal Excess Heat observed during Mizuno-type Experiments
11:50-13:30		<i>Lunch</i>	
13:30-15:00		Poster Presentation (Chair: A.Kitamura)	
	Thu-6	Afonichev Dmitriy D	High-frequency radiation during the vacuumization of the titanium alloy samples previously saturated by deuterium
	Thu-7	I.Savvatimova	Unusual Structures on the Material Surfaces Irradiated by Low Energy Ions and in Other Various Processes
	Thu-8	K. Iizumi	Heat Measurement during Plasma Electrolysis

Thu-9	Hiroshi Yamamoto	An Explanation of Earthquake by BlackLight Process and Hydrogen Fusion
Thu-10	S. Taniguchi	ICP-MS Analysis of Electrodes and Electrolytes after HNO ₃ /H ₂ O Electrolysis
Thu-11	A.G. Lipson	Generation of DD –Reactions in a Ferroelectric KD ₂ PO ₄ Single Crystal During Transition Trough Curie Point (T _c = 220 K)
Thu-12	T. Toimela	Multiple Resonance Scattering
Thu-13	Q. Wang , J. Dash	Effect of an Additive on Thermal Output during Electrolysis of Heavy Water with a Palladium Cathode
Thu-14	Ludwik Kowalski	Searching for excess heat in Mizuno-type plasma electrolysis
Thu-15	A.B.Karabut	Research into Energy and Temporal Characteristics of X-ray Emission from Solid State Cathode Medium of High-Current Glow Discharge
Thu-16	Rainer W. Kühne	Hitler's Cold Fusion Bomb?
Thu-17	Yu.N. Bazhutov	Possible Generation of Neutron Bursts in Framework of Erizon Model & Their Registration
Thu-18	A. Spallone	Measurements of Resistance Temperature Coefficient at H/Pd Overloadings

Session 7: Chair: F.Celani / T.Itoh

15:00-15:30	Thu-19	Edmund Storms	Description of a Sensitive Seebeck Calorimeter used for Cold Fusion Studies
15:30-16:00	Thu-20	Thomas O. Passel	Excess Heat from Glow Discharges in Deuterium Gas
16:00-16:30	Thu-21	Bin Liu	“Excess Heat” Induced by Deuterium Flux in Palladium Film
16:30-17:00	Thu-22	S. B. Krivit	Introduction to A Novel Method for Cold Fusion/Condensed Matter Nuclear Reactions
17:00-17:30	Thu-23	V.I.Vysotskii	Observation and Investigation of He ⁴ Fusion and Self-Induced Electric Discharges in Turbulent Distilled Light Water

Friday, December 2

Session 8: Chair: V.Violante / K.Matsui

9:00-9:30	Fri-1	J.-P. Biberian	Excess Heat observed during Electrolysis of Deuteriated Phosphoric Acid with Palladium Electrodes and a Solid State Electrolyte in Deuterium Gas
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9:30-10:00	Fri-2	Fulvio Frisone	Theoretical Comparison between Semi-Classic and Quantum Tunneling Effect
10:00-10:30	Fri-3	Andrei G. Lipson	Enhanced First Wall Damage in ITER Type TOKAMAK Due to LENR Effects
10:30-10:50		<i>Break</i>	

General Consideration & Summary

10:50-11:20	Fri-4	F.A. Gareev	Stimulation Mechanisms of Low Energy Nuclear Reactions Using Superlow Energy External Fields
11:20-11:50	Fri-5	Peter Gluck	Developing Creative Thinking Methodologies for CMNS, aiming Complete Understanding and Technology Level Reproducibility
11:50-12:10		Xing Z. Li	Summary of ICCF12 and future work
12:10-12:20		K. Ota	Closing remarks

NO PHOTOGRAPHING, NO VIDEO RECORDING in the conference presentation, unless permitted in advance by both the presenter and the conference organizer.

Progress for Condensed Matter Nuclear Science*

A. Takahashi

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A brief review of recent progress of CMNS (Condensed Matter Nuclear Science) is presented. Key aspect of consequences from recent experimental researches is of concluding Clean Deuteron-related Fusion (Cold Fusion) and Cold Transmutations of host and added metal nuclei taking place under the environments of surface and/or near surface of condensed matter, for instance metal/deuterium and metal/hydrogen systems^{1,2}. Nano-meter-scale-surface modification of metal/D(H) test samples and external stimulations are about to be concluded as conditions for reproducibility. This will be the emergence of new field of CMNS and its application will be expected to portable clean nuclear energy devices and remediation of radioactive wastes from existing fission power plants.

The content of the lecture will be the following:

- 1) Brief history of CF claims and research projects (NHE-project) and works in 1989-2000.
- 2) Major experimental results after 2000, which have given concrete evidences of new kind of nuclear reactions closely related to the environment of condensed matter physics and chemistry. Excess heat with He-4 production in quantitative correlation has been confirmed by many groups by various experiments. Selective transmutation with mass-8 and atomic-number-4 increase of host and added metal nucleus has been reported with 100% reproducibility. Transmutation and excess heat was observed in Ni/H systems.
- 3) Efforts for theoretical modeling have also been accumulated in these years. Key issues, namely how to overcome strong Coulomb barrier, how new out-going channel to ⁴He to be possible, what is route to cold transmutation and even fission, etc., have been tried to explain by various ideas of theoretical models. These are Deuteron cluster fusion model by EQPET/TSC, Coherent fusion by nuclear-lattice-phonon gage transformation model, Lattice-induced ion-band state coherent fusion model, Resonant tunneling model, Bose-Einstein condensation model, Polynutron reaction model, and some weak interaction models. Brief and critical review on models is given. The dynamic ordering and constraint environments in condensed matter may have key role to induce new class of fusion and transmutation reactions in metal/D(H) systems.
- 4) Application of major results to energy and remediation projects will be very briefly discussed.

Conclusion is for the emergence of new interesting research field of Condensed Matter Nuclear Science.

References)

1. A. Takahashi: Deuteron cluster fusion and related nuclear reactions in metal-deuterium/hydrogen systems, *Recent Research Developments in Physics*, Transworld Research Network, India, 6(2005), pp.1-28: ISBN=81-7895-171-1
2. A. Takahashi: Condensed Matter Nuclear Effects, Proc. IMFP2005, Int. Meet. Frontiers Physics, 25-29 July 2005, Kuala Lumpur, to be published by Malaysian Institute of Physics, see also <http://www.lenr-canr.org/> And ppt of Siena2005, at <http://www.iscmns.org/>

* For Key-Note-Lecture at ICCF12, November 28 2005, Yokohama, Japan

Progress in Electrolysis Experiments at Energetics Technologies

I. Dardik, H. Branover, A. El-Boher, E. Greenspan, B. Khachaturov, V. Krakov, S. Lesin, M. Tsirlin and T. Zilov,

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ABSTRACT

Using the electrolytic cells described in our ICCF-11 paper driven with Dardik's modified SuperWaves, we have succeeded obtaining significant excess heat with seven different Pd foils. Several of the successful foils were provided by Dr. Vittorio Violante of ENEA, Frascati. By "significant excess heat" we mean that the output power exceeds the input power by at least 100%. The maximum excess heat obtained is 600%; it lasted for 24.5 hours. The longest period of excess heat generation we obtained was 134 hours; the level of the excess heat generation was 150%.

A new type of experiments was initiated this year in which the electrolytic cells are exposed to ultrasonic waves. Two sets of experiments were performed – deuterium loading by the ultrasonic waves without applying a current through the electrolyte; and exposing the Pd cathode to a combination of electrolysis and cavitation induced by the ultrasonic waves. It was found that when the ultrasonic induced cavitation is super-imposed on loading by electrolysis, the maximum loading achieved is very high – exceeding $D/Pd=0.95$, even when using a low current density of $\sim 10 \text{ mA/cm}^2$. Unfortunately, the cell these preliminary experiments were done in did not have a calorimeter. A new experimental setup for the ultrasonically excited electrolysis having a good calorimeter was recently put into operation. The acoustic power available in this experimental setup is $5\div 20 \text{ W}$ and the wave frequency is either 16 KHz or 38 KHz. Presence of cavitation is verified by registration of sonoluminescence in the cells.

X-ray studies were undertaken of the deuterium concentration and phase composition in the Pd-D cathodes that were exposed to a combination of electrolysis and ultrasonic waves. It was found that the ultrasonic wave enhances not only the deuterium concentration, but also the stability of the β -phase of Pd-D. Electron-microscopy analysis has shown that the ultrasonic wave resulted in formation of local structures of so-called "negative crystals". Selected targets are being analyzed using also differential scanning calorimetry, micro-thermo-gravimetry, TOF SIMS and dynamic SIMS.

Progress in Excess of Power Laser Triggering

V.Violante¹, M.Bertolotti², C.Sibilia², E. Castagna², F.Sarto³, M. McKubre⁴, F. Tanzella⁴

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A three years research activity has been developed in the field of triggering anomalous effects in metals hydrides/deuterides to be ascribed to nuclear processes. An enhancement of the excess of power reproducibility in deuterated palladium was obtained by using HeNe laser irradiation during electrochemical loading and a preliminary correlation between excess of energy and helium-4 concentration increasing above the background was found. The continuation of the experimental program confirmed the effect of the laser triggering in gaining a satisfactory reproducibility.

A new experimental set-up was designed and realized to upgrading the calorimetric system and the helium seek. The future work will be oriented to merge material science and triggering in order to gain an enhancement of the excess of power signal.

Calculations of Nuclear Reactions Probability in a Crystal Lattice of Lanthanum Deuteride

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For calculations of probability of nuclear reactions of hydrogen isotopes in the crystal lattice of lanthanum deuteride the dynamic model of electron orbitals deformation (EODD) offered earlier for palladium deuteride was used [1-2]. The hydrogen isotopes predominantly occupy tetrahedral sites in the face-centered cubic lattice of lanthanum hydride. A symmetrical position of deuterium atoms concerning the edge connecting two adjacent tetrahedral sites in lanthanum was selected as initial conditions for numerical experiments. In a series of computer experiments the probability of D-D approach for random initial conditions was calculated, when initial energies of approaching deuterons were set in the range of energies 0.05-0.43 eV (the potential barrier for diffusion of deuterium atoms in lanthanum is about 0.43 eV). For each experimental value of D-D approach the reaction rate was calculated on the shifted Coulomb potential with the shift energy, which equals to the energy of screening [1-2].

The series consists of 28300 experimental values. The mean distance of D-D approach on all series equals 0.66 angstroms, that exceeds the mean distance in a molecule D-D. However, more than 24% of all experimental values show an approach of deuterons for a distance less than 0.1 angstroms. If one considers the reaction rate at each case of approach, and then averages as a whole on the entire sample, the general reaction rate for the given set of the initial conditions will make $10^{3.15} \text{ DD}^{-1} \text{ s}^{-1}$. It is 3 orders of magnitude less, than the analogous rate calculated earlier for palladium deuteride [2], but more than 1 orders of magnitude higher than for titanium deuteride [3]. For optimization of calculations the most favorable initial conditions were selected. As a result the rate of the reaction calculated according to the above model should be additionally multiplied by a correction factor [1], which allows for the probability of the occurrence of these favourable conditions. At calculation of this factor it is necessary to take into consideration, that the content of deuterium in lanthanum deuteride is 6 times higher, than in palladium deuteride, and quantity of atoms of deuterium in adjacent tetrahedral positions is 32 times higher, than in adjacent octahedral positions $\text{PdD}_{0.5}$. Besides it is necessary to take into account, that in LaD_3 there are close arranged adjacent octahedral and tetrahedral positions occupied by deuterium. Thus, if it would be able to provide high mobility of deuterons in LaD_3 crystal lattice, the reaction rate will be close on the order of magnitude to the rate calculated earlier [2] and experimentally observed in palladium deuteride (see, for example, [4] and reviews in [1,5]).

Because of small difference of parameters of crystal lattices of other rare earth metals and also yttrium deuterides a reaction rate of nuclear fusion in them could be practically equal those for a palladium deuteride, that is $10^{-12} - 10^{-14} \text{ DD}^{-1} \text{ s}^{-1}$. As the cost of a natural mixture of rare earth elements is tens times lower than of the same mass of palladium, and their abundance in the nature is much higher than more precious metal - palladium, the rare earth metals can be very perspective catalyst for cold nuclear fusion.

This work was supported by the RFBR (grant No 05-05-64930).

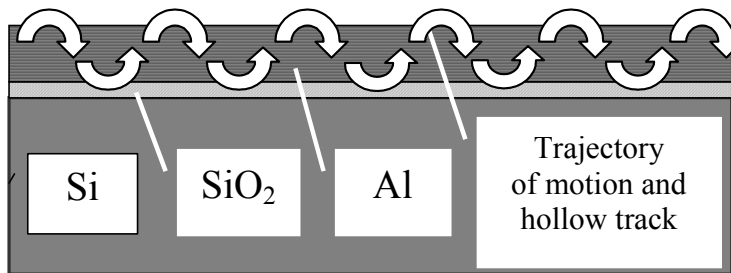
1. V.A. Kirkinskii, Yu.A Novikov. Theoretical modeling of cold fusion. – Novosibirsk: Novosibirsk State University, 2002, 105 p.
2. V.A. Kirkinskii, Yu.A Novikov. Numerical Calculations of Cold Fusion Rates in Metal Deuterides. *Europhysics Letters*, 2004, v. 67, No 3, pp. 362-368.
3. V.A. Kirkinskii, Yu.A Novikov. Calculations of Nuclear Reactions Probability in a Crystal Lattice of Titanium Deuteride, 2004, Proceedings of ICCF-10 (<http://www.lenr-canr.org/acrobat/Kirkinskiicalculatio.pdf>).
4. V.A. Kirkinskii, V.A. Drebuschak, A.I. Khmelnikov. Excess Heat Release During Deuterium Sorption-Desorption by Finely Powdered Palladium Deuteride. *Europhysics Letters*, 2002, v. 58, No. 3, pp. 462-467.
5. P. Hagelstein et al. New Physical Effects in Metal Deuterides. (<http://www.lenr-canr.org/acrobat/Hagelsteinnewphysica.pdf>).

Observation, Investigation and Modeling of the Ordered Motion of the Hypothetical Magnetic-Charged Particles on the Multilayer Surface and the Problem of Stimulated Low-Energy Fusion

Stanislav V. Adamenko¹, Vladimir I. Vysotskii^{1,2}

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During the experiments at Electrodynamic Laboratory "Proton-21" on achieving the superdense state of the matter (the state of electron-nuclear collapse [1,2]) by using the high-current electron driver, the traces of strongly ordered thermomechanical impact on surfaces of the multilayer targets (standard MIS structures) were registered. Each trace looked like the ideally ordered hollow mechanical breakage of oscillating trajectory type with the constant period that is periodically goes deep into the target volume up to the Si substrate and then returns back to its surface. The surface of the target was placed perpendicular toward the direction to the



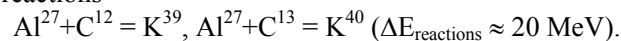
collapse zone within the distance of 10 cm. The target was composed from Si plate covered with the thin SiO₂ and Al layers. The trajectory (oscillating periodical trace) looked like the hollow channel in the volume of Al and SiO₂ with the average diameter near 2 microns and the period approximately $\Lambda \approx 60$ microns with the length more than 2000 microns. Near the places of periodical outs from Al volume

onto the target surface numerous melted Al drops are present. Through the whole trace trajectory (along the both sides of mechanical break) the presence of foreign chemical elements with $A=39-40$ was revealed by SIMS. Evaluations taking into account full thermal and mechanical work that is necessary for destroying and melting of the surface and the upper layers volume along the trace result in $\Delta Q_{\text{tot}} \approx 2 \cdot 10^5$ GeV for full energy-release and $dQ/dl \approx -10^6$ GeV/cm for specific energy-release.

Possible mechanism of the origin of such traces is also discussed in this paper.

It is supposed that it is connected with interaction of hypothetical magnetic-charged particles (which could burn in the collapse zone [2]) with the different layers of the target surface, the combination of paramagnetic (Al) and diamagnetic (SiO₂ and Si) materials. The mechanism of forming the oscillating trajectory is considered.

Predicted is a source of the enormous energy-release resulted in the mechanic breakage and melting of the aluminum along the trace volume. The possible mechanisms of such energy -release is connected with accelerated low energy fusion reactions



The presence of the carbon in minor quantities on the Al surface is connected with the functioning of oil pumps in the experimental set-up vacuum system. These reactions can be stimulated and accelerated within many orders by the influence of superpower magnetic field of the hypothetical magnetic-charged particles onto electronic shell and nuclei of the atoms. Considered are the such possible mechanisms of interactions which result in effective low-energy nuclear fusion with the experimental reaction speed evaluation

$$\lambda \approx 10^{14} \text{ (Al-C nuclear reactions over a second per one magnetic-charged particle).}$$

1. Adamenko S.V., Vysotskii V.I. Mechanism of synthesis of superheavy nuclei via the process of controlled electron-nuclear collapse //Foundations of Physics Letters, v. 17, No. 3 (2004), p. 203-233.

2. Adamenko S.V., Vysotskii V.I. Evolution of annular self-controlled electron-nucleus collapse in condensed targets //Foundations of Physics, v. 34, No. 11 (2004), p. 1801-1831

Theoretical Modeling of Electron Flow Action on Probability of Nuclear Fusion of Deuterons

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Electrons play important role in cold fusion reactions. Earlier it was shown a screening of deuterons by electrons of outer metal shells, and a rate of d-d reaction in palladium deuteride was calculated [1, 2]. In the present work we conducted theoretical modeling of deuteron interaction under the action of free electron flow.

A behavior of deuterium atom D under influence of electron flow is simulated in the frame of the classical mechanics. Interaction of particles obeys the Coulomb law. Trajectories of particles are calculated by means of numerical solution of system of differential equations. The initial distance between incident electrons and deuteron is 1 Å; the incident electrons kinetic energy obeys the Fermi distribution with parameters, specific to free electrons in a crystal of Pd at room temperature. The flow of incident electrons is isotropic; the aiming distance is limited by the value of 0.53 Å. When one of electrons fly out to a distance more than 10 Å, the residual system $d+e^-$ (non-stationary state of deuterium atom D^*) is bombarded by a new free electron, and so on. Over 10^4 histories with up to 100 free electrons in each of them were simulated. The significant part of collisions of electron with D^* results in decrease of energy of D^* and its size. The distance r electron from deuteron in the apogee of the orbit was accepted as a size of D^* . The density functions of D^* size $f(r/l)$ were obtained ($l \leq 100$ is a quantity of an D^* and free electrons collisions, subjected to the Poisson distribution $P_a(l)$ with the parameter a ; the mean quantity of collisions a is proportional to electron flux density and to the time). These distributions were used for calculations of reaction rate for nuclear fusion in deuterided crystal of Pd.

The main contribution to reaction rate make small D^* ($r \sim 0.001$ Å), that have a high mobility. So, the crystal lattice does not strongly interfere with $D^* - D^*$ collisions. Let n and N be the concentration and full quantity of D^* atoms in the working volume of crystal. Fractional reaction rate λ is equal to

$$\lambda(a) = -\frac{1}{N} \frac{dN}{dt} = \sum_{l=0}^{100} \sum_{m=0}^{100} P_a(l) P_a(m) \frac{n}{2} \int_0^\infty dr_1 \int_0^\infty dr_2 f(r_1 | l) f(r_2 | m) \int_0^\infty dE v \sigma[v(E)] F_M(E),$$

where $E = \mu v^2/2$; μ – reduced mass of deuterons pair; v – relative speed of deuterons; $F_M(E)$ – Maxwell distribution at room temperature. The cross-section of $D^* - D^*$ collisions which result in fusion reactions in quasiclassical approximation is $\sigma[v(E)] = S_0 P(E)/E$, where $S_0 = 0.55 \cdot 10^{-19} \text{ cm}^2 \text{ eV}$; $P(E) = \exp\{-4\pi h^{-1} \int_0^R [2\mu(V(r) - E)]^{1/2} dr\}$, $R = V^{-1}(E)$. The screening action of the orbital electrons of D^* atoms is taken into account by means of the potential: $V(r) = e^2/r - e^2/(r_1 + r_2)$, when $r < r_1 + r_2$, $V(r) = 0$, when $r > r_1 + r_2$.

Averaging over $a \leq 100$, that is equal to averaging over the time, yielded a result $\lambda \approx 10^{-4} \text{ s}^{-1}$, that is by a factor of 10^6 greater than value, obtained in [1, 2] using electron orbital deformation dynamic model (EODD).

It is necessary to point out that with relation to the quantum mechanics, D^* is not a kind of hypothetical atomic states with energies less than the ground state energy. But one should consider D^* as non-stationary configuration within multi-particle non-radiating system.

In the used model we did not take into account the electromagnetic radiation by electrons. Such an approximation in which elastic interactions only are involved is widely used in quantum mechanics for particle scattering calculations and also for other tasks which are in good accordance with experimental data.

This work was supported by the RFBR (grant No 05-05-64930).

1. V.A. Kirkinskii, Yu.A. Novikov. Theoretical modeling of cold fusion. – Novosibirsk: Novosibirsk State University, 2002, 105 p.
2. V.A. Kirkinskii, Yu.A. Novikov. Numerical Calculations of Cold Fusion Rates in Metal Deuterides. Europhysics Letters, 2004, v.67, No 3, pp.362 – 368.

Neutron Isotope Reactions

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It is suggested that neutron clusters of sufficient size are bound and stable against strong decay and that these massive neutron isotopes can react with ordinary nuclei by transferring neutrons to them, accepting neutrons from them, and binding with them to form composite nuclei. Implications of this enlarged scope of nuclear physics are explored, including chain reactions with ^{18}O and ^2H that produce energy, ^4He , ^3H , and other nuclear products. This approach provides a natural explanation for a range of novel nuclear phenomena for which evidence has been accumulating over the past fifteen years. It provides a theoretical framework for guiding future research and for exploring potential applications to energy generation and to other nuclear processes.

Mechanism of ^3T and ^4He formation via low energy nuclear reaction.

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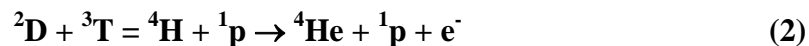
The occurrence of cold nucleus fusion (CNF) by the tritium channel is often assumed as the most advanced mechanism of interaction $\text{D}+\text{D}$ in the metallic matrix [1, 2]. However, a number of papers being devoted to cold nuclear fusion noted the creation of ^4He [3,4].

When the concentration of deuterium is more than 10 at. %, the distance between atoms of deuterium in the metallic matrix is close to the distance between them in the liquid state. As known, the distribution of hydrogen isotopes in metal is highly non-uniform. That is why while considering the state of deuterons one should also take into account their mutual interaction. It is assumed that ions D_2^+ should form in linear defects of the crystal structure.

It is known that CNF occurs in the vicinity of the sample surface. The proposed mechanism of the process of interaction of pairs in ions assumes accelerated movement of ions D_2^+ and DT^+ along the linear defects in the alternating field of the crystal lattice. The interaction of particle pairs in ions occurs due to the resonance transportation of a neutron from one deuterium to another resulting in proton and ^3T formation



or from a deuterium to a tritium resulting in proton and ^4He formation.



The ratio of reaction velocities may change depending on chemical composition of the alloys and surface structure of the samples studied and other experimental conditions.

1. BARC Studies in Solid Fusion/Eds P.K. Iengar, M. srinivasan.- BARC-1500.- Trombay; Bombay, India: Bhabha Atomic Research Center, November, 1989.
2. Clarke B; Fusion Sci. Technol. 2001, 40 p. 147.
3. Bush B. F., Lagowski J. J. J. Electroanal. Chem, 1991, V. 304, p. 271-278.
4. Case L.C., Catalytic Fusion of Deuterium into Helium-4. in ICCF7, 1998. Vancouver, Canada: ENECO, Inc., Salt Lake City, UT.

Quantum Theoretical Heating Mechanism of Deuteron Precipitates Imbedded in Al on
Electron Bombardment
Spin-Flip-Phonon- Maser Action of Deuteron Nucleus-

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This paper deals with the theoretical explanation of the experimental results reported in previous papers (1,2), demonstrating the anomalous melting of Al surface layer, which contains large precipitates of D_2 molecules on the energetic deuteron implantation. The melting occurs during the observation in electron microscope. The most significant features of the phenomenon are that the melting of Al surface is observed only with the deuterium precipitates, but never observed with the hydrogen precipitates, and further, it is not associated with any nuclear product.

Quantum theoretical heating mechanism is presented. The mechanism is based on the spin-flip- phonon-maser action, specially on the Raman process, of deuteron nucleus in a strong magnetic field as previously reported to explain the heating of heavy water on acoustic wave propagation (3), and gives large enough energy to explain almost quantitatively the melting.

Very crude scenario of the present mechanism is as follows;

- 1) 200 keV electrons of the electron microscope produce internal secondary electrons in Al;
- 2) some of the secondary electrons impinge into the deuterium precipitates and produce wide band incoherent phonons because of the higher velocity of the electrons than the sound velocity in the precipitates, similarly to the *Cerenkov* Radiation in water
- 3) some of the incoherent phonons thus formed produce pumping excitation and another part of them induce coherent phonons through the Raman process working on the spin scheme of the deuteron nuclei, which have the nuclear quadrupole moment, under the strong magnetic field of the electron microscope; and finally,
- 4) thus induced coherent phonons produce enough energy for the melting of the sub-surface region of the Al.

(1) K.Kamada, H.Kinoshita and H.Takahashi; Jpn.J.Appl.Phys.35 (1996) 738.

(2) K.Kamada, Y.Katano, Y.Enokido et al.; Rad.Eff. in Solids, 157 (2002) 275.

(3) K.Kamada, I.Yoshizawa; J.Phys.Soc.Japan 37 (2004) 826.

1) Professor Emeritus of NIFS

Thermal Conduction from the Centers of the Nuclear Reactions in Solids

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Abstract

If nuclear reactions happen in solid, heat generated from the reaction center is diffused. In this study, we theoretically consider the thermal conduction from the centers of a DD reaction in solid as a simplified model. The void in solid is assumed as the site of the reaction center. We consider DD reactions induced by Bose-Einstein condensation at the site. [1]

Equations of the thermal conduction are solved using Fourier expansion. The calculated results show the rapid temperature relaxation. This means that thermal explosion will not happen.

References

1. K.Tsuchiya, "Quantum States of Deuterons in Pd ", International Journal of Hydrogen Energy, **29**(2004)1513

Magnetic Interaction of Hypothetical Particles moving beneath the Electrode/Electrolyte Interface to Elucidate Evolution Mechanism of Vortex Appeared on Pd Surface After Long-term Evolution of Deuterium in 0.1M LiOD

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Long-term electrolysis for well annealed thick Pd rod (9.0 mm ϕ) in 0.1M LiOD was performed. High count rate of neutron appeared after the current increased to c.a. 100mA/cm² and the temperature was raised to 50 $^{\circ}$ C¹⁻². Microscopic observation of the 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; vortex¹⁻². In-situ measurement of the hydrogen/deuterium loading behavior of the Pd-H (D) system³ and the measurement of solid-state properties of the post electrolysis Pd⁴ revealed the micro structural model inside the solid (N-cycle reaction model, also see Ref.3), which improves reproducibility of cold fusion related phenomena. An important process in that model is the motion of deuterium from a vessel to other one and /or to surface, 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 (LGCA) is utilized for simulating the Poiseuille flow with the boundary condition incorporating the motion of the hypothetical particles fluid. An advanced LGCA simulation has been performed adopting the advanced Inflow and Outflow boundaries under particle generation and disappearance conditions⁵⁻⁶. The LGCA simulation result (Fig. 1) showed that the vortex axis appeared along the electrode surface due to the coincidental flow of the hypothetical particles (shown as arrows in the Fig.1). However, by comparing the vortex patterns obtained by the LGCA simulation and the post electrolysis Pd surface observation the vortex with the leaned axis along the electrode can only be acceptable to describe the motion of the hypothetical particles. This means that the force might exert on the vortex motion of the particles during these traveling in either an electromagnetic or magneto-magnetic sense. Preliminary calculation of magnetic field density has been performed using ANSYS in the vicinity of the electrode and the electrolyte bulk⁶. It was apparent that the amplitude of magnetic field density of the electrode was 3 times higher than those of the electrolyte. It is recognized that the electromagnetic interaction of atoms possessing an unpaired electron spin with a given magnetic field yields the force exerting on the orbit of an atom beam (Stern & Gerlach 1921). In this poster the LGCA result of the hypothetical particles' motion, that is, the massive electrons, protons, neutrons and neutrino, particularly possessing 1/2 spin (charged or uncharged) will be presented associated with the forces exerted on the axis of the vortex. More exact maps of magnetic field at the electrode/electrolyte interface will also be presented for discussion.

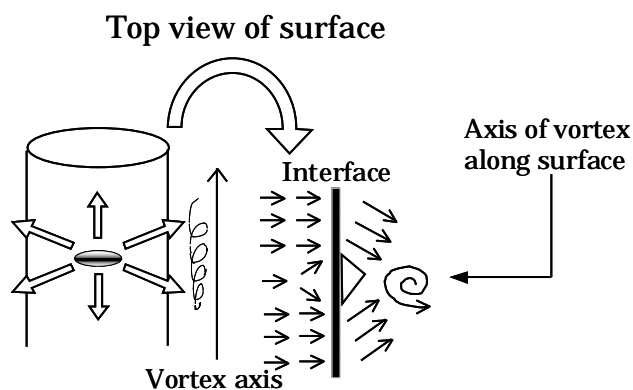


Fig.1 Schematic view of vortex with axis along electrode obtained by numerical simulation.

1. R. Takagi, et al.: Neutron Emission during a Long-term Electrolysis of Heavy Water, Fusion Technol., **19**, 2135-2139(1991)
2. H. Numata et al.: Neutron Emission and Surface Observation during a Long-term Evolution of Deuterium on Pd in 0.1M LiOD, Conf.Proc.Vol.33 of ACCF2, "The Science of Cold Fusion", p.71-79 (1991)
3. H. Numata and I. Ohno: In-situ Potentiometric, Resistance and Dilatometric Measurements of Pd Electrode During Repeated Electrochemical Hydrogen Absorption, Fusion Technol., **38**, 206-223(2000)
4. H. Numata and M. Fukuhara: Low-Temperature Elastic Anomalies and Heat Generation of Deuterated Pd, Fusion Technol., **31**, 300-310(1997)
5. Y. Matsukuma and R. Takahashi, JSME, **61-588, B**, 2826-2832 (1995)
6. H. Numata and M. Ban: Simulation approach to elucidate evolution mechanism of vortex appeared on Pd surface after long-term evolution of deuterium in 0.1M LiOD, Proc. JCF6, in press, Apr.27-28, 2005

Heat Response Triggering by a YAG Frequency Double Laser in a D/Pd Gas-loading System

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In recent years anomalous heat triggering by a laser is an effective way to “cold fusion” research. And a gas-loading system is more sensitive than electrolysis one in heat-detecting ability because the former has a less heat capacity than that the latter has. In our latest work, which is intended to see the anomalous heat effect triggering by a YAG frequency double laser in a D/Pd system, the correlation between the laser power and the “excess heat response” were investigated under some different loading ratios. When the laser power input was 10 mW, the maximum “heat response power” measured was 22.6, 10.3, 9.0, 11.7, 14.2 and 18.7mW as the loading ratio was 0.1, 0.25, 0.31, 0.46, 0.58 and 0.68 respectively whereas both heat response and loading-ratio were considered as zero. When the power was 30 mW, the “heat response powers” were 19.0, 54.6, 56.2, 56.5, 49.6 and 45.0mW as the ratio were 0.17, 0.25, 0.31, 0.39, 0.59 and 0.68 respectively. And when the power was 50 mW the “heat response powers” were 8.9, 13.5, 18.1, 11.2mW respectively as the ratio was 0.25, 0.30, 0.46 and 0.58. There seem not is any apparent “excess heat” occurred in the system, but the “heat response power” has some correlation indeed with the loading ratio under a certain laser power input. This result may have some help in “excess heat” acquisition by a laser’s triggering in a gas-loading system. According to the SRT model raised by Dr. Li^[1,2] there must be a suitable environment in crystal lattice if two nuclei inside collide and fuse into a heavier one through a tunneling manner.

1. Xing Z. Li, Jian Tian, M.Y. Mei, Cong X Li. Sub-Barrier Fusion and Selective Resonant Tunneling, Physical Review C, Vol. 61 No.2, 2000,p.4610.
2. Xing Z. Li, Bin Liu, Jian Tian, Qing M. Wei, Rui Zhou and Zhi W Yu. Correlation between Abnormal Deuterium Flux and Heat Flow in a D/Pd System, Journal of Physics D: Applied Physics, 38 ,1-3 2003

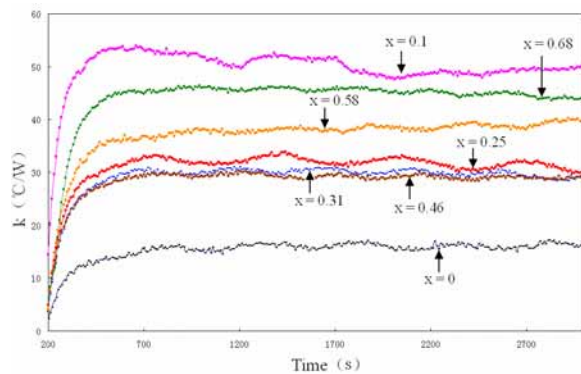


Fig.1

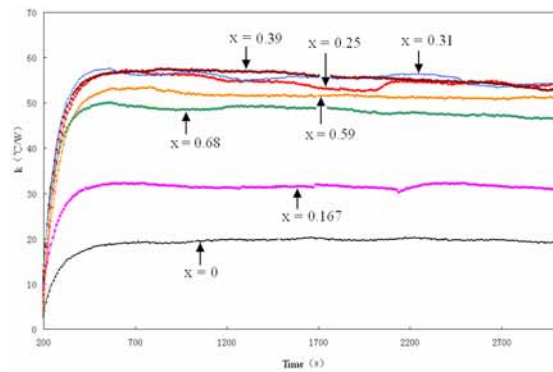


Fig.2

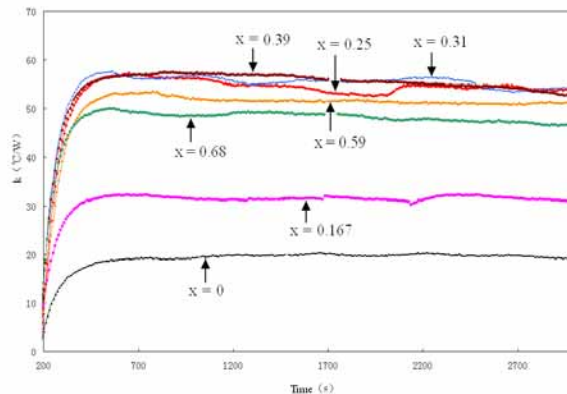


Fig.1 The variation of heating response by 10mW laser spotted on a hydride that has different loading ratio

Fig.2 The variation of heating response by 30mW laser spotted on a hydride that has different loading ratio

Fig.3 The variation of heating response by 50mW laser spotted on a hydride that has different loading ratio

ICCF12, November 27 – December 2, 2005 Yokohama, Japan

New Energy Times Archives

Production Method for Violent TCB Jet Plasma from Cavity

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ABSTRACT

The TCB(Transient Cavitation Bubbles) jet implant is formed when phenomena like load rejection happens, and it creates a considerable cavity that collapses more violently than the stable cavitation bubbles; therefore, higher energy density in the bubble contents is produced, see figures 1,2.

Implanted jet plasma is a high-density changing energy plasma, and we should expect that this low energy plasma to change. The high-density plasma is acquired via the plasma jet, which is pinched by the changing magnetic forces that are produced through the high velocity plasma electrons. The TCB "Jet" is stabilized by this pinch effect.

One of the hydropower plants in our country has 4 Francis turbines so that two units on the right way(looking downstream) share a common penstock and a common long tailrace tunnel and other two units on the left also share a penstock and tailrace tunnel.

Upon commissioning of one unit, the hydraulic transient in the draft tube during load rejection above 75% was excessive. It was apparent that the guide vane closing law that had been adopted would result in water column separation during load rejection at full power. Tests with a slower closing rate showed that the risk of column separation was reduced, but a violent surge developed in the draft tube close to maximum over speed. The measurement equipment in this experiment has a sampling time of 0.01 sec. The energy level and cavity volume that are produced are much more than those of regular TCB (Transient Cavitation Bubbles) experiments, and therefore, we should expect more effects than the TCB jet.

The helical cavity, which happens in hydro power plants at the time of load rejection, could collapse, and violent TCB jet plasma would be implanted. It seems that it is possible to make simulator of this phenomena (Load Rejection).

The level of collapse energy and frequency is controllable by the use of air injection. It is possible to generate TCB jet plasma for several times by opening and closing of the wicket gates during load rejection, see Fig.3.



Fig1 – Cavity under runner in Model Test

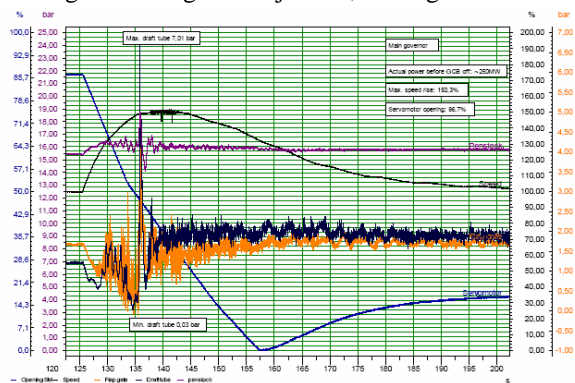


Fig.2-Shows a severe surge during an emergency shout down

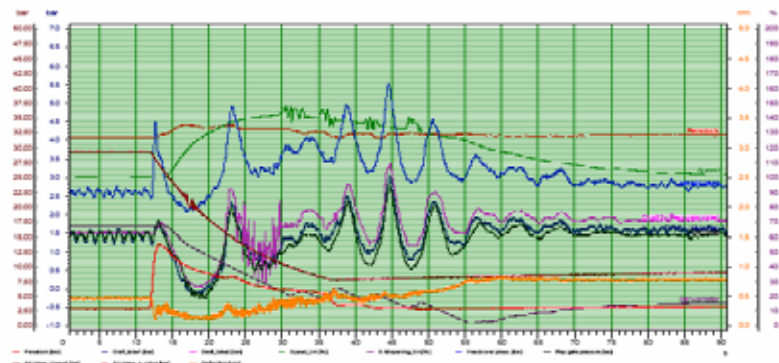


Fig 3- Several TCB jet plasma generation by opening and closing of the wicket gates during load rejection

Coupled-Channel Equations for the 3-Body and 4-Body Problems

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To describe phonon exchange in a nuclear reaction that occurs in a condensed matter environment, we require a description of the nuclear wavefunctions and the associated dynamical equations. We have made much progress on this problem during the past year. We have obtained a definition of the wavefunctions in terms of products of spin, isospin and space using general correlated spatial wavefunctions. We have “scalarized” the Hamada-Johnston interaction by calculating the spin and isospin matrix elements analytically. General coupled-channel equations for the space-dependent part of the problem have been obtained. A goal of this effort is to develop analytic expressions (in terms of the correlated spatial wavefunctions) for the distorted-wave Born approximation for the DD and HD fusion reactions, which can be modified to include phonon exchange. We are also interested in the calculation of interaction potentials that occur in the resonating group method, and the extension of these potentials to include phonon exchange.

Nuclear Diagnostic of Cold Nuclear Transmutation at Electrolysis with Anode Gas Discharge in Water Solutions

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It was fulfilled series of experiments of electrolysis with anode gas discharge. Voltage was (100-400)V. Current amplitude was (1-10)A. Heavy water concentration in electrolyte was (0,017-30)%. Possible addition of Lithium & Potassium in electrolyte was (0-20)%. Titanium was used for cathode, Gold & Tungsten were used for anode. For received results there were used following diagnostic methods: 1) γ -spectrometer based on lowbackground pure Ge-detector (120 ml) & NaI ($\varnothing 63 \times 63 \text{mm}^2$) scintillator detector; 2) Tritium scintillation diagnostic in electrolyte (sensitivity $\sim 0,1 \text{ Bq/ml}$); 3) Neutrons flux diagnostic (sensitivity $\sim 2 \text{ n/cm}^2\text{s}$). Received results of regular reproducibility of neutrons & tritium generation were corresponded to the Erzion model predictions. Large neutron yield reached value of 10^6 neutrons per second with correlated tritium yield value $\sim 10^{11}$ in heavy water & much less in light water. Control experiment predicted in framework of Erzion model suppressed neutron yield down to zero.

Essential Condition of the Solid- State Deuterium Nuclear Fusion (“cold fusion”) Using Double structure Cathode(“DS-cathode”)

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In electrolytical experiments with Double Structure cathode(DS-cathode’),abundant reacting products(helium and excess energy) generated from solidified deuterium nuclear fusion within solid(cold fusion) were detected exactly. In addition, using D₂O or H₂O-liquids as electrolytes and Pd black, nano-particles or bulk metals as cathode materials, the “cold fusion” has been caused in both materials of Pd black and nano-particles using only pure D₂O-electrolysis, but never for bulk metals and also for these all cathode materials using pure H₂O-electrolysis, neither.

To confirm the results from “cold fusion” occurring in cathode materials (generally “sample solid”) are exact, following experimental conditions are necessitated.

1) “Clean sample solid” should be utilized: Sample solid should be kept generally in a high vacuum with long period(~150 , ~50hrs,~10⁻⁷torr) before electrolytical experiments.

2) As a nuclear fuel, pure deuterium with high density than host atoms in “clean sample solid” are nessary. The best condition cause “cold fusion” corresponds to generate “Pycnodeuterium” with ultra high density solidified deuterium which is dispersed innumerably inside sample solids.

3) To clarify the reaction events(reaction elements, excess energy), electrolytical experiments should be continued at least over 1000 hrs. If the experiments period is several hundred hrs., sometime misjudgments will be caused.

4) It is well known that helium never escape from metal and cannot invade into metal from outside under low Temperature such as bellow room temperature, then, if the helium generate in sample solid metal, and the sample metal should be heated over several hundred degree[], the helium certainly release from the sample metal and it can be detected exactly by “QMS”.

5) Using LiOH in D₂O/H₂O- electrolyte, Li⁺ combined with surface of the DS-cathode and prevent D⁺ invading into cathode surface, if the electrolytical experiment was elapsed several hundred hour, to keep the constant electric current the electrolytic voltage becomes higher, then to obtain constant electrolytic condition should be quickly clean the cathode surface. This is important technology.

We have performed exactly with above five items using DS-cathode, and the products of “cold fusion” were detected precisely using a “QMS” connected with a particular apparatus includes “cathode piercing system”. As a result, helium was detected from both inner gas and highly deuterated sample powders inside DS-cathode.

Recently, we try to improve above DS-cathode rise-up “efficiency” as a reactor.

Why *Particular* Nano-Scale PdD Crystals Turn-on Faster

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Two persistent questions have been: 1. Why is it often necessary to wait for a finite period of time before the Excess Heat effect[1] is observed after palladium (Pd) has been sufficiently loaded with deuterium (D), that the near full-loading condition (PdD_x , $0.85 \sim x \rightarrow 1$) that is required for Excess Heat, has been achieved? 2. Is it possible to identify physical properties of the materials and/or crystals that are used that might be playing a role in the length of the interval of time associated with this phenomenon? In the paper, through a generalization[2] of conventional energy band theory, as it applies to infinitely-repeating, periodic lattices to situations involving finite lattices, I have been able to address both questions. The associated theory is based on a generalization Bloch's theorem, in a many-body form for finite lattices. In the generalization, the somewhat vague notion of a quasi-particle is replaced with a rigorous picture in which each energy band state is the relative zero of energy, used to define the classical turning point in the kinetic energy associated with a particular set of indistinguishable fermions or bosons. Reaction rates establish the relative time-scales of potential processes. The ground state (GS) is required to have minimal overlap with states that would be degenerate with it in the limit that far from the boundaries of the solid, a lattice exists, in which the net flux of particles into and away from the lattice vanishes. In the absence of accumulation of charge at the boundary, there is no way to distinguish the zero of energy of a particular many-body state from a second many-body state that is identical to it, except that it is moving, relative to it at a constant uniform velocity. Thus, a huge number of states can be degenerate with the GS as a result of implicit forms of invariance with respect to Galilean transformations that preserve particle-particle separation. As a consequence, significant amounts of momentum can be transferred coherently through Mossbauer-like, rigid translations of a lattice (or sub-lattice) instantly, from the CM, in opposition to an applied electric field, provided outside collisions are stifled. During the prolonged electrolysis of D_2O by PdD a situation that mimics this limit can take place[2,3] as a result of small fluctuations in loading ($\delta = \pm 0.03\%$) in finite $\text{PdD}_{1+\delta}$ lattices. In finite $\text{PdD}_{1+\delta}$ crystals, the associated loading-induced motion of Pd nuclei that results from these fluctuations has a small deuteron component that involves ion band state occupation since each fluctuation extends throughout the solid and carries charge. In large lattices, the ion band states do not conduct appreciable ion charge because for all values of the wave-vector k , their energy ε is the same: $\varepsilon = \varepsilon(k) = \varepsilon(0)$. When this equality holds approximately, the collisions that prevent possible Mossbauer-like, coherent processes are stifled, and the ions effectively mimic the behavior of electrons in an insulator. But then, because collisions are stifled, a phenomenon similar to Zener/Electronic breakdown[4] can take place, in which ions, as opposed to electrons, tunnel into a higher, conducting (ion) energy band state, after a critical period of time. In this form of Zener/Ionic breakdown, the tunneling time depends on crystal size. Crystals with dimensions $< \sim 6$ nm, which have tunneling times \sim microseconds, either can not provide enough momentum to initiate $d+d \rightarrow {}^4\text{He}$ reactions or conduct ions so rapidly that collisions occur. Crystals with dimensions ~ 60 nm create heat and load rapidly (~ 3 ms). But crystals with more than ~ 60 microns have tunneling times that are longer than a month. This suggests that optimal incubation times (as observed by Arata[5]) occur in particular nano-scale crystals.

1. C.G. Beaudette, Excess Heat: Why Cold Fusion Research Prevailed. (Oak Grove Press, Bristol, ME, 2002)
2. S.R. Chubb, "Role of Broken Gauge Symmetry on Conduction of Charged and Neutral Particles in Finite Lattices," submitted to Proc Roy. Soc Series A (2005).
3. S.R. Chubb, "Nuts and Bolts of the Ion Band State Theory," Proc. ICCF10, World Scientific, in press.
4. C. Zener, *Proc. R. Soc. A* **145**, 523-529 (1934).
5. Y. Arata and Y.-C. Zhang, "Development of Compact Nuclear Fusion Reactor Using Solid Pycnodeuterium as Nuclear Fuel," Proc. ICCF10, World Scientific, in press (2005).

Seebeck Envelope Calorimetry with a Pd|D₂O+H₂SO₄ Electrolytic Cell

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After the successful public demonstrations of excess heat in Pd|D₂O+H₂SO₄ electrolytic cells at Boston (ICCF10) in 2003 [1,2]; we verified this anomalous effect using a more accurate method of heat measurement, which is possible with a Seebeck Envelope Calorimeter (SEC).

The experimental arrangement is very similar to that used before [1,2]. A cell is placed in a SEC, which measures the output heat flux directly and avoids many problems of other methods.

The maximum excess power thus far was 1 W, with input power of 13 W at a current density of about 0.4 A/cm².

The calibration experiments were conducted using a Pt|H₂O+H₂SO₄ electrolysis cell, a pure resistor, or a dummy cell with a resistor in it. Calibrations were carried out before and after electrolysis experiments. The calibrations give a consistent device constant within the error range of the measurements.

The SEC results verified that the Pd|D₂O+H₂SO₄ electrolysis system can give excess power. Nevertheless, there are also some unknown parameters affecting the occurrence and the magnitude of the excess power.

Pd cathodes were analyzed by scanning electron microscopy and energy dispersive spectrometry. Unexpected elements are observed on the sample surface after electrolysis.

References:

1. A. Ambadkar and J. Dash: "Electrolysis of D₂O with a palladium cathode compared with electrolysis of H₂O with a platinum electrode: procedure and experimental details", see:
<http://www.newenergytimes.com/Library/2003DashJ-ColdFusionRecipe.pdf>
2. J. Dash and A. Ambadkar: "Co-deposition of palladium with hydrogen isotopes", see:
<http://www.lenr-canr.org/acrobat/DashJcodepositi.pdf>

Phonon-Exchange Models for Anomalies in Condensed Matter Systems with Molecular Deuterium

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We have pursued the phonon-exchange approach to models for anomalies in metal deuterides. Within the models, deuterons need to be close to interact. We have quantified this, and evaluated numerous materials in terms of an associated figure of merit. Progress has been made on the phonon exchange matrix elements, and we report on our new results. The reaction dynamics has been studied with new models that provide insight as to how the dynamics work. Three functions have been identified: tunneling transitions from the molecular system to compact systems and the ground state; receiving transition to angular-momentum stabilized compact states; and the conversion of the nuclear excitation energy to low-energy modes. The new models show how the different functions work within the framework of the model and impact the reaction dynamics.

Observation of Surface Distribution of Products by X-ray Fluorescence Spectrometry during D₂ Gas Permeation through Pd Complexes

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Low energy nuclear transmutations have been observed on the Pd complexes, which are composed of Pd and CaO thin film and Pd substrate, induced by D₂ gas permeation through Pd multilayer complexes. Our experimental method can be characterized by the permeation of D₂ gas through the Pd complex and the addition of an element that is specifically targeted to be transmuted. We already reported transmutation reactions of Cs into Pr, Ba into Sm and Sr into Mo, respectively [1], [2]. In this study, we investigated the relation between Pd surface structure and performed “in-situ” observation of transmutation of Cs into Pr using X-ray Fluorescence Spectrometry at SPring-8 that is a large Synchrotron Orbital X-ray facility.

The Pd complex consists of Pd bulk (25mmX25mmX0.1mm), Pd and CaO complex layer (100nm) and Pd thin film (40nm). Three samples that were already permeated were analyzed by XRF and 2 dimensional XRF spectra were taken. Two kinds of X-ray beam in 100- and 500-micrometer squares were used for this analysis.

We detected Pr by the two kinds of small size X-ray beams as expected. The amount of Pr changed greatly depending on the locations of the Pd surface. Furthermore, peaks that can be considered as La were observed on some points. This element might be localized on specific region. Since we could detect this La like peak at few points using 100-micrometer square X-ray beam, even if no La peak were detected using 500-micrometer square X-ray beam. If we scan by the 100-micrometer beam on the same region scanned by 500-micrometer beam, we get 25(5X5) points. Some of the 25 points revealed the presence of the La like peak, though this peak cannot be distinguished if we use 500-micrometer square beam.

Peaks that can be considered as La, in addition to Pr, were detected from all the three samples and experimental data indicated that XRF spectra changed depending on the locations of the Pd surface. It suggests that transmutation pass or speed varies depend on the Pd surface region since La can be supposed to be transmuted from Cs. However, clear correlation between products and the locations could not be seen under present measurement condition. It would be necessary to use smaller X-ray beam although it would take much more time for XRF measurement.

The authors built up an experimental set-up aiming “in-situ” measurement of transmutation reactions. We made D₂ gas permeated through a Pd complex with Cs for 7-14 days. X-ray fluorescence spectrometry was performed during D₂ permeation “in-situ” at the beginning and the end of experiments. 1mm square X-ray beam was used for the “in-situ” experiments. Pr emerged and Cs decreased at some points after D₂ gas permeation, though any Pr cannot be observed before D₂ gas permeation at all the points on the Pd complex surface. In some cases, La like peak also could be seen at few points.

Above experimental results suggests that nuclear transmutations do not occur uniformly but some unspecified factors, presumably condensed matter effects in the present Pd/D/CaO system, make a lot of effects on the rate of reactions or the process of the reactions. We should clarify the unspecified factors and obtain how to control the present transmutation reactions.

[REFERENCE]

- [1] Y.Iwamura, M.Sakano and T.Itoh, “Elemental Analysis of Pd Complexes: Effects of D₂ gas permeation”, Jpn. J. Appl. Phys., 41 (2002) 4642.
- [2] Y.Iwamura, T.Itoh, M.Sakano, N.Yamazaki, S.Kuribayashi, Y.Terada, T.Ishikawa and J.Kasagi, Proc.of ICCF 11, World Scientific Inc., 2005, to be published..

Discharge Experiment Using Pd/CaO/Pd Multi-layered Cathode

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Among the experimental approaches for the study of low energy nuclear reaction in/on condensed matter, permeation of D through Pd/CaO complex samples is widely recognized as well established technique in which some specific transmutation reactions (e.g. Cs to Pr) have been demonstrated [1]. Although the reaction mechanism has not been clarified theoretically, it has been claimed that the multi-layered structure of the sample, especially for existing CaO layer, as well as sufficient D flux in the permeation through the sample are necessary for triggering the phenomenon.

Besides the permeation method, we have experimentally demonstrated the possibility of inducing low energy nuclear reaction by exposing Pd or Pd deuteride to the discharge in deuterium atmosphere. For example, we have reported the detection of nuclear products and anomalous gamma ray emission [2,3]

Considering those experimental results, we perform the discharge in deuterium gas atmosphere using cathode with multi-layered structure of Pd/CaO/Pd on which Cs are deposited and search for the evidence of nuclear reactions, especially for Pr production by the transmutation reaction of Cs just as observing in the permeation experiment.

The multi-layered sample is prepared in the following procedure. On the Pd substrate (12.5mm x 12.5mm x 0.1mm in size, and >99.95% in purity), ~2nm CaO layer and ~40nm Pd layer are formed by sputtering. Then, Cs is deposited onto the sample surface by electrolysis. After Cs deposition, the multi-layered sample is put as cathode into the discharge cell made of Pyrex glass. The Au foil is used as anode and the gap distance between the two electrodes is ~10mm. After evacuating the cell to 10^{-2} - 10^{-3} Torr, deuterium gas is supplied until inside pressure becomes 1Torr, followed by applying DC voltage to expose the sample to discharge with currents of 1-4mA and voltage of 400-600V. This discharge condition is standard glow. Two NaI(Tl) scintillation counters are used to detect gamma rays from the experimental system. These counters have independent power supply and data acquisition system, so that foreign electric noise and accidental noise can be distinguished from the real signal by checking coincidence signal of two counters. 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 flown away from the sample. In order to detect such elements, some pieces of Au foil are placed around the cathode.

According to recent reports, laser irradiation to hydrated/deuterated metal sample is supposed to initiate and amplify the nuclear effect in condensed matter [4,5]. In this study, we utilize the semiconductor laser (690nm in wavelength and ~20mW in output power) and it is irradiated to the multi-layered cathode during the discharge for inducing the nuclear reaction effectively.

The composition of the cathode and the Au foil is analyzed by ICP-MS and TOF-SIMS. We investigate the existence of Pr on the sample and the possibility that the transmutation reaction of Cs, just as observing in permeation method, occurs in the discharge method. In addition, we survey all the elements qualitatively and check newly produced elements as well as anomaly in the isotopic abundance for the elements detected. By the systematic considerations for the results in the both permeation and discharge methods, we discuss the theoretical background in the reaction and the possible ideas for improving the reaction efficiency for developing the future applications.

1. Y. Iwamura et al., Jpn. J. Appl. Phys. 41 (2002) 4642.
2. A. Arapi et al., Jpn. J. Appl. Phys. 41 (2002) L1181.
3. S. Narita et al., Proceedings of JCF5 (2004) 14.
4. D. Letts, Proceedings of ICCF10, in press.
5. V. Violante, Proceedings of ICCF11, in press.

Time-Dependent EQPET Analysis of TSC

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For a consistent theoretical model of various condensed matter nuclear effects, namely clean He-4 producing fusion and cold transmutation, EQPET/TSC models have been developed by the author¹⁻⁴. Transient motion of TSC (tetrahedral symmetric condensate) by 4 deuterons plus 4 electrons has been treated with a primitive approximation using the linear combination (EQPET: electronic quasi-particle expansion theory) of wave-functions for pseudo-molecular states of d-d pairs with normal electrons and quasi-particle-electron states $e^*(2,2)$ and $e^*(4,4)$ as steady state solutions for narrow time-window.

Since the barrier factor changes drastically with astrophysical orders according to the assumed pseudo-molecular states, numerical studies based on time-dependent treatment are expected to know more accurate values of fusion rates of multi-body deuteron interactions in the transient process.

This work reports a trial study of Time-Dependent EQPET analysis for TSC squeezing motion to estimate time-averaged fusion rates of 4d/TSC.

Starting with the formation of TSC state ($t=0$) with 6-wings wave function which is composed of 6 dde^* molecular wave functions with 6 orthogonal singlet spin wave functions, time-dependent screening potentials are adiabatically approximated with pseudo-molecular potentials for $ddee$, $dde^*(2,2)$ and $dde^*(4,4)$ according to the change of mean d-d distance. Semi-classical treatment is done for the time-dependent reduction of mean d-d distance. Using this algorithm, a computer code is made.

Time-dependent fusion rates for 2D and 4D reactions are calculated for squeezing of TSC from about 100 pm size to its minimum size (about 10 fm), within about 75 fs squeezing motion. Life time of the minimum TSC state is yet to be studied. Time-averaged fusion rates are given, by assuming the life time of minimum TSC state is negligible. Time-averaged 2D fusion rate was given as $2.9E-25$ f/s/pair, and time-averaged 4D fusion rate was $5.5E-8$ f/s/cl. These values are compared with $1.0E-20$ f/s/pair for 2D and $1.0E-9$ f/s/cl for 4D respectively of previously estimated values by EQPET/TSC models¹⁻³. Effective fusion time by the TSC squeezing motion was estimated as 0.04 fs: namely fusions may happen in very short time interval.

The present result gives another basis of EQPET/TSC models.

1. A. Takahashi: Deuteron cluster fusion and related nuclear reactions in metal-deuterium/hydrogen systems, *Recent Res. Developments in Physics*, Transworld Research Network, India, 6(2005), pp.1-28: ISBN=81-7895-171-1
2. A. Takahashi: TSC-induced nuclear reactions and cold transmutations, Siena Workshop on Anomalies in D/H loaded metals, Siena, Italy, 13-16 May 2005: <http://www.iscmns.org/>
3. A. Takahashi: A theoretical summary of condensed matter nuclear effects, *ibid*
4. A. Takahashi: Condensed Matter Nuclear Effects, Proc. IMFP2005, Int. Meet. Frontiers Physics, 25-29 July 2005, Kuala Lumpur

Producing Transmutation Elements on Plain Pd-foil by Permeation of Highly Pressurized Deuterium Gas

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Deuterium and hydrogen permeation experiments have an advantage of minimizing contamination to the palladium sample, which is preferably used in investigating small amount of elements. We have reported¹⁾ 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 on Fe production. 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 deuterium permeation by highly pressurized deuterium gas 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 °C. 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 B, Mg, Zn and Ba was found after the deuterium permeation using ICP-MS.

- 1) H. Yamada, S. Narita, H. Onodera, H. Suzuki, N. Tanaka, T. Nyui and T. Ushirozawa, "Elemental Analysis on Pd-foil after Hydrogen Permeation at Room Temperature by TOF-SIMS", Proceedings of the 5th Meeting of Japan CF Research Society, pp. 69-73, 2004

High-Density Quantum Plasma Fusion Mechanism for Low-Energy Nuclear Transmutation Reactions

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The most basic theoretical challenge for understanding low energy nuclear reaction (LENR) [1,2] and transmutation reaction (LETR) [3-6] processes in condensed matters is to find mechanisms by which the large Coulomb barrier between fusing nuclei can be overcome. A quantum plasma (QP) fusion theory has been developed as a possible mechanism for the LENR processes in matters [7-11]. In this paper, it is shown that nuclear fusion theory based on the QP fusion mechanism with high-density nano-scale quantum plasmas [7-11] is also applicable to the results of LETR experiments [3-6]. The results of Iwamura et al. [4,5] are discussed in terms of the QP fusion mechanism as an application.

There have been many experimental evidences indicating that LENR processes in condensed matters are surface phenomena (SP) occurring in micro- and nano-scale active (hot) spots in the surface regions rather than bulk phenomenon (BP) in the bulk of the deuterated metals. Theoretical studies of a recently developed QP fusion mechanism have been carried out using an approximate solution to the many-body Schroedinger equation for a system of N identical charged, integer-spin nuclei ("Bose" nuclei) confined in micro- and nano-scale traps (cavities or atomic clusters) forming high-density nano-scale quantum plasmas [7-11]. The ground-state solution is used to obtain theoretical formulae for estimating the probabilities and rates of nuclear fusion for N identical Bose nuclei confined in an ion trap or an atomic cluster. One of the main predictions is that the Coulomb interaction between two charged bosons may be suppressed for the large N case and hence the conventional Gamow factor may be absent. Recently, the one-specie LENR theory of the QP fusion mechanism [7-11] used for reactions such as (D+D) has been generalized to the two-species case and applied to (D+Li) reactions [11], which may be also applicable to other LETR processes. The only unknown parameter of the theory is the probability of the QP ground-state occupation, Ω . Since Ω is expected to increase as the effective temperature decreases, the nuclear reaction rates for the QP fusion mechanism are expected to increase at lower temperatures.

For the LETR experiments by Iwamura et al. [4,5], quasi 2-dimensional quantum plasmas of mobile deuterium ions (deuterons) are expected to be created in the nano-scale Pd surface layer. The QP fusion mechanism [7-11] can be applied to this deuteron quantum plasma by solving approximately the many-body Schroedinger equation with a quasi 2-dimensional confining potential. The theoretical results are expected to be similar to the 3-dimensional case [7-11]. The Coulomb interaction among other nuclear species (impurity ions (Sr, Cs, Ba, etc.) and Pd ions) may be suppressed in this deuteron quantum plasma, as in the case of the Coulomb interaction between two deuterons [7-10].

The predictions of the QP fusion mechanism can be tested in well designed experiments such as those of Iwamura et al. [4,5] to find out whether the QP fusion mechanism is a correct theory for the LETR processes in condensed matters. New experimental tests for the predictions of the QP fusion mechanism will be discussed.

There is another possible fusion mechanism involving a quantum correction for interacting particles to the classical Maxwell-Boltzmann velocity distribution. The effect of this quantum correction on LENR and LETR will be also discussed.

1. P.L. HAGELSTEIN et al., "New Physical Effects in Metal Deuterides", submitted to DOE for a review, July 2004, and references therein. This report was posted December 1, 2004 at the DOE website: <http://www.sc.doe.gov>
2. See experimental papers in the Proceedings of the 10th International Conference on Cold Fusion (ICCF-10), Cambridge, MA, USA, 2003.
3. G.H. MILEY and P. SHRESTHA, "Review of Transmutation Reactions in Solids", Proceedings of the ICCF-10 and references therein.
4. Y. IWAMURA et al., Proceedings of the ICCF-9, ICCF-10 and ICCF-11.
5. Y. IWAMURA et al., Jpn. J. Appl. Phys. 41, 4642 (2002).
6. S. SZPAK, P. A. MOSIER BOSS, C. YOUNG, and F.E. GORDON, "Evidence of Nuclear Reactions in the Pd Lattice", Naturwissenschaften 00, 1-4 (2005).
7. Y.E. KIM and A.L. ZUBAREV, Fusion Technology 37, 151 (2000).
8. Y.E. KIM and A.L. ZUBAREV, Italian Physical Society Proceedings 70, 375 (2000), ICCF-8.
9. Y.E. KIM and A.L. ZUBAREV, Physical Review A64, 013603 (2001).
10. Y.E. KIM, Progress of Theoretical Physics Supplement 154, 379 (2004).
11. Y.E. KIM and A.L. ZUBAREV, Proceedings of the ICCF-11, Marseille, France, 2004.

High Resolution Mass Spectrum for Deuterium(Hydrogen) Gas Permeating Palladium Film

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More than 100 years have been past since the discovery of the great absorption rate of hydrogen in palladium; however, only a little has been revealed about the process of absorption. An experiment based on Hall effect [1] showed that hydrogen molecules are dissociated and ionized after absorption in palladium. It has been quite interesting what happens to deuterium after permeation through the palladium thin film. Thanks to INFICON, this experiment has been done using the high resolution mass spectrometer in their R & D laboratory. One atm. deuterium gas was



fed into a thin palladium film ($\phi 20\text{mm} \times 0.1\text{mm}$) at 330°C for 1 hour. When the deuterium gas was pumped out, a temperature rising was recorded. In parallel, the outgoing gas was sent to the high resolution mass spectrometer. The first row of the above figures shows the plot of mass analysis (Scan #1--#6). The abscissa shows the mass number $\times 100$. The dominant components are mass 2 and mass 3. However, the original deuterium gas has only mass 4 as a dominant component (see second row). One may imagine that most of deuterium molecules were dissociated into deuterium atoms; then, why were there so much mass 3 component? A careful mass analysis was done after calibration using standard helium-3 gas. The third row of figures shows that the mass 3 component is very close to the mass of HD molecule. The fourth row shows where the helium-3 was supposed to be. A more detailed analysis of this mass 3 peak will be presented in ICCF-12.

[1]A.H. Verbruggen, et al., "Hall Voltage Induced by Hydrogen Diffusion in Palladium," *Phys. Rev. Lett.* 52,1625 (1984).

*This work is supported by the Natural Science Foundation of China (#10475045), Ministry of Science and Technology (Division of Fundamental Research), and Tsinghua University (985-II, Basic Research Funds)

Study on Formation of Tetrahedral or Octahedral Symmetric Condensation by Hopping of Alkali or Alkaline-earth Metal Ion

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Recently, the experiments of permeation of deuterium through Pd complex by Iwamura et al. have indicated that nuclear transmutation is observed in the case of alternating CaO and Pd layers but no nuclear reaction is observed in the case of replacing it with MgO. It is interesting to know what kind of effect carries out alkali or alkaline-earth metal, which takes place in almost all of light and heavy water electrolysis and deuterium permeation experiments.

In theoretical side, we have directed our attention to Tetrahedral Symmetric Condensate / Octahedral Symmetric Condensate (TSC/OSC) model of proton/deuteron by Takahashi, which can explain consistently the major experimental results. And then it is interesting to know how and where TSC/OSC is formed.

We have thought whether or not the two, the alkali or alkaline-earth metal and TSC/OSC are related to each other. So, we have examined the role of the alkali and alkaline-earth metal ions in the crystal lattice of the host metal when TSC/OSC is formed.

As a result, we have obtained very consistent simple scenario about the formation of TSC/OSC that the alkali or alkaline-earth metal ions infiltrating into the host metal surface layers make cavities there when they hop into the other sites of the crystal lattice of the host metal, and then condensation of protons or deuterons is caused in the cavities. There might be three kinds of electrolytic current density or deuterium flux, which have the minimum and maximum respectively and have to be controlled properly in experiments. And, hopping of the alkali or alkaline-earth metal ion, which makes the cavity in the crystal lattice of the host metal, might cool it to cause the condensation of protons or deuterons.

The Italy-Japan Project

-Fundamental Research on Cold Transmutation Process for Treatment of Nuclear Wastes-

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Effective utilization of nuclear energy is seriously expected to support realizing the sustainable developments of nations on this planet, although the problem of nuclear wastes is seriously concerned. Bonification (complete remediation of radio-activities by transmutation) technology for major fission products as Cs-137, Sr-90 and Cs-135 might be developed based on the recent discovery of transmutations from Cs-133 to Pr-141 and Sr-88 to Mo-96 by Iwamura group^{1,2)} of Mitsubishi Heavy Industry Co. in Japan.

The IJ Project proposes, as the first phase research, that confirmation of the cold transmutation using radioactive isotopes as Cs-137, Sr-90 and Cs-135 to non-radioactive elements will be implemented based on the MHI method.

A theoretical background has been given by the TSC-induced nuclear reactions³⁾. Charge-neutral pseudo-particle of 4d/TSC can become as small as 10 fm radius in its minimum state of squeezing motion and will make 4D-capture reaction with host metal (or added metal) nuclei in the surface region of permeation^{1,2)} samples. Major reaction will be:



Theoretical modeling of the process is briefly explained and resulting reaction products, their decays and final stable isotopes are predicted for Cs-137, Sr-90 and Cs-135 transmutations.

Employing the above model as working hypothesis of cold transmutation of radioactive wastes, methods of radiation spectroscopy and mass-elements analyses are discussed.

1. Y. Iwamura, et al.: *Jpn. J. Appl. Phys.*, 41(2002)4642
2. Y. Iwamura, et al.: Proc. ICCF10, August 2003, Boston.
3. A. Takahashi: TSC-induced nuclear reactions and cold transmutations, Proc. Siena Workshop, May 2005, <http://www.iscmns.org/>

Perspective Way to Utter Solution of the Problem of Radioactive Waste Remediation

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At present intensive investigations are being carried on in many countries with a view to developing effective methods of treating radioactive waste (RW). In most cases those works are aimed at providing isolation of RW from environment and long term safe storing RW of different origination. One of the directions of developing such technologies with application to low and intermediate level RW stipulated significant decreasing of the waste initial volume and converting it into a form suitable for disposing it of for a long term storage.

It is recognized now by many specialists that the most perspective technology for solving this problem is the technology of plasma pyrolysis of the organic components and melting inorganic part of RW and converting it into the form of vitrified slag. Provided the appropriate technical solution implemented the technology stipulates incorporating (capturing) 90-95% of the entire radioactivity of the waste material inside the vitrified slag as well as actual absence of dangerous discharging of radioactive and other hazardous products into the atmosphere.

Such technology has been developed in Russian Research Center “Kurchatov Institute” and realized in Russia in cooperation with Scientific and Industrial Association “Radon” at two pilot facilities – installations “Pyrolis” and “Pluton” – and at present, based on those two installations, a number of new facilities of higher capacity for processing RW at nuclear power plants and processing waste of different originations. It is worth to note that these Russian facilities obtain a number of significant advantages as compared to other known installations implementing analogous technological principles, in particular, the “PACT” installations developed and manufactured by the “Retech” US company.

However, even these sophisticated installations do not solve completely the problem of RW remediation since the secondary product of plasma processing, though being highly stable, nevertheless remain radioactive and hence needs special handling and storage space.

Meanwhile, thanks to the success in research of low energy transmutation of nuclei of chemical elements, now there has appeared a possibility of solving the problem of utter remediation of RW. The results of experimental and theoretical research of a group of Russian scientists at the Dubna Center of Applied Physical Research [1] allow to hope that the newly discovered method of electromagnetic impact on radioactive materials that results in transforming unstable isotopes into stable ones and such process is not accompanied with any ionizing irradiation. It was determined that low energy transmutation is actually a threshold nuclear reaction of resonance nature and of exothermic type which makes it energetically advantageous. According to their findings in order to initiate reaction of transmutation radioactive material is placed into special reactor and subjected to irradiation with electro-magnetic energy of specific frequency, amplitude and topology. The authors of that discovery determined that the process of transmutational processing RW may take from decades of minutes to several hours depending on the isotopic composition of radioactive compound and its concentration. The highest efficiency of the process is to be achieved when working with concentrated mixtures.

Such conclusion makes it reasonable to stipulate that the most effective approach towards RW remediation may become combination of the above mentioned plasma processing technology which provides concentration of dissipated radioactivity into slag compound thanks to the capability of the plasma process to capture most of the radioactivity provide almost 100-fold shortage of the slag volume as compared to the initial volume of the material accepted for processing, - combination of the same with the process of stabilization of the radioactive slag in special transmutation reactor. The design of such reactor has been developed. The task of today is recognized to be practical creation of an experimental unit of such reactor based on the principles found by Russian scientists.

Reference

1. “Annals de la Fondation Louis de Broglie”, vol. 28, № 2 2003. Web-site: <http://FondationLouisdeBroglie.org> Article: Low Energy Transmutation of atomic Nuclei of Chemical Elements by V.Kuznetsov et al.)

Coupled Electron and Electron Neutrino in Nucleus and Its effect on D-D Cold Fusion into Helium in Pd

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We investigated a possibility of coexistence of coupled electron and electron neutrino in nucleus, based on weak interaction in β decay, using electromagnetic and weak interactions. In nucleus, the weak interaction is mediated by W^\pm boson between u and d quarks in different nucleon each other, while both neutrino and antineutrino in proton and both electron and antielectron in neutron are mediated by Z^0 boson (Fig.1). From Compton wavelengths of the electron and the W boson, the zone ratio of the electromagnetic interaction to the weak one is around 4.04×10^{-11} . Provided that the electron of atom takes one's share of both electromagnetic and weak interactions, we obtain 2.07×10^{-5} eV as the electron mass for the weak one, closing to estimated neutrino mass, 10^{-5} - 10^{-6} eV. Therefore we can see that one electron and one neutrino exist in proton and neutron, respectively. In particle physics, thus, we must note the role of the electrons for atoms associated with u and d quarks. The electron and the neutrino are coupled as a boson in nucleus.

Then we also investigated necessary and sufficient conditions for cold fusion of helium in solid lattice in terms of elementary particle physics¹. 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 keV. Introduction of the s -wave coupled electron and neutrino enhances cold fusion.

The electron and neutrino pair may come from double β decay formation of helium,
 $(Z, A) \rightarrow (Z+2, A) + 2e^- + 2\bar{\nu}$
 In this non-equilibrium equation, ^{106}Pd , ^{108}Pd and ^{110}Pd are plausible in nature.

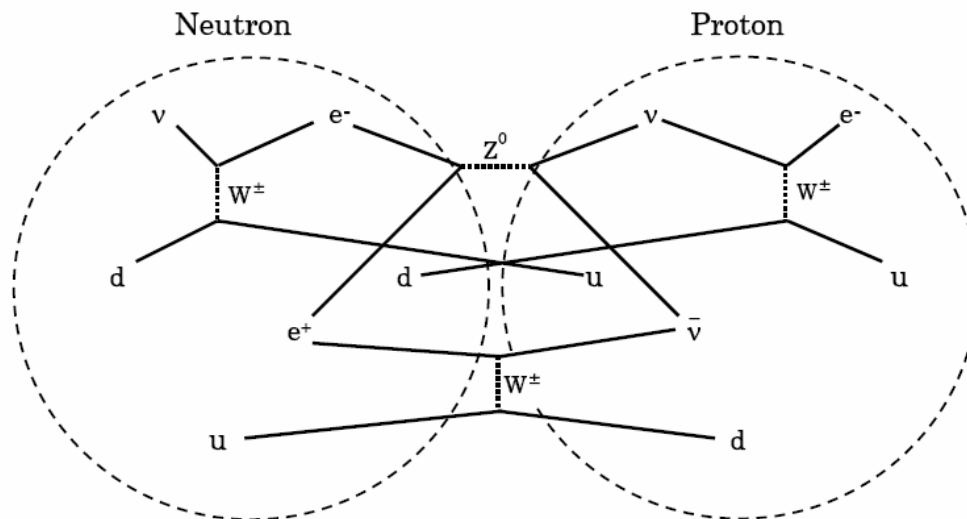


Fig.1 Schematic representation of elementary particle interactions, $d+\nu \leftrightarrow u+e^-$ and $e^- + \nu \leftrightarrow e^+ + \bar{\nu}$, mediated by W and Z^0 bosons in proton and neutron deuterium atom, respectively, where u and d are up and down quarks, respectively. The reaction, $e^- + \nu \leftrightarrow e^- + \nu$, is eliminated.

Reference

1. M.Fukuhara, The 6th.Proc.Japan Cold Fusion, (2005), in press

Two Types of Nuclear Fusion in Solids

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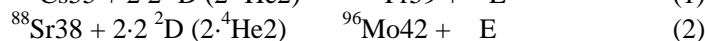
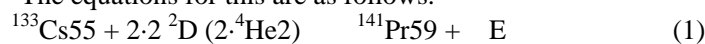
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As with the genius Wolfgang Pauli's admission of the "devilish" properties residing in the surface of a metal solid, the presence of complex and mysterious phenomena makes it difficult to gain an overall understanding, but as time passes the fog is lifting and a portion has appeared before our eyes. This visible portion is low-temperature nuclear fusion. However, although the phrase "low-temperature" is used, such fusion can be classified into two types according to the extent that room temperature is maintained. With one type, despite the application of weak electricity and low temperature from outside the metal, a strong electromagnetic field and thermonuclear fusion occur in the interior of the metal, depending on the metal's physical properties. With the other type, low-temperature, nonthermal nuclear fusion occurs with no strong electromagnetic field occurring even within the metal. The author has been fortunate enough to encounter both types of nuclear fusion, and so hereby presents a theory regarding these two fusion types.

The first phenomenon that may be considered is thermonuclear fusion in a vacuum crack within a solid. When a platinum plate is connected to a positive electrode and a palladium-alloy plate is connected to a negative electrode in deuterium and a 200-V electrolysis current is passed through them, neutrons, helium³, and 3.27 MeV of heat are obtained. The fact that such a phenomenon is produced despite the low voltage suggests the following: Firstly, a vacuum microcrack is produced within the palladium alloy. Next, a large quantity of Bose-particle deuterium nuclei flow into the crack as impurities due to the Kondo effect. Accordingly, the effect of the Heisenberg uncertainty principle ($\Delta x \Delta p \approx \hbar$) is exerted, the movement-position range of the deuterium nucleus becomes extremely small ($\Delta x \approx 0$), and the movement amount gradually increases ($\Delta p(mv) \approx \hbar/\Delta x$). Integrating this movement amount yields $mvdv = 1/2mv^2 + C$, and when the movement energy of this $1/2mv^2$ exceeds 10 kV, thermonuclear fusion occurs. The equation for this is $D + D = n + He + 3.27 \text{ MeV}$.

The phenomenon that may be considered next is that of the experiment conducted by Iwamura, et al. This is elemental transmutation due to nonthermal nuclear fusion in a solid acted upon by a vacuum. A device was made in which palladium alloy was disposed at the center, with deuterium gas on the left and vacuum on the right, so that large quantities of the deuterium gas passed through the palladium-alloy plate toward the vacuum. In this case, coating the surface of the palladium alloy facing the deuterium gas with radioactive cesium resulted in the creation of praseodymium, and coating the surface with radioactive strontium resulted in the creation of molybdenum. Common points in these phenomena are the facts that the atomic number increased by 4 and the atomic mass by 8.

In this regard, it appears that the transmutation was the result of nuclear fusion of the radioactive cesium or strontium with two compound nuclei of deuterium – that is to say, $2 \cdot 2^2D(2 \cdot 4He2)$. The equations for this are as follows.



This can readily be explained by postulating a chemical structure that assumes that the atomic nucleus form a regular-polyhedral liquid-crystal structure due to Platonic and Keplerian space-filling.

Tunnel Resonance of Electron Wave and Force of 1/f Fluctuation

M. Ban

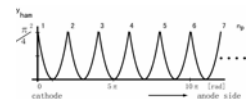
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A cold fusion was observed when the gas of high pressure permeates a partition wall of thin board.¹⁾ The permeation or penetration of a partition was a tunnel phenomenon. And a cold fusion has been observed at the tunnel phenomenon of a dc electric circuit. When the tunnel phenomenon occurred because of the glow discharge, the plasma dusts were assembled a formation as a crystal by the tunnel phenomenon.^{2,3)}

The tunnel phenomenon had a special power to dance the corpuscles at this discharge. We found a force that assists to form in line for deuterium atoms in a condensed matter. How to locate Deuterium in a condensed matter has been suspected to be the cause of a cold fusion. By the way, also in a small circuit or large one, the nature is same because an electric phenomenon is not influenced by the size or scale of a circuit. For example, both electric discharge and a tunnel phenomenon are in a small dc circuit by a scanning tunnel microscope.

However, a constant electric noise was not in STM about a steady condition. The feature of three kinds of noises changing and alternating is found. When Koji Maeda et al. observed a carbon graphite with STM, several kinds of power spectrum densities $P(f)$ were observed as $P(f) \propto 1/f$ or $P(f)f^2=C$.⁴⁾ Since there are several ways of making the noise, that have a power spectrum $P(f)$ as $P(f) \propto f^n=C$, ($n=1,2$) including white noise $P(f) \propto f^0=C$, the nature of noise in the electrical discharge part is alternated with each other. If the power spectrum of noise alternates the nature, a change occurs in wavenumber k , and a fluctuation of wave will be made. It is calculable that force $F = \hbar dk/dt$ arises in the fluctuation of wavenumber. If the electron wave shakes, a corpuscle will be received power $F = \hbar dk/dt$ and swing when the wave packet propagates the crystal that the plasma dusts made.

A simultaneous equations consists if it thought about the tunnel phenomenon after the material wave is divided into the standing wave and the progressive wave. If those tunnel phenomena are repeated, two or more simultaneous equations consist at the same time. The progressive wave group makes the wave packet in the repeated tunnel phenomenon. The wave packet is a soliton which has nature of $P(f) \propto f^2=C$ and distortion phase, and that soliton equation can be made unite with Shrodinger wave equation. Then, the parametric amplification begins to make the amplitude modulation wave. It consists of a nonlinear equation $(\partial L/\partial t - [B, L])\psi = 0$ and the solution u of the soliton is given. The crystal is organized itself with the harmonic component if there is a specific phase in the boundary when there is a standing wave in wavenumber $k = n\pi$ in the electrical discharge section. If a tunnel phenomenon occurs and is repeated by the crystal, the plasma crystal can be drawn itself on graph by the formula.

A resonance that restrains the initial phase $\theta(\omega)$ exists $\left(\sum_{m=1}^{\infty} \frac{\sin mkx}{m}\right)^2 = y_{ham}$ 

in the condition of $P(f)f^2 = C$ if the current is considered to be a fluid of those electrons. The current is

replaced from the expected value of energy with the flow of that electrons.⁵⁾
$$i(t) = S \sqrt{\frac{2\hbar}{m}} \int_{-\infty}^{\infty} \frac{\sin \tau}{\tau} e^{i(\tau + \theta)} d\tau$$

1. Y. Iwamura, M. Sakano and T. Itoh: Jpn. J. Appl. Phys. 41(2002)4642.
2. <http://annex.jsap.or.jp/hokkaido/yokousyuu39th/B-29.pdf>, in Japanese.
3. H.M.Thomas and G.E.Morfill, Nature(London)379,806,(1996).
4. K. Maeda, S. Sugita, H. Kurita, M. Uota, S.Uchida, M. Hinomaru, Y. Mera: Spatial variation of 1/f current noise in scanning tunneling microscopes, J. Vac. Sci., Technol. B 12(3),pp.2140-2143, May/Jun.
5. M. Ban, Three Kinds of Frequency Characteristics by Matter Wave Resonant, The 6th Meeting of Japan CF-Research Society JCF6 Proceedings April(2005).

ICCF12, November 27 – December 2, 2005 Yokohama, Japan

Low Energy Nuclear Reactions Induced by D₂ Gas Permeation through Pd Complexes.
(Y. Iwamura 2004 effect).

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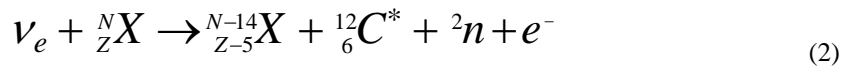
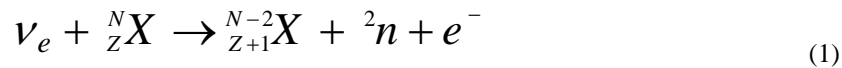
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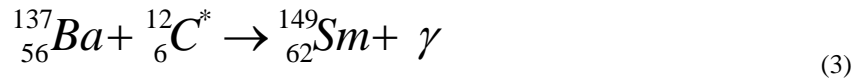
Anomalous elemental changes have been observed on the Pd complexes (40nm Pd + 100nm Pd/CaO + 01mm Pd) after D₂ gas permeation. ¹⁴⁹Sm or ¹⁵⁰Sm emerged on the surface of Pd complex after D₂ gas permeation for the case, when ¹³⁷Ba or ¹³⁸Ba were added on the surface of a Pd complex [1].

This effect — Iwamura et al. effect 2004 — belong to a new category of nuclear reactions. From our point of view it is possible to suggest:

First step of these reactions is neutrino - dineutron reactions [2,3], for example



Second step



The Iwamura et al. effect 2004 (Mitsubishi company) can stimulate development of physics of electromagnetic interaction of the neutrino [4] and of physics of the dineutrons [5]. It is possible to suggest that low energy neutrino and even relic (connate) neutrino can initiate effect of transmutation in special cases (corresponding model of the boson interaction).

The similar process runs in cathode samples induced by low energy deuterium ions in glow discharge experiments [6].

1. Y. Iwamura et al. Nuclear transmutation induced by deuterium permeation through the Pd complexes... ICCF-11, Marseilles, France, 2004.

2. V.I.Muromtsev, P.A. Muromtsev, V.A.Chelishev. Stable dineutrons in astrophysics. Gravitation and Cosmology, Supplement, V8, P227, (2002) Moscow

3. V.I.Muromtsev, V.A.Chelishev. Russian Fed. Patent num. 2,145,095. Method of detection neutrino fluxes.

4. A.Suzuki et al. Constraints on Dirac-type neutrino magnetic moments from ³⁷Cl and Kamiokande II solar-neutrino observations. Phys. Rev. D, vol. 43, num. 10, p. 3557 (1991).

5. M.Sakisaka, M.Tomita. Experiments on the possible existence of a bound di-neutron. J. Phys. Soc. Japan, 16, 2597 (1961)

6. I.Savvatimova, D.Gavritenkov. Results of Analysis of Ti foil after G.I.D. ICCF-11, Marseilles, France, ICCF12, November 27 – December 2, 2005 Yokohama, Japan

2004.

ICCF12, November 27 – December 2, 2005 Yokohama, Japan

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In-situ Accelerator Analyses of Palladium Complex under Deuterium Permeation

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It has been claimed [1,2] that forced permeation of deuterium through Cs-doped Pd/(CaO+Pd)/Pd samples induced nuclear transmutations from ^{133}Cs to ^{141}Pr , from ^{88}Sr to ^{96}Mo , from ^{138}Ba to ^{150}Sm and from ^{137}Ba to ^{149}Sm . The diagnostic methods they mainly used were XPS, TOF-SIMS and XRF. To confirm and investigate the phenomena, it is essential that the same results are obtained in different laboratories with different analytical methods.

In the present work, we have constructed an experimental system, with which accelerator analyses including PIXE, ERDA, NRA and RBS can be made *in situ* and simultaneously with gas permeation through the samples. A sample with a Pd(Cs)/CaO/Pd multilayer on the surface is placed in a vacuum chamber, and its rear surface is exposed to D_2 gas at a pressure of 0.1 MPa typically. The multilayered sample surface is diagnosed with probe beam ions to emit characteristic X-rays which are analyzed either with a CdTe detector or a Si-PIN-type X-ray detector positioned at 120 or 90 degree relative to the probe beam direction. Additional solid-state charged-particle detectors are provided for RBS, ERDA and/or NRA characterization of the sample.

The minimum areal densities of Pr and Cs detectable in the PIXE analysis are estimated to be $4 \times 10^{14} \text{ cm}^{-2}$ and $2 \times 10^{14} \text{ cm}^{-2}$ for 100-pμC/5-MeV α -particle probing. These limiting values of the areal densities have been confirmed by preliminary analyses of the Au/Pd sample and a CaO/Pd sample. Experiments using multilayered Pd(Cs)/CaO/Pd samples are in progress.

1. Y. Iwamura, M. Sakano and T. Itoh; Jpn. J. Appl. Phys. 41 (2002) 4642-4650.
2. Y. Iwamura, T. Itoh, M. Sakano, S. Kuribayashi, Y. Terada, T. Ishikawa and J. Kasagi; Proc. ICCF11, 2004, Marseilles, France.

Heat Response Triggering by a YAG Frequency Double Laser in a D/Pd Gas-loading System

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In recent years anomalous heat triggering by a laser is an effective way to “cold fusion” research. And a gas-loading system is more sensitive than electrolysis one in heat-detecting ability because the former has a less heat capacity than that the latter has. In our latest work, which is intended to see the anomalous heat effect triggering by a YAG frequency double laser in a D/Pd system, the correlation between the laser power and the “excess heat response” were investigated under some different loading ratios. When the laser power input was 10 mW, the maximum “heat response power” measured was 22.6, 10.3, 9.0, 11.7, 14.2 and 18.7mW as the loading ratio was 0.1, 0.25, 0.31, 0.46, 0.58 and 0.68 respectively whereas both heat response and loading-ratio were considered as zero. When the power was 30 mW, the “heat response powers” were 19.0, 54.6, 56.2, 56.5, 49.6 and 45.0mW as the ratio were 0.17, 0.25, 0.31, 0.39, 0.59 and 0.68 respectively. And when the power was 50 mW the “heat response powers” were 8.9, 13.5, 18.1, 11.2mW respectively as the ratio was 0.25, 0.30, 0.46 and 0.58. There seem not is any apparent “excess heat” occurred in the system, but the “heat response power” has some correlation indeed with the loading ratio under a certain laser power input. This result may have some help in “excess heat” acquisition by a laser’s triggering in a gas-loading system. According to the SRT model raised by Dr. Li^[1,2] there must be a suitable environment in crystal lattice if two nuclei inside collide and fuse into a heavier one through a tunneling manner.

1. Xing Z. Li, Jian Tian, M.Y. Mei, Cong X Li. Sub-Barrier Fusion and Selective Resonant Tunneling, Physical Review C, Vol. 61 No.2, 2000,p.4610.
2. Xing Z. Li, Bin Liu, Jian Tian, Qing M. Wei, Rui Zhou and Zhi W Yu. Correlation between Abnormal Deuterium Flux and Heat Flow in a D/Pd System, Journal of Physics D: Applied Physics, 38 ,1-3 2003

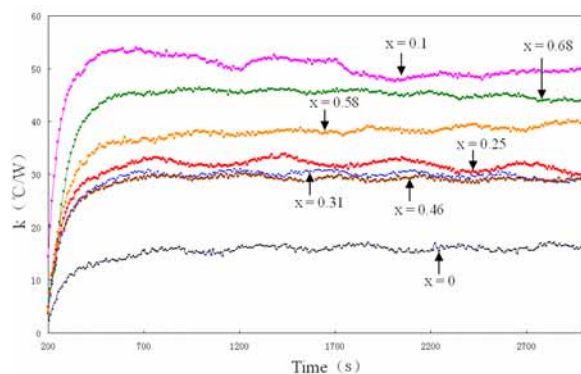


Fig.1

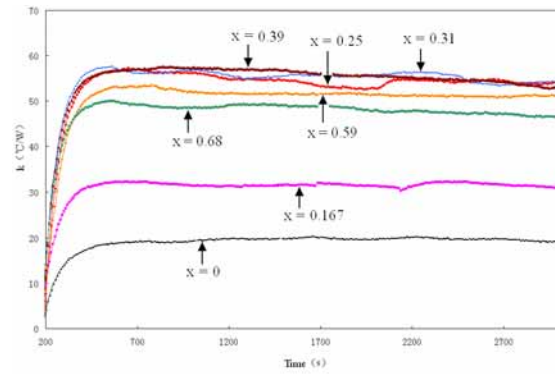


Fig.2

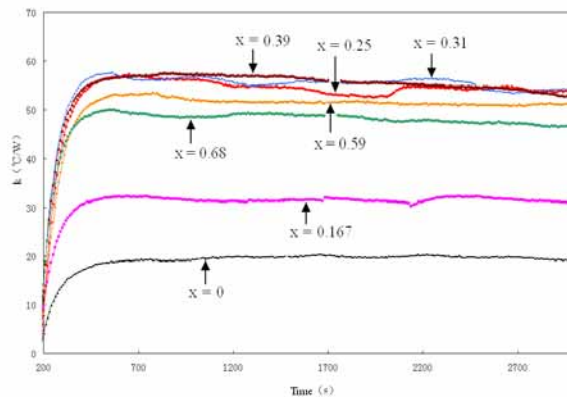


Fig.1 The variation of heating response by 10mW laser spotted on a hydride that has different loading ratio

Fig.2 The variation of heating response by 30mW laser spotted on a hydride that has different loading ratio

Fig.3 The variation of heating response by 50mW laser spotted on a hydride that has different loading ratio

ICCF12, November 27 – December 2, 2005 Yokohama, Japan

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Coherence between Application and Fundamental Research

G. Conforto¹

Organic Physics² explains Low-Energy Nuclear Reactions (LENR), investigating:

- the nature of the force, which propels them;
- the physical conditions that can induce them;
- the true “elements” that fuse themselves.

Recently discovered particles, such as pentaquarks and/or diquark, clearly indicate that the fusion of the “elements” can also be that of elementary particles like quarks or anti quarks. In those experiments, it was evident a spin-dependent force that propels their **nuclear fusion**.

My proposal is that the spin-dependent force is the *neutral weak current* (Z^0). According to the Standard Model, Z^0 can actually interact with all the quarks and anti quarks. *Neutral weak interactions* don't alter the chemical composition, but change nuclear spins or energy levels; these interactions have been observed in laboratory too, although they are believed to be very elusive. In crystals or huge organic molecules with masses > 100 GeV *neutral weak interactions* can easily occur and make the various types of quarks, fuse. If a crystalline lattice with high nuclear spins is involved, spin flip-flops can easily occur and provoke a domino effect, an *acoustic resonance* between the Z^0 bosons and the peculiar *phonons* generated by the spins flip-flops of the atomic nuclei that compose the lattice. In other words, crystals work like musical cases that resound and amplify the *weak neutral current*. This interpretation shows the nature of the *neutral weak current*. It is *music*, at very high frequency (10^{26} Hz); it makes a lattice resound, if its “strings” that are its atomic nuclei are highly ordered, i.e. have a high spin. This hypothesis can be tested, verifying the main feature of a weak interaction, *parity violation* that can also imply **CT** violations. So the total nuclear spin of a lattice appears as a critical variable for inducing LENR. The higher the spin, the more ordered the lattice and the more probable the “fusion” that produces heat. Such a fusion is not necessarily of protons or neutrons, but of the various kinds of quarks and anti quarks. So pentaquarks might be involved in LENR too as well as in the Earth's global warming.

Moreover *phonons* are bosons having zero spin while, Z^0 are bosons having 1 spin. These values can provide other main features about their eventual coupling and help us to more easily find the conditions that allow us to induce LENR and produce clean, free energy.

¹ <http://www.giulianaconforto.it/English/home.Eng.htm>

² http://www.giulianaconforto.it/English/Organicphysics_global.htm

A Novel LiF-based Detector for X-ray Imaging in Hydrogen Loaded Ni Films under Laser

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A novel soft X-rays imaging detector, based on optically stimulated luminescence of active color centers in lithium fluoride (LiF) [1], has been used to obtain the image of radiation emitted from a nickel film, hydrogen loaded by electrolysis, under light coupling with an He-Ne laser.

The detector, recently proposed [2] and developed for soft X-ray micro-radiography and microscopy applications, as well as for intense EUV sources characterization, consists in a radiation-sensitive thin film of LiF, thermally evaporated on a glass substrate. Irradiation of this material with several kinds of low-penetrating ionizing radiation [3] induces the stable formation of electronic defects, known as color centers (CCs). Primary and aggregate point defects are stable at room temperature (RT) in LiF, and few of them emit intense visible photoluminescence from the exposed areas, even at RT. The peculiar optical and spectroscopic properties of this material allow imaging with a sub-micrometric spatial resolution, simply by reading the green and red photoluminescence of F_3^+ and F_2 centers (two electrons bound to three and two close anion vacancies, respectively) stored in the LiF-based imaging plate. The image can be directly read in an optical microscope operating in fluorescence mode with blue light excitation.

The LiF film detector has been mounted in contact with the back-side of a 1 mm thick polyethylene substrate, covered by a 45 nm thick nickel film, previously loaded with hydrogen by electrolysis. The sample has been positioned on a rotating support and, by selecting the proper incidence angle, a c.w. He-Ne laser at 632.8 nm and power 5 mW has been coupled in the black metallic layer through a glass prism placed in close contact with the Ni surface for an irradiation time of 3h. In this configuration, the He-Ne light can be coupled in the Ni metallic layer, by focusing the laser beam in the contact region between the glass prism base and the black Ni surface.

After removing the imaging LiF sensor, a c.w. Argon laser operating at 458 nm has been utilized to excite the photoluminescence of active CCs eventually produced in this radiation-sensitive thin film. A carefully inspection of its surface in a standard optical microscope operating in reflection mode, and a more complete and detailed optical investigation performed in a confocal laser scanning microscope (CLSM) Nikon Eclipse 80i, allows to identify several light-emitting spots, closely grouped, with typical spatial dimension from tens to hundreds of micrometers. The CLSM system provides the opportunity to collect, acquire and store these images, and to reach a spatial resolution of few hundreds of nanometers at the used wavelengths.

The coupled e.m. wave can produce coherent oscillations of the Fermi-level electrons in the metal lattice, as its frequency is quasi-resonant with electronic plasma one. According with [4], the excitation could produce local intense electric field, and soft X-ray emission at energies below the Ni *K* edge can take place. Our novel detector integrates all the emitted radiation and indicates that its production is confined in the spatial region of coupling between the evanescent wave and the black Ni surface. The comparison with other Ni samples will be discussed.

1. G. Baldacchini, F. Bonfigli, A. Faenov, F. Flora, R.M. Montereali, A. Pace, T. Pikuz, L. Reale, J. Nanoscience and Nanotechnology **3**, 6(2003)483-486
2. ENEA Patent TO2002A000575, G. Baldacchini, F. Bonfigli, A. Faenov, F. Flora, R.M. Montereali, A. Pace, T. Pikuz, L. Reale (International N°: WO 2004/005906 A1).
3. R.M. Montereali, *Point Defects in Thin Insulating Films of Lithium Fluoride for Optical Microsystems*, in Handbook of Thin Film Materials, H.S.Nalwa ed., Vol.3: Ferroelectric and Dielectric Thin Films, 2002, Academic Press, Ch.7, pp.399-431
4. V. Violante, A. Torre, G. Selvaggi and G.H. Miley, Fusion Technology 39(2001)266-281

Plan to Study the Interface between Insulators and Transition Metals

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The Iwamura et al.¹ work and a subsequent theory² suggest that it is possible for a process to occur, involving nuclear transmutation, in which two alpha particles, effectively are added to a Cs or Sr nucleus. In the theory, the alpha addition transmutation process has been modeled as a 4-step process in which the first step is a Fleischmann-Pons (F-P) fusion of Bloch deuterium into Bloch helium.² This exothermic fusion step is postulated to take place² inside the volume that constitutes an interface layer between a salt-like CaO crystallite and the transition metal Pd. The mechanism postulates the presence of deuterium in a 2-dimensional symmetry D^+ Bloch state. Conditions favoring this D^+ Bloch state may be provided by the CaO, which as an isolated crystal has a very negative free energy, and the transition metal Pd, which probably serves as a source of interface electrons. The CaO serves as a lattice template and the more malleable Pd metal provides surface electrons that can neutralize the D^+ Bloch charge. The process may be aided by deuterium fluxing through the CaO,Pd composite volume.

Further evidence for the possible role of insulator-metal interfaces in promoting F-P cold fusion is provided by the work of Arata and Zhang³. They have shown that oxidization of Zr,Pd alloys produces powder that produces multi-watt levels of excess heat. These powders presumably contain insulating-oxide,Pd interfaces. Arata and Zhang have persistently taught the need for deuterons to have high surface mobility throughout their hosting powder beds, using the term "spillover deuterium" to describe this property, and using absorption rate and the quantity of hydrogen absorbed at subatmospheric pressure to quantify this property.⁴

These observations suggest the need for a program to study and more fully understand the properties of insulator-metal interfaces and their applicability to the development of cold fusion heaters. It is time to conduct experiments that more fully define the Iwamura and Arata type processes. There is also need to model insulator-metal interfaces, and to determine whether or not a fully loaded deuterium interface is needed for development of active Bloch deuterium. It is important to know whether a thin coating of adsorbed water on Pd powder can create an interface between Pd metal and water that can sometimes mimic that between CaO and Pd. Adsorbed water was measured in a post run study of an Arata cathode containing Pd black.⁵

A study plan centered on the study of insulator-metal interfaces and their possible role in F-P cold fusion and related transmutations will be presented.

1. Y. Iwamura, M. Sakano, and T. Itoh, "Elemental Analysis of Pd Complexes: Effects of D_2 Gas Permeation", *Jpn. J. Appl. Phys.* **41**, 4642 (2002).
2. T. A. Chubb, "II. Inhibited Diffusion and Surface Transmutations", *Proc. ICCF11*, (In press, 2005).
3. Y. Arata and Y-C Zhang, "Formation of Condensed Metallic Deuterium Lattice and Nuclear Fusion", *Proc. Japan Acad.* **78B**, 57 (2002).
4. Y. Arata and Y-C Zhang, "A New Energy Caused by 'Spillover-Deuterium'", *Proc. Japan Acad.* **70B**, 107 (1994).
5. W.B. Clarke, B.M. Oliver, M.C.H. McKubre, F.L. Tanzella, and P. Tripodi, "Search for ^3He and ^4He in Arata-Style Cathodes II: Evidence for Tritium Production", *Fus. Sci. and Technol.* **40**, 152 (2000).

Multiple Scattering of Deuterium Wave Function near Surface of Palladium Lattice *

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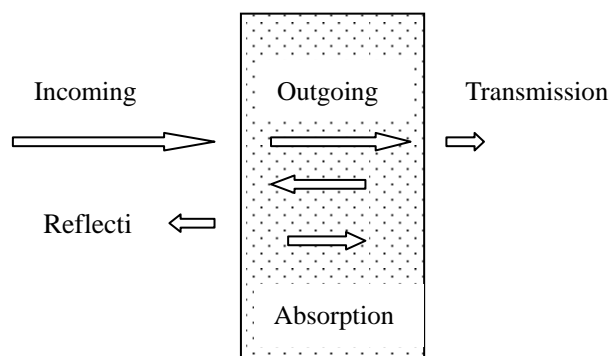
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Nuclear fusion cross-section is much less than the scattering cross-section; hence, we must confine the nuclei in order to have enough nuclear fusion reactions before they are lost due to the scattering. For this purpose magnetic confinement or inertial confinement was proposed to realize the “break-even”. After more than 60 year effort, ITER program (International Thermonuclear Experimental Reactor) will be conducted under the auspices of IAEA, United Nation. However, is there any other approach to confine the deuterons? What we are proposing is a new scheme of confinement using the wave nature of the low energy deuteron.

The multiple scattering of the wave function of the deuterons near the surface of palladium lattice might be used for this purpose. However, 2 problems have to be solved first:

(1) In order to keep the incoming deuterons in the palladium lattice, we must reduce the reflection of incoming wave on the palladium front surface and reduce the penetration of outgoing wave on the palladium back surface. The wave nature of the deuteron just meet this need. The first layer on the surface of palladium lattice might reflect the deuteron wave, but the second layer near the palladium surface may reflect the deuteron wave as well. These 2 reflecting waves might interfere in a destructive way such that the resultant wave is much weaker, and the total reflection rate is dramatically reduced. In the same way, the penetrating wave on the other side of the palladium lattice might be reduced due to the interference of the penetrating waves also. Hence, the total penetrating wave is reduced such that the transmission rate is dramatically reduced as well. Consequently, the deuteron wave will be reflected back and forth inside the palladium lattice until it is absorbed inside the palladium lattice (see schematics on right).

(2) In order to keep this wave nature, there must be a mechanism to avoid the random effect of the thermal vibration of the palladium lattice. The symmetry in the lattice plane provides this mechanism. When the momentum of deuteron increases in the direction parallel to the lattice surface due to adding the reciprocal vector of lattice, the momentum of deuteron perpendicular to the lattice surface reduces such that its wave



length in this direction would be comparable to the distance between two lattice planes. Hence, it is possible to keep the wave nature for thermal deuterons for this component. The low energy electron diffraction (LEED) has shown that 150 eV electron beam may experience the first 4~5 layers of lattice. The higher mass of deuteron might cause the wave length of deuteron much less than that of electron; however, the energy of deuterons is much lower than 150 eV. Their wave lengths may be still comparable. Since the Debye-Waller factor (the effect of the thermal vibration) depends only on the wave length; hence, we may still expect that the deuteron wave at thermal energy may still manifest its wave nature.

A simple model has been constructed to show that: even if the absorption rate for a single layer is very low, the total absorption rate might be as high as 50% due to this multiple scattering process. Particularly, the peak of

*This work is supported by the Natural Science Foundation of China (#10475045), Ministry of Science and Technology (Division of Fundamental Research), and Tsinghua University (985-II, Basic Research Funds)

penetration flux is correlated with the peak of absorption rate. This is just the feature of our experiments.

*This work is supported by the Natural Science Foundation of China (#10475045), Ministry of Science and Technology (Division of Fundamental Research), and Tsinghua University (985-II, Basic Research Funds)

The Structural, Chemical and Isotopic Composition Change of the Materials Irradiated By Low Energy Ions in Glow Discharge

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The review of structural, elemental and isotopic changes of cathodes composition irradiated in low-energy ions plasma of the glow discharge, executed during the last 15 years, is carried out. Examinations by various mass spectrometry methods (a secondary ion mass spectrometry, a spark mass spectrometry, a mass spectrometry with additional ionization of the neutral sprayed particles, a thermo-ionization mass spectrometry), micro probe X-ray spectral analysis, a Roentgen-luminescent analysis for the stable elements of metals and alloys and alpha, beta, gamma emission measurement and gamma - spectrometry of uranium were fulfilled. The bombardment by ions of hydrogen, deuterium, an argon and xenon using the discharge voltage 300-1000 volts, a current 5-150 mA is carried out.

The changes of structure, of chemical composition and of isotopic composition depended on ion current density, the dose and ions kind and other parameters of the process. The influence of each of the parameters on the process intensity and its reproducibility has been estimated.

The role of "hot points" in structural, chemical and isotopic changes is shown. Groups of prevailing chemical elements and isotopes in the "hot points" of the active zones have been studied by various analytical methods.

The role of the impurity component has been estimated. Correlation of chemical elements and isotopes with possible kind of reactions of fusion and fission, found out by various analytical methods has been shown.

1. Savvatimova, Ya.Kucherov and A. Karabut, "Cathode Material Change after Deuterium Glow Discharge Experiments," *Transaction of Fusion Technology* (December 1994); v.26, number 4T (1994), pp. 389-394.
2. Savvatimova I.B., Senchukov A.D., Chernov I.P. Transmutation Phenomena in the Palladium Cathode after Ions Irradiation at the Glow Discharge. ICCF6. Proceedings. Progress in new hydrogen energy. October 13-18, 1996- Japan, 1996, p.575-579.
3. Savvatimova I.B., Karabut A.B. Nuclear Reaction Products Registration on the Cathode after Deuterium Glow Discharge. *Surface*, V. 1, Moscow: RAN, 1996, p.63-75.
4. Savvatimova I.B., Karabut A.B. Radioactivity of the palladium's cathode after glow discharge irradiation. *Surface*, V.1 Moscow: RAN, 1996, p.76-81.
5. Savvatimova I.B, Transmutation in cathode materials exposed at glow discharge by low energy ions. Nuclear phenomena or irradiation result? ICCF-7, Canada, 1998
6. Savvatimova I.B Reproducibility of experimental in glow discharge and process accompanying deuterium ions bombardment. ICCF8, Italian Physical Society, Bologna, Italy, 2000, P.277
7. J. Dash, I. Savvatimova, S. Frantz, E. Weis and H. Kozima, "Effects of Glow Discharge with Hydrogen Isotope Plasmas on Radioactivity" *Proc. ICENES2002*, p. 122 (2002) 20
8. Savvatimova I.B., Gavritenkov D.V. Results of analysis Ti foil after glow discharge with deuterium. Proceeding ICCF-11 2004.

Experimental Observation and Combined Investigation of High-Performance Fusion of Iron-Region Isotopes in Optimal Growing Microbiological Associations

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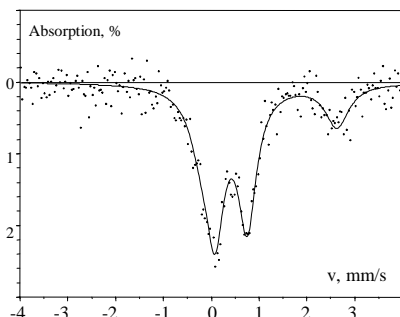
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Several years ago we have studied and reported the process of transmutation of stable isotopes in growing "one-line" (one type) microbiological cultures like *Escherichia coli* or *Deinococcus Radiodurans* [1]. It was shown that the transmutation process by such microbiological cultures took place but its effectiveness was low and equaled about $\lambda \approx 10^{-8} \text{ s}^{-1}$ in reaction $\text{Mn}^{55} + \text{d}^2 = \text{Fe}^{57}$ and $\lambda \approx 10^{-10} \text{ s}^{-1}$ in reactions with middle range mass isotopes. The low effectiveness was the result of the narrow interval of functional characteristics of any "one-line" type of culture.

In a contrast to this "one-line" cultures investigated microbiological associations include many thousands types of different cultures. These cultures are in a state of symbiosis and grow as a correlated macrosystem. The spectrum of their functional characteristics is very wide. It has been expected that it would lead to high effectiveness of stimulation of the transmutation process.

This report represents the results of combined (Mössbauer and mass-spectroscopy) examinations of isotopes transmutation process in growing microbiological associations in the iron-region of atomic mass ($50 < A < 60$). The general aim of investigation was to find biotechnology ways for effective isotope transmutation. During experiments special microbiological MCT ("microbial catalyst-transmutator" [2]) granules including microbiological associations were used. The base $\text{Mn}^{55} + \text{d}^2 = \text{Fe}^{57}$ reactions with heavy water in growing MST were conducted in the system " $\text{D}_2\text{O} + \text{Mn}^{55} + \text{MCT} + \text{additional nutrient components}$ ". The control experiments were conducted in another system " $\text{H}_2\text{O} + \text{Mn}^{55} + \text{MCT} + \text{the same additional nutrient components}$ ". Many different experiments under varying conditions were carried out. The typical duration of each experiment was about 20-30 days. Several of our main experimental results are:

1. Creation of rare Fe^{57} Mössbauer isotope (see Mössbauer spectrum of grow MCT) in the process of low-energy transmutation in growing microbiological associations with effectiveness



$\lambda \approx N(\text{Fe}^{57})/N(\text{Mn}^{55})\Delta t \approx (0.5-1) \cdot 10^{-6}$ (synthesized Fe^{57} nuclei per s and per single Mn^{55} nucleus). The total number of created Fe^{57} nuclei is about $N/V \approx 10^{18}$ nuclei per 1 cm^3 of D_2O that is by 100 times more in relation to "one-line" cultures;

2. Decreasing of Mn^{55} isotope concentration in transmutation flask synchronized with creation of Fe^{57} isotope in the same flask;

3. Changes of isotopes ratios from values $\eta(\text{Fe}^{54})/\eta(\text{Fe}^{56}) \approx 0.06$, $\eta(\text{Fe}^{57})/\eta(\text{Fe}^{56}) \approx 0.025$, $\eta(\text{Fe}^{58})/\eta(\text{Fe}^{56}) \approx 0.003$ (for the case of pure natural Fe and for impurity Fe in the control experiments) to

$$\eta(\text{Fe}^{54})/\eta(\text{Fe}^{56}) \approx 0.5, \quad \eta(\text{Fe}^{57})/\eta(\text{Fe}^{56}) \approx 0.05, \quad \eta(\text{Fe}^{58})/\eta(\text{Fe}^{56}) \approx 0.1$$

(for optimal experiments on transmutation in the medium with D_2O presence).

The possible ways of Fe^{54} and Fe^{58} isotopes transmutation are also discussed.

[1]. V.I Vysotskii., A.A. Kornilova. Nuclear fusion and transmutation of isotopes in biological systems, Moscow, "MIR" Publishing House, 2003.

[2] V. I. Vysotskii, A. Odintsov, V. N. Pavlovich, A. B. Tashirev, A. A. Kornilova. Experiments on controlled decontamination of water mixture of different long-lived active isotopes in biological cells// Proceeding of ICCF-11, France, 2004.

Research into Low Energy Nuclear Reactions in Cathode Sample Solid with Production of Excess Heat, Stable and Radioactive Impurity Nuclides

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The experimental researches of thermal, high-energy and nuclear processes occurring in the solid medium under the influence of a high-intensity ion flow with the energy of 1 - 2 keV were presented.

The experiments were carried out using a current glow discharge plant that is a precision three-channel flow calorimeter. The plant consisted of a water-cooling vacuum chamber, cathode and anode units. The discharge occurred in D₂, Kr, Xe at the pressure up to 10 Torr, pulse-periodic current up to 200 mA and discharge voltage of 1000-2500 V. The cathode samples made of Pd, Ti and other materials with the area up to 1cm² were used.

The excess heat power up to 10 –15 W and efficiency up to 150 % was registered under the experiments for deuterium-charged cathode samples in D₂, Kr, Xe discharge. The excess heat power was not produced when using the cathode samples made of pure Pd (not deuterium-charged) in Xe and Kr discharges.

The analysis of the impurities content in the cathode samples material before and after the experiments. The spark mass spectrometry, secondary ionic mass spectrometry, and secondary neutral mass spectrometry were used. The elements impurities were recorded in the near-surface layer having the thickness of 1000 nm in amount up to some tens percents. The main impurity nuclides (with the content more than 1%) were ⁷Li, ¹³C, ¹⁵N, ²⁰Ne, ²⁹Si, ⁴⁴Ca, ⁴⁸Ca, ⁵⁶Fe, ⁵⁷Fe, ⁵⁹Co, ⁶⁴Zn, ⁶⁶Zn, ⁷⁵As, ¹⁰⁷Ag, ¹⁰⁹Ag, ¹¹⁰Cg, ¹¹¹Cg, ¹¹²Cg, ¹¹⁴Cg, ¹¹⁵In. Changing the natural ratio of the isotopes by some tens of times was registered for some impurity elements (Ca, Ti, Fe, Ni, Ge and others). In this case some basic (with large % content in nature) isotopes of the elements impurities were observed to be absent. The following isotopes ⁵⁸Ni, ⁷⁰Ge, ⁷³Ge, ⁷⁴Ge, ¹¹³Cd, ¹¹⁶Cd were registered being absent completely.

The gamma rays emission registration was made using HPGe detector. Gamma rays emission in the energies range of 0.3-3MeV and the intensity up to 10³ 1/sec was observed during discharge burning and after discharge current turning out within eight days. About 3000 gamma lines for 20 β-radioactive decay chains identified in gamma spectra.

The results of X-ray spectra registration show that excited energy levels with the lifetime up to a few hours and more exist in the solid medium.

Using the total combination of the obtained results, the phenomenological theory of the basic processes occurring in the solid medium was formulated, the prototype of a power plant for excess heat power production on the basis of nonequilibrium transmutation nuclear reactions proceeding in the solid medium was designed.

Elemental Analysis on Palladium Electrodes after Pd/Pd Light Water Critical Electrolysis

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Since Ohmori et al. reported the nuclear transmutation reaction in his light water electrolysis system¹⁾, many researchers still have claimed various kinds of low energy nuclear reactions. However, it is quite difficult to replicate that reaction on normal electrolysis condition. Through our previous experiments and the other reports, we conjecture that electrolysis system and electric-parameters are important factors to induce condensed matter nuclear reactions. At this conference, we propose an optimum electrolysis system and condition based on our major findings thorough light water electrolysis experiments.

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. constructed a new type of electrolysis, which is referred to as Critical Electrolysis^{2, 3)}.

Here, we suppose that there exist a positive correlation between excess heat and current density, or cell voltage in case of the normal electrolysis region, or the plasma region, respectively. If the cell voltage increases up to a breakdown point, then the current immediately drops down due to the generation of a vapor sheath in which high electric field ionize vapor molecules to form the plasma state. Hence, most favorable current density or cell voltage is just before the breakdown point: Critical region, to obtain the excess heat and the transmutation in electrolysis system.

After the Critical Electrolysis we analyzed cathode materials by EDX, and found obvious platinum peaks, which originate from the counter electrode in all cases. Although it is widely recognized that the platinum anode less dissolved and electrodeposited in alkali solution, the experimental result suggests this reaction might be accelerated in a certain condition, and this platinum could complicate transmutation processes like photofission⁴⁾. Then that electrodeposited platinum makes an evaluation of process difficult. Therefore we propose that the anode material has to be same as cathode to discuss the transmutation simply.

The most salient feature of our work is Pd/Pd light water critical electrolysis system. In this case, we can avoid the difference of electrode between anode and cathode. Therefore origins of detected elements on the palladium electrodes are restricted within the alternative of impurities or transmutations. Furthermore, if they are the transmutation products, the conjectures of these processes become more simply than those in the case of Pd/Pt system.

After the experiments, we analyzed palladium electrodes and depositions. And there exists obvious differences on spectrums between depositions on the electrodes and precipitations at the bottom of the cell, where main elements of both samples are the palladium from anode. For example, in a certain case, iron and copper peaks are detected only on the depositions, while the precipitations don't contain these elements. Consequently, we consider these different elements are low energy nuclear reaction products induced around cathode.

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
4. A. Takahashi et al., Jpn. J. Appl. Phys., 40, 7031, 2001

ICCF12, November 27 – December 2, 2005 Yokohama, Japan

Reproducible Nuclear Emissions from Pd/PdO:D_x Heterostructure during Controlled Exothermic Deuterium Desorption.

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Weak nuclear emissions accompanied deuterium loading/deloading into Ti and Pd matrix have been studied for more than a dozen years [1,2]. PdD_x sample subjected to electrochemical/gas loading or deuterium desorption/deloading generate weak random fluxes of DD-reaction products (neutrons and protons) and energetic alpha particles. However, reproducibility of these emissions was low depending on material quality and experimental conditions. Here we present new reproducible results on DD-reaction products, energetic alpha particles and soft X-ray emissions detected in controlled conditions of exothermic deuterium desorption from the surface of Pd/PdO:D_x heterostructure.

The samples of Pd/PdO were synthesized by thermal growing of thin oxide layer (PdO_y) of 20 nm thick on top of 110 μm thick annealed cold worked Pd foils (area 5x2 cm²) using an oxygen-propane torch. The electrochemical loading of Pd/PdO cathodes by x=D/Pd = 0.7 has been carried out with low current density (j ~ 20 mA/cm²) electrolysis in 1M-LiOD/D₂O solution using a special cell with divided cathode and anodic spaces. Immediately after achieving an x=0.7 loading ratio, the electrolysis is interrupted. The Pd/PdO:D_x sample with attached CR-39 or thermal luminescent (TLD) detectors is placed under mechanical loading (m=150 g) for one hour at T =20 °C. During this time the Pd/PdO:D_x sample showed signs of heating up to 40 °C caused by exothermic deuterium desorption. About 80% of initial deuterium content was found to be desorbed through Pd-PdO interface during t = 1.0 hr. In control experiments a similar Pd/PdO sample electrochemically loaded with hydrogen in 1-M NaOH/H₂O electrolyte and exposed to CR-39 detectors has been employed. In blank/background experiments, unloaded Pd/PdO heterostructure samples were used with CR-39. Both open and filtered CR-39 track detectors have been applied in our experiments in order to estimate type and energy distributions of emitted particles. The photo-insensitive X8 LiF TLD (Landauer) units used for soft X-ray detection were filtered by 1-4 layers of 15 μm polypropylene.

Pd/PdO:D_x runs with CR-39 detectors showed a highly reproducible yield of 3 MeV protons from DD-reaction accompanied by energetic alpha emission in the range of 11-16 MeV. These emissions are not detected in the blank experiments with unloaded Pd/PdO heterostructure. The particle energies are in good agreement with their stopping ranges in the filtered foils. Taking into account the detection efficiency (accordingly to energy dependence of critical angle magnitude) the d(d,p)t yield corresponded to 3.0 MeV proton emission is found to be $\langle N_p \rangle = (1.55 \pm 0.15) \times 10^{-2}$ p/s-cm² in 4π-steradian. This magnitude of d(d,p)t reaction is in agreement with our earlier data on the 2.45 MeV neutron yield in the Au/Pd/PdO:D_x samples [2]. The reproducible yield of energetic alpha particles was found to be $\langle N_\alpha \rangle = (5.1 \pm 0.6) \times 10^{-3}$ α/s-cm², which is higher than that observed during long electrolysis runs [3]. The Pd/PdO:H_x samples showed comparable yield of energetic alphas, but did not show 3.0 MeV proton emission. The X-ray TLD measurements performed with Pd/PdO:D_x sample showed emission of quanta with energy as low as E_x = 1.3 ± 0.3 keV. The mean intensity of these X-ray quanta in 4π ster. being emitted from Pd/PdO:D_x surface during exothermic D-desorption was found to be N_x = 9 ± 2 s⁻¹-cm⁻². The energy of X-ray quanta emitted from Pd/PdO:D_x during D-desorption is in good agreement with energy of intense X-ray generated by Pd and Ti cathodes in Karabut's type high current pulsed glow discharge [4]. The entire results of this research indicate that exothermic D-desorption is that obvious link between DD-screening, soft X-ray emission and high energy alpha generation from the surface of Pd/PdO:D_x.

References

- [1]. S.E. Jones et al, in ICCF 10 Proc, Boston, Mass., 24-30 August, 2003
- [2]. A.G. Lipson et al, Fusion Tech. **38**, 257 (2000).
- [3]. A.G. Lipson et al, in ICCF 10 Proc, Boston, Mass, 24-30 August, 2003
- [4]. A.G. Lipson et al., JETP, 100, 1175 (2005).

Correct Identification of Energetic Alpha and Proton Tracks in Experiments on CR-39 Charged Particle Detection during Hydrogen Desorption from Pd/PdO:H_x Heterostructure

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Earlier experiments [1,2] have showed emissions of energetic charged particles (α -particles and protons) during exothermic H desorption from the Pd/PdO:H_x heterostructures. The occurrence of these emissions was confirmed by independent experiments using both Si-surface barrier and CR-39 plastic track detectors. Earlier we already showed that purified CR-39 plastic track detectors can be considered as an adequate scientific instrument, which suitable for detection of individual uniformly distributed charged particles and also for the groups of these particles being emitted from the active spots (“hot zones”) attributed to the maximum internal strain area at the surface of Pd/Ti:D samples. The analysis of CR-39 data showed that in some cases energetic charged particle tracks (α -particles and protons) concentrated inside the small spots of detector. The typical “hot zone” with $\sim 10^2$ tracks within the area with the size of $0.2 \times 0.2 \text{ mm}^2$ were found to be appeared during the hydrogen desorption experiments with Pd/PdO:H_x samples [2].

In present work we demonstrate the advance of track detection technique allowing to perform an unambiguous identification of CR-39 tracks in order to obtain full information about type and energy of detected particles as well as to distinguish them from usual background events and surface defects

Track parameters (coordinates and diameters) measurements have been carried out with automated microscope facility (PAVICOM) [2,3]. In order to obtain correct particle identification, in-depth track etching and comparison of their parameters (including diameters and etching rates) with those for calibration tracks (obtained with accelerator alpha and proton bombardment of CR-39) have been performed. The detectors were etched in 6N solution of NaOH at 70°C, during the time intervals corresponded to 7, 14, 21, 28 and 35 hrs. After the etching during every specific time interval, the diameters were measured for each individually selected track. Thus, the measurements of parameters for individual tracks in the “hot zone” and calibration detectors were carried out after each 7 hours of etching. Using the results of these measurements we plotted the functions of track opening diameter vs. etching time and the rate of etching inside the track vs. removed layer depth [4].

The comparison of etching dynamics of Foreground tracks from the “hot zone” with that of calibration alpha and proton track openings allowed unambiguously identify α -emission ($E_\alpha = 11 - 16 \text{ MeV}$) and proton emission ($E_p = 1.0 - 1.5 \text{ MeV}$). The example of identification of α -particle track from “hot zone” is shown in Fig.1.

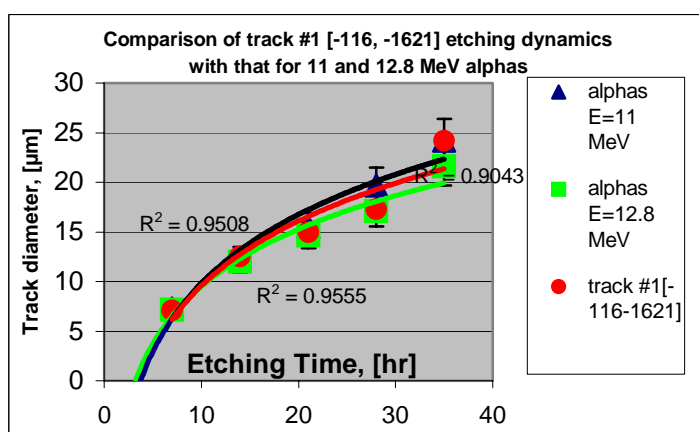


Fig. 1. The comparison of the dynamics of track #1 (coordinates [-116,-1621]) opening growth with alpha particles having energies 11 and 12.8 MeV. The energy of particle, which is corresponded to track #1 is ranging from 11 to 12.8 MeV

References:

- [1]. A.G. Lipson et al. Fusion Technology **38**, 238 (2000)
- [2]. A.S. Roussetski. Proc. of ICCF-11 (Marseilles 2004, France)
- [3]. A.B. Aleksandrov et al, Nucl. Instr. And Meth. A535 (2004) 542-545.
- [4]. B. Dorschel et al. Radiation Measurements 31 (1999) 103-108

On Aspects of Complex Nuclei in LENR Relative to Transmutation Reactions and X-ray Emission from Localized Clusters

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Swimming Electron Layer theory plus fission of resulting heavy complex nuclei were proposed earlier to explain the reaction products observed in packed-bead "Patterson cell" experiments [1]. More recently we proposed a modified version of this model to explain the Iwamura transmutation experiment [2]. Extensions of this model are also consistent with recent measurements of energetic charged-particle emission during controlled electrolysis and with certain aspects of localized reactions and x-ray production observed during plasma bombardment experiments [3] and during desorption of electrolytically loaded Pd targets [4]. These cluster states also appear to be related to the superconducting states observed in densely packed D/H regions associated with dislocation loops in stressed Pd targets [5]. The binding energy per nucleon can be estimated for states in the thin-film bead experiments by an energy balance combined with identification of the products associated with each complex. For example, the complexes with average $A=39$ and $A=104$ are found to have excitation energies of 0.05 and 0.2 MeV/Nucleon, respectively. The excitation energies in the case of the Iwamura complex is much lower due to edge effects, as is the case for charged-particle and x-ray emissions. Recent x-ray measurements along with these calculations and other supporting experimental data will be discussed in terms of the cluster concepts.

1. G.H. Miley, and J.A. Patterson, "Nuclear Transmutation in Thin-film Coatings Undergoing Electrolysis," *J. New Energy*, vol. **1**, pp.11-15, (1996).
2. G. H. Miley and H. Hora, "Nuclear Reactions in Solids," *APS 2002 Fall Nuclear Phys. Mtg.*, East Lansing, MI, Oct 7-10 (2002).
3. G. H. Miley, N. Luo, H. Hora and A. G. Lipson, "Screening Effects in Low Energy Nuclear Reactions of Importance to Astrophysics", *IEEE Nuclear Sciences Symposium*, Paper NS 101, Portland, OR, Oct. 19 – 25 (2003).
4. A.G. Lipson and G. H. Miley, "X-ray emission from electrolytically loaded targets", AFRL report, August, 2005, in press.
5. A. G. Lipson, C. H. Castano, G. H. Miley, B.F. Lyakhov, A. Y. Tsivadze, and A. V. Mitin, "Evidence of Supersoichiometric H/D LENR Active Sites and High Temperature Superconductivity in a Hydrogen-cycled Pd/PdO", ICCF12, *to be presented*.

Kinematical Measurements for the D+D → p+t Reaction in Metal at $E_d \sim 10$ keV: Are Target Deuterons in Motion before Collide?

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Since the screening energy for the DD reaction in some of the metals is much larger than the energy scale of the atomic systems, one might expect the effects on the kinematical quantities. We have tried to see such an effect in yield ratios of protons to tritons in the D+D → p+t reaction detected with a single detector. The measured ratio is equal to the ratio of the solid angle ratio of protons to tritons which depends only on the bombarding energy as well as the detection angle, as shown as follows;

$$R = \frac{Y_p}{Y_t} = \frac{(dN_p/d\Omega_{lab})}{(dN_t/d\Omega_{lab})} = \frac{(d\sigma/d\Omega_{cm})_p}{(d\sigma/d\Omega_{cm})_t} \frac{(d\Omega_{cm}/d\Omega_{lab})_p}{(d\Omega_{cm}/d\Omega_{lab})_t} = \frac{(d\Omega_{cm}/d\Omega_{lab})_p}{(d\Omega_{cm}/d\Omega_{lab})_t}.$$

Here, $(d\sigma/d\Omega_{cm})$ is the differential cross section at the detected angle in the cm system and its value is the same for proton and triton for the D+D → p+t reaction. Thus, any deviation of the yield ratio from the kinematical calculation requires the change of the kinematics of the two-body colliding system; for example, the target deuteron is not at rest but in motion before the collision.

The measurements of yield ratio of protons to tritons have been carried out with a Si detector placed at 145 degree with respect to the beam direction for bombarding energies between 8 and 20 keV. As the host for the DD reaction, foils of CD₂, Ti, Pd, PdO and Au were bombarded. In order to obtain statistically significant results, both protons and tritons were accumulated at least 40000 counts for one run at each bombarding energy and more than 10 runs of the measurements were performed.

The experimental data and preliminary analyses show the following: The measured ratios for the CD₂ and Ti host are in agreement with a simple calculation assuming that the target deuteron is at rest and only single D+D collision occurs. However, the ratios for the Pd, PdO and Au are systematically and surprisingly smaller than the calculation. We have considered that a multiple scattering process in which a beam deuteron scatters off the host atom may alter the kinematical condition. It is found out that the multiple scattering reduces the ratio, but the experimentally observed deviations cannot be explained for PdO, Pd and Au.

We infer that the deviations are due to the motion of the target deuteron in the metal environment. Although a precise calculation including multiple scattering is not available yet, the observed deviations roughly give the amount of the kinetic energy of the target deuteron before the DD collision occurs in metal; 100 eV for Au, 200 eV for Pd and 500 eV for PdO. Of particular interest is the correlation of the screening energy and the energy of the target deuteron. Thus, the large screening energy and the motion of the target deuteron might originate from the same source.

Some theoretical works concerned with the nuclear phenomena in condensed matter predict the motion of deuterons in metal; deuterons as Bloch ions, Bose-Einstein condensation, lattice-deuteron coherent motions, and so on. It is worthwhile to examine carefully these theories in order to explore the source of huge energies observed in kinematics change of the DD reaction in metal

Unifying Theory of Nuclear Fusion Based on Quantum Plasma Fusion Mechanism for Low-Energy Nuclear Reaction and Transmutation Processes in Deuterated Metals, Acoustic Cavitations, and Deuteron Beam Experiments

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There have been many reports of experimental evidences for low-energy nuclear reaction (LENR) processes in condensed matters as documented in a recent document submitted for a DOE review [1] and as reported in Proceedings of ICCF-10 [2]. However, most of experimental results cannot be reproduced on demand. This situation has prevented us from development of a coherent theoretical understanding or working theoretical model of the phenomenon which can be used to guide us in designing and carrying out new experimental tests to sort out essential parameters and controls needed to achieve reproducibility on demand (ROD). In this paper, it is shown that a recently developed theoretical model based on quantum plasma (QP) fusion mechanism is applicable to the results of many different types of LENR and low energy transmutation reactions (LETR) experiments.

There have been many experimental evidences indicating that LENR processes in condensed matters are surface phenomena (SP) occurring in micro- and nano-scale active (hot) spots in the surface regions rather than bulk phenomenon (BP) in the bulk of the deuterated metals. Theoretical studies of quantum plasma fusion mechanism have been carried out using an approximate solution to the many-body Schroedinger equation for a system of N identical charged, integer-spin nuclei ("Bose" nuclei) confined in micro- and nano-scale traps (cavities or atomic clusters) [3-6]. The ground-state solution is used to obtain theoretical formulae for estimating the probabilities and rates of nuclear fusion for N identical Bose nuclei confined in a ion trap or an atomic cluster. One of the main predictions is that the Coulomb interaction between two charged bosons may be suppressed for the large N case and hence the conventional Gamow factor may be absent. Recently, the one-specie LENR theory of the QP fusion mechanism [3-6] used for reactions such as (D+D) has been generalized to the two-species case and applied to (D+Li) reactions [7], which may be also applicable to other LETR processes in matters.

The QP fusion mechanism is applicable to nearly all of the reported results of the LENR and LETR experiments: (1) electrolysis experiments, (2) gas experiments, (3) nuclear emission experiments, (4) transient acoustic cavitation experiments, (5) acoustic cavitation experiments, (6) deuteron beam experiments, and (7) transmutation experiments.

The only unknown parameter of the theory is the probability of the QP ground-state occupation, Ω . Since Ω is expected to increase as the effective temperature of the QP ground-state decreases, the nuclear reaction rates for the QP fusion mechanism are expected to increase at lower temperatures.

Recent results of cross-section measurements from deuteron beam experiments with metal targets by Kasagi et al. [8] and Rolf et al. [9] indicate that this temperature dependence may be occurring. Recently, Rolf et al. [9] have investigated the electron screening effect in the $D(d,p)^3H$ reaction with low energy deuteron beam on deuterated targets. They have found that all deuterated metal targets yield large extracted values of the screening energy U_e ranging from $U_e=180 \pm 40$ eV (Be) to $U_e=800 \pm 90$ eV (Pd), while all deuterated non-metal targets yield smaller values of $U_e \leq 80$ eV. Their observed temperature dependence of U_e with deuterated Pt is consistent with the prediction of the QP fusion mechanism. The use of deuterated porous metal targets is suggested for future low-energy deuteron beam experiments to test the temperature dependence predicted by the QP fusion mechanism.

The predictions of the QP fusion mechanism can be tested in well designed experiments listed above in order to find out whether the QP fusion mechanism is a correct unifying theory for the LENR and LETR processes in condensed matters. New experimental tests have been recently proposed [10,11].

1. P.L. HAGELSTEIN et al., "New Physical Effects in Metal Deuterides", submitted to DOE for a review, July 2004, and references therein. This report was posted December 1, 2004 at the DOE website: <http://www.sc.doe.gov>
2. See experimental papers in the Proceedings of the 10th International Conference on Cold Fusion (ICCF-10), Cambridge, MA, USA, 2003.
3. Y.E. KIM and A.L. ZUBAREV, Fusion Technology 37, 151 (2000).
4. Y.E. KIM and A.L. ZUBAREV, Italian Physical Society Proceedings 70, 375 (2000), ICCF-8.
5. Y.E. KIM and A.L. ZUBAREV, Physical Review A64, 013603 (2001).
6. Y.E. KIM, Progress of Theoretical Physics Supplement 154, 379 (2004).
7. Y.E. KIM and A.L. ZUBAREV, Proceedings of the ICCF-11, Marseille, France, 2004.
8. J. KASAGI, Progress of Theoretical Physics Supplement No. 154, 365 (2004); J. KASAGI et al., J. of Phys. Soc of Japan 73, 608 (2004).
9. C. ROLFS et al., Progress of Theoretical Physics Supplement, No. 154, 373 (2004); F. RAIOLA et al., Eur. Phys. J. A19, 283 (2004).
10. Y.E. KIM, D.S. KOLTICK, R.G. REIFENBERGER, and A.L. ZUBAREV, Proceedings of the ICCF-11.
11. Y.E. KIM and T.O. Passell, Proceedings of the ICCF-11.

Evidence of Supersoichiometric H/D LENR Active Sites and High Temperature Superconductivity in a Hydrogen-Cycled Pd/PdO

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In contrast to homogeneous bulk palladium, which showing no sign of superconductivity, at least above 3 mK, bulk Pd hydride and deuteride are superconducting, exhibiting an inverse isotope effect with critical temperatures between 7 and 10 K near stoichiometric compositions. The effect of approaching a stoichiometric compositions is dramatic, with the critical temperature increasing from ~ 1 K to 8 K as the composition increases from PdH_{0.80} to PdH_{1.00}. The origin of superconductivity in Pd hydride is attributed to strong electron-phonon coupling to the optical modes, requires a suppression of spin fluctuations in the Pd lattice, and sd-hybridization of the hydrogen and Pd electrons. Recently, Ashcroft has proposed that hydrogen dominant metal hydrides may exhibit high temperature superconductivity (HTSC). The central thesis in Ashcroft's work is that these hydrides are in a form of "pre-compression" due to the high electron density and additional external pressure can induce a metallic phase. The electrons from both the hydrogen and the metal atoms could then participate in common overlapping bands, leading to HTSC.

In the present work we continued the study of electron transport and magnetic properties of highly hydrogen loaded dislocation core site in Pd [1]. The structural, magnetic and transport characteristics of a 12.5 μm thick cold worked Pd foil with a thermally grown oxide and a low residual concentration of hydrogen $\langle x \rangle = \text{H/Pd} \sim 6 \times 10^{-4}$ were measured with high accuracy using high vacuum thermal analysis (TDA) facility, 1T-SQUID (MPMS-3, Quantum Design) and Keithley182 digital voltmeter [2]. This foil was deformed by electrochemical cycling across the Pd hydride miscibility gap and the residual hydrogen was trapped at dislocation cores. TDA of the residual hydrogen showed a sharp primary release peak near 430 °C superimposed on a much broader peak is evident in the Pd/PdO:H_x measurement. The binding energies corresponding to the sharp and broad peaks are estimated as $\epsilon_{\text{H}} = 0.65 \pm 0.10$ eV and $\epsilon_{\text{H}} = 0.16 \pm 0.05$ eV, respectively. The concentration of hydrogen corresponding to the primary release peak is estimated as $\langle x \rangle = 6.0 \times 10^{-4}$ [H]/[Pd] based on calibration of the TDA system with TiH₂ powder [1]. This is the concentration averaged over the entire volume of the sample. The local concentration within one Burgers vector (2.75 Å) of the dislocation core will be much higher and can be estimated as $\langle \tilde{x} \rangle \sim 1.8$ [H]/[Pd] using simple geometric arguments with an assumed dislocation density of 2×10^{11} cm⁻² [1,2].

Anomalies of both resistance and magnetic susceptibility have been observed below 70 K, indicating the appearance of excess conductivity and a diamagnetic response providing an evidence for weak/filamentary superconductivity. The filamentary HTSC is attributed to a condensed hydrogen-rich phase at dislocation cores (dislocation network) over the Pd-PdO interface.

The role of these supersoichiometric "metallic" hydrogen/deuterium sites at dislocation cores with respect to LENR's active centers, including possibility of multibody fusion [3] will be discussed.

This work was partially supported by NSF Grant No. DMR-9982520 and Grant from New York Community Trust. The magnetic measurements were performed at the Frederick Seitz Material Research Laboratory at UIUC supported by the U.S. Department of Energy under Grant No. DEFG02-91-ER45439. The authors thank Prof. A. Bezryadin (UIUC) and Prof. R. Prozorov (Univ. South Carolina) for useful comments.

References

- [1] A.G. Lipson et al, Phys. Lett. A, **339**, 414, (2005).
- [2] A.G. Lipson et al, PRB, Rapid Communications, in press (2005).
- [3] A. Takahashi, Proc ICCF 11, Marseille, France (2004).

New Procedure to Make Active, Fractal like, Surfaces on Thin Pd Wires

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It has been recently shown that nano-structures of metallic Palladium, stabilized in a matrix of Zirconium oxide, can absorb surprisingly large amount of H₂ or D₂. Atomic ratios (H,D)/Pd >> 1 can be easily accomplished (according to Yoshiaki Arata recent results and to the Akito Takahashi theoretical model) at an overpressure of few bars only with respect to the ambient pressure.

On the basis of such results we are now convinced that the most of the high loading ratios (H-D/Pd) and/or anomalous effect (both thermal and nuclear using D), carried out (in general in a not reproducible way) by people involved in cold fusion experiments, can be due to the spontaneous and uncontrolled growing-up of fractal nanostructures on the surface of the Pd cathodes.

In our opinion, even the Sr and Cs transmutation (experiments carried out by the Yasuhiro Iwamura team at Mitsubishi Heavy Industries, Yokohama, Japan), which occur in a reproducible way on the surface of the Pd/Pd-CaO/Pd multilayer, could be due to the formation of fractal-like structures produced during the multilayer fabrication process.

In order to simplify the very sophisticated Y. Arata procedures necessary to produce stabilized Pd nanostructures, we tried to develop a technique capable to form a thin layer of active (nano-structure like) surface directly on the Pd wires used for conventional electrolytic loading tests.

A thin (50µm diameter) Pd wire was Joule heated in air (\cong 600mA for 60 seconds) at about 700°C in order to get a thin layer of PdO. After such a heat-treatment the wire was immersed into a diluted solution of colloidal silica, and then heated again as to produce a Palladium silicate.

The wire exposed to a 1-atmosphere D₂ gas showed an astonishingly rapid loading rate and in about 100 seconds the electric wire resistance (R/R₀) reached the value of 1.90. The maximum R/R₀ value of 1.98 (D/Pd \cong 0.75), reached two minutes later, remained stable for a long time (further details, by the authors of this paper, are shown in the JCF6 proceedings). We presume that such a result is due to the formation of a sort of fractal structure of metallic Pd sponge stabilized by the presence of silicon oxide. In fact, if the wire immersion in the colloidal silica is omitted, the loading rate becomes lower and long after the wire tends to degas.

Since 2001 we noticed that extremely large and fast loading rates (H/Pd \cong 1 in about 10 minutes) could be achieved in hydro-alcoholic electrolytes when the Pd wires used as cathodes were previously heat treated in air (our aim at that time was to carry out a stress relief annealing of the Pd wires). Coming back to those experiments, we can now re-interpret those results as due to the production of a fractal structure on the cathodic surfaces. We also noticed that in hydro-alcoholic ambient some corrosion of the Pd wires occurred during the anodic cycles. We found that after those cycles the H-D loading rate was in general increased.

By assuming that a strong anodic oxidation of the Pd wires could be as effective as the previously described heat treatment in air, we have performed some tests in hydro-alcoholic ambient. After a properly strong anodic cycle the loading rate of the cathode was extremely fast: in 300 seconds the R/R₀ peak was reached and in further 700 second the R/R₀ value dropped down to 1.2.

A systematic study on the procedures necessary to convert into a fractal structure the surface of virgin thin Pd wires and the correspondent loading rates and loading ratios will be reported.

Using Resistivity to Measure H/Pd and D/Pd Loading; Method and Significance.

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The most frequent technique used to determine the extent of interstitial loading of hydrogen or deuterium atoms into palladium electrodes or extended structures used in electrolytic or gas phase cold fusion experiments is the resistance ratio method. Specifically, advantage is taken of an empirical relationship between the measured resistance, R , normalized to that of the same body at the same temperature in the absence of hydrogen isotope, R° , hence R/R° , and the atomic fraction occupancies of octahedral interstitials, $x = \text{H/Pd}$ or D/Pd . This method was first suggested and employed in cold fusion studies by the present authors¹, and received immediate and widespread acceptance because of the ease with which this experimental technique could be used to make *in-situ*, real-time measurements of a parameter, D/Pd , anticipated² or hypothesized³⁻⁶ at that time to relate to cold fusion heat excess or nuclear production.

We take up this topic again 15 years later in an attempt to clear up some errors and misunderstandings regarding the resistance ratio method and its application in cold fusion studies. The relationship between R/R° and x is empirical, that is calibrations are only as good as the experiments that support the shape of the curve and cannot be used outside the range $[P, T, x]$ in which data are taken. The original calibration¹ (unaccountably and erroneously immortalized as the “famous Baranowski curve”) involved an extrapolation of known data into the region of cold fusion interest in the D-Pd system, at $x \gg 0.6$. Present theory and results focus new attention on the very high loading region where double occupation of octahedral sites, tetrahedral site occupancy, new phase formation or new electrical states may be relevant to the underlying physical process of excess heat and nuclear production. Rather than simply using the resistance ratio as a qualitative tool to determine whether an electrode is better or lesser loaded, it is now important to obtain accurate quantitative information for x close to unity. The curve originally published in 1990¹ is substantially in error in the high loading condition. We will describe how this empirical fit has been improved over the years for both H/Pd and D/Pd by employing new data, new analysis of old data, new experimental methods and results.

A second issue deserving more extended inquiry is the relationship between high bulk loading inferred from a measured resistance ratio, and the expected onset of cold fusion effects. What is the relevance of a bulk loading measurement if cold fusion is a surface effect or owes its existence to the formation of a surface or near-surface chemical state with conditions requisite for nuclear activity? What are the effects of compositional inhomogeneity along the diffusion vector or orthogonal to it on the average loading value estimated from resistance measurements? What role is played in producing cold fusion effects by deuterium absorbed or occluded in lattice traps, defects, dislocations, grain boundaries, voids and other non-interstitial sites? Do reference potential measurements of the type originally recommended by Fleischmann more directly interrogate the surface chemical condition than bulk cathode resistance in electrolytic experiments? Why do cold fusion heat excesses measured for electrolytic cathodes of diameter 1-3 mm appear to exhibit a clear threshold effect of loading in the range $0.85 > x > 0.875$, whereas gas loaded fine particle such as those employed by Case⁷ and others⁸ apparently exhibit similar excess heat power densities at bulk interstitial loadings that clearly do not approach this threshold? These questions and others will be addressed in an attempt to clarify, expand and reinforce the use of resistance ratio methods in cold fusion experiments.

1. M. McKubre *et al*, “Calorimetry and Electrochemistry of the D-Pd System”, in Proceedings of the First Annual Cold Fusion Conference, Salt Lake City, F. Will, Ed., (1990).
2. G. Cheek and W. O’Grady, “Quartz Crystal Microbalance Study of Pd/H Interactions”, *ibid*.
3. G. Preparata, “Theoretical Ideas on Cold Fusion”, *ibid*.
4. P. Hagelstein “Status of Coherent Fusion Theory”, *ibid*.
5. S. Chubb and T. Chubb, “Quantum Mechanics of ‘Cold’ and ‘Not-So-Cold’ Fusion”, *ibid*.
6. J. Schwinger, “Nuclear Energy in an Atomic Lattice”, *ibid*.
7. L. Case, “Catalytic Fusion of Deuterium into Helium-4”, in Proceedings ICCF7, Vancouver, F. Jaeger and G. Miley, Eds., (1998).
8. M. McKubre *et al*, “The Emergence of a Coherent Explanation for Anomalies Observed in D/Pd and H/Pd Systems”, in Proceedings ICCF8, Lercici, F. Scaramuzzi, Ed., (2000).

ICCF12, November 27 – December 2, 2005 Yokohama, Japan

Anomalous Energy Generation during 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 K₂CO₃ 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.

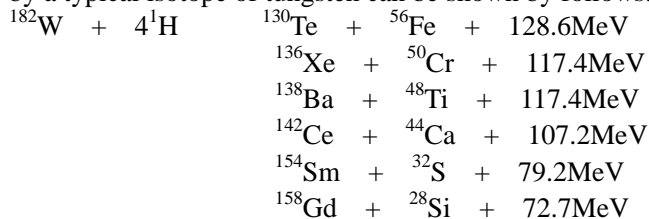
The event occurred in the first stage of the experiment before plasma normally forms. Soon after ordinary electrolysis began, voltage was increased to 20 V and current rose up to 1.5 A. Within 10s later, the cell temperature steeply rose up to 80 degree and a bright white flash was surrounded around 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.



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.

Abnormal Excess Heat observed during Mizuno-type Experiments.

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ABSTRACT :

The purpose of our experiment was to determine the relation between the average water evaporation rate on the average electric heating power. That relation was studied twice, first with the current flowing through an ohmic heater and then with the current flowing through the electrolyte. The two curves were found to be significantly different. Electric energy needed to evaporate a given amount of water via electrolytic heating was found to be significant smaller than in the case of ohmic heating. Abnormal excess heat as already observed by T. Mizuno during plasma-electrolysis of water with Tungsten electrodes have been therefore assessed in our own experiments. Reproducibility was confirmed in a satisfactory quantitative manner. Our simple device allows us to do reproducible and reliable measurements. Heat excess depends on the voltage used and of the chosen characteristics of the experiment.

High-frequency radiation during the vacuumization of the titanium alloy samples previously saturated by deuterium.

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High frequency radiation was detected during deformation of titanium alloy samples preliminary saturated by deuterium and in the process of their deuterium saturation [1].

One of the most interesting works devoted to CNF was the paper by Lobanov and others [2] dealing with registration of neutrons during vacuumization of samples $Ti_{50}Fe_{50}$ at room temperature. The samples were preliminary saturated by deuterium and subjected to thermal cycling from $T = 900^{\circ}C$ to $T = 20^{\circ}C$ by about 10 times. Since detection of neutrons was erroneous, we performed a similar experiment on samples out of titanium alloy and detected high frequency radiation (HFR) using an apparatus applied in [1].

The titanium alloy samples were placed into a quartz tube where discharge with the residual pressure $P = 10^{-5}$ mm Hg was created. HFR was detected after vacuumization for 20-30 minutes and had a pulsing character similar to the one detected during deformation or saturation of samples by deuterium. That is why it is seemed natural to refer the radiation detected in all three cases to one and the same process, namely CNF. The absence of any external action on the samples can lead only to cleaning of their surface from any impurities fixed on it. The mechanism of CNF occurrence is discussed.

1. Afonichev D.D., Murzinova M.A. Indicator of the process of cold fusion., Int. J. Hydrogen Energy. 2003, V 28, No 9 pp. 1005-1010.
2. Lobanov V.V., Zetkin A.S., Kagan G.E., et al. Pisma v ZHTF, 1991, v. 17, No. 23, p. 22-25 (in Russian).

Unusual Structures on the Material Surfaces Irradiated by Low Energy Ions and in Other Various Processes.

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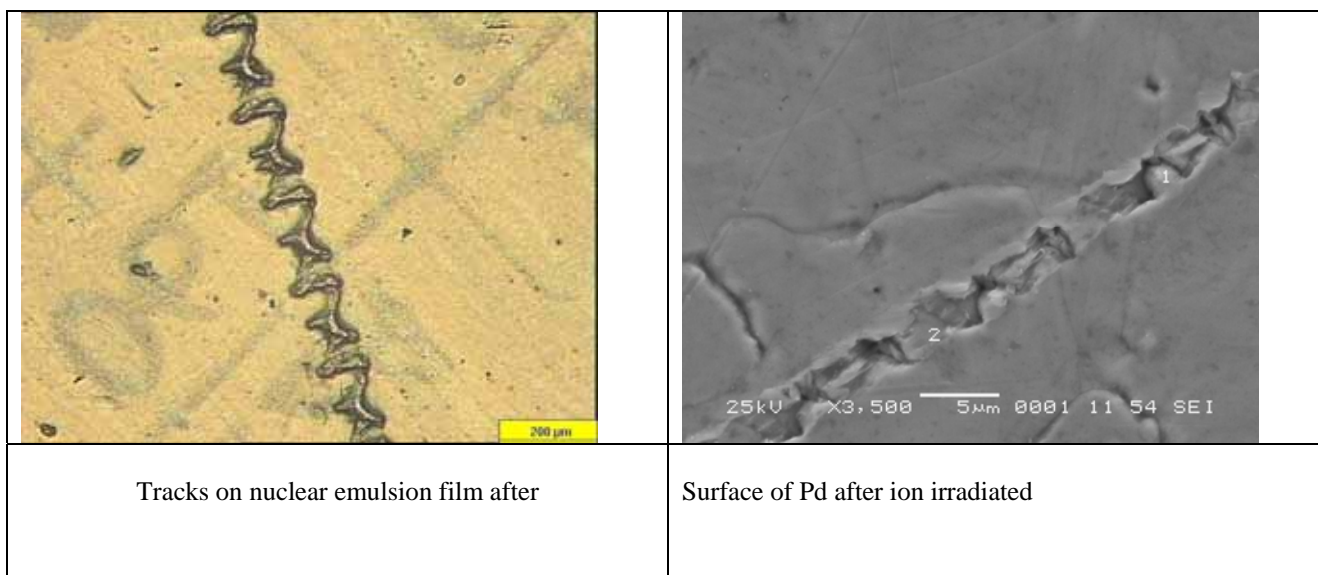
It is known, the unusual structures on the surfaces of metals and films (x-ray films, nuclear films and others) have not a comprehensible explanation with positions of material science and demand special physical interpretation (fig. 1 - regular structures: spirals, chains, chains of voids and others). It form during irradiation of materials by low energy ions in glow discharge plasma , at an electrolysis and other low-energy processes when energy of particles does not exceed several keV (the reference to Matsumoto, Savvatimova, Solin, Dash, Urutskoev, Bogdanovich, etc.) are observed. The each object require of the special explanation

Each of these objects is unusual not only in the shape and structure, but also in the chemical compound sharply distinguished from the composition of the basic material on which this structure has arisen (tables to fig. 1 with chemical composition). We shall take into account, that all these objects are received under conditions of low-energy influence when the nuclear processes in materials from the traditional point of view can't exist. Therefore at present there is no comprehensible hypothesis of the formation of such structures from the impurities. We shall also take into account, that the majority of the chemical elements forming unusual structures were not present in the initial material, and in the composition of the surrounding medium or in constructive details of the experimental installations. Thus, the shape, structure and composition of unusual objects demands special explanation, probably, on the basis of new physical concept. This unusual concept, as well as their possible practical application requires further examination of unusual structures.

We can offer two approaches to the explanation of the formation of such unusual structures:

1. The integrated approach. The formation of the complex objects can occur instantly and immediately in the light long-range action concept (Feynman, Vladimirov, etc.) The consecution of occurrence of complex structures from the simple ones is out of question.
2. The differential approach. It is based on stage-by-stage formation of the complex objects from simple ones. This second approach is a traditional methodology, but, it does not allow "to skip" a series of main problems. For example, the “cold transmutation of nucleus” is difficult for explanation.

We hope that the further examinations of the strange formations on the surfaces of various materials subjected to various low-energy actions, will allow establishing the true mechanism of formation of unusual material structures. Applied prospects of such examinations, will be naturally determined by physics of possible unusual processes which examples we have considered.



Heat Measurement during Plasma Electrolysis

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An accurate heat measurement with reproductivity would be one of the key issues to prove the cold fusion phenomenon. Mizuno et al reported the excess heat during their plasma electrolysis¹⁾. In this condition, the accurate heat measurement is very difficult, because the input power is much higher than an usual electrolysis. Therefore, an accurate calorimetry system should be designed for the plasma electrolysis system. In this study, a flow calorimetry system using a flow cell system for the plasma electrolysis has been developed, and the heat balance during the plasma electrolysis has been measured.

Figure 1 shows the structure of the flow cell for the plasma electrolysis. The body of the cell was 27cm length of an acrylic tube. The inside and outside diameter were 2cm and 5cm, respectively. The anode was a platinum mesh (99.99% purity, 55meshes) with 2cm diameter of a cylindrical shape. The cathode was a tungsten rod (1.0mm or 1.5mm, 99.95% purity), and was placed at the center of the cylindrical anode.

The electrolyte was K_2CO_3 light water solution, and was circulated in this system passing through a reservoir. The temperature of the electrolyte at the cell inlet was kept at 296K. The flow rate was fixed at the range of 571~1052ml min^{-1} . The temperature difference between the inlet and the outlet of the electrolyte was measured by Pt resistance thermometers. Hydrogen and oxygen that generated during electrolysis were collected in the reservoir and measured the rate of gas generation.

Figure 2 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 would start in this region, and the bright plasma was observed above 130V when the cell voltage was increasing. The plasma was observed above 90V in the cell voltage decreasing, and the plasma stopped at 90V. The current increased from 2A to 13A at this moment.

The resistance of the cell with plasma was higher than that without plasma. The heat balances were measured for 30 minutes with constant current. The electrolyte flow rate was 825ml min^{-1} of 295K at the room temperature. During the plasma electrolysis, the cell voltage, the current, and the outlet temperature were 130V, 2A, and 301K, respectively. The current efficiency of the gas evolution was 95% or more. The loss of the current might be caused by the re-combination of the water. In this case, the heat balance was 91%. The heat balances among 28 runs were ranged from 86% to 94%. Any relation between the heat balance and the flow rate of the electrolyte were not observed. During these experiment we could not find a clear excess heat.

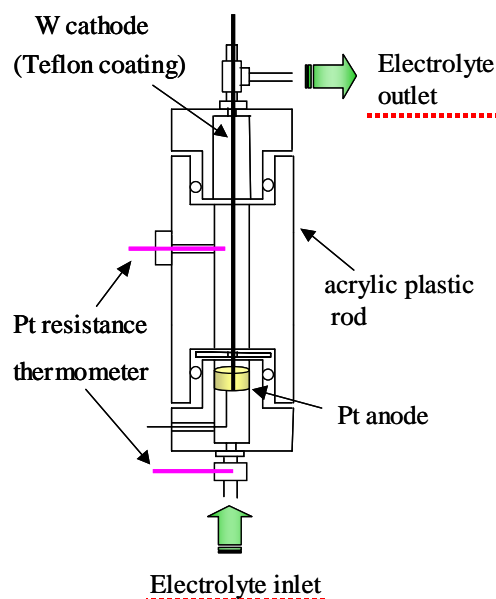


Fig. 1 Schematic drawing of the electrolytic cell for the calorimetry.

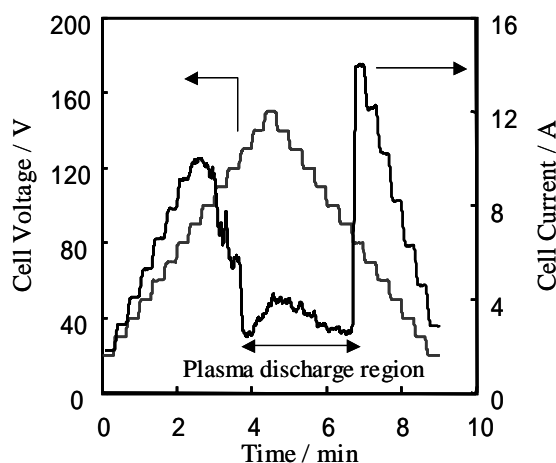


Fig. 2 Trend of input voltage and current during normal and plasma electrolysis in 0.2M K_2CO_3 light water solution.

Reference

1) T. Mizuno, T. Ohmori, T. Akimoto and A. Takahashi, Jpn J. Appl. Phys. **39** (2000) 6055.

ICCF12, November 27 – December 2, 2005 Yokohama, Japan

An Explanation of Earthquake by Black Light Process and Hydrogen Fusion

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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. 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. $3\text{Fe} + 4\text{H}_2\text{O} \rightarrow 8\text{H}\cdot + \text{Fe}_3\text{O}_4$

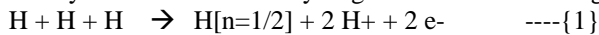
It is known that water injection into deep wells can cause earthquakes. The Matsushiro swarm earthquakes gave us information on relations between water and helium gas eruption(1) in the event of earthquakes.

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. Randle 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 and calls hydrogen with lower energy states hydrino. The author has reported that anomalous explosions such as mysterious hydrogen explosions in the pipe line of nuclear power plants in Japan and the explosion of a cold fusion cell at SRI International in Menlo Park, California in 1992, can be explained by the BlackLight process(3).

BlackLight process by atomic hydrogen

3 body reaction of atomic hydrogen can make BlackLight process.



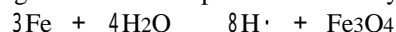
H[n=1/2] designates a hydrogen whose electron orbit is shrunken to 1/2 the radius of a normal one and these will be shrunken further as reaction continues. This reaction releases energy somewhat between chemical and nuclear reaction.

From BlackLight process to nuclear fusion

It can be postulated that well shrunken hydrino which has a relatively small Coulomb repulsive force can fuse each other, if containing vessels are tight enough, resulting in the formation of helium as by-product.

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.



It can be reasonably postulated that in high pressure(1GPa) and at 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, resulting in the fusion of hydrogen with formation of helium and rumbles of the earth's crust.

Reference

- (1) Wakita, H., et al., "Helium Spots: Caused by Diapiric Magma from the Upper Mantle," Science, Vol. 200, April 28, pp. 430-432, 1978.
- (2) Mills, R., "The Grand Unified Theory of Classical Quantum Mechanics", Blacklight Power Inc., 1999
- (3) 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, 2003

ICCF12, November 27 – December 2, 2005 Yokohama, Japan

ICP-MS Analysis of Electrodes and Electrolytes after HNO₃/H₂O 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 poly-tetrafluoroethylene (PTFE). 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 Pd lead wire (1 mm) and the Pt lead wire (1 mm) were used for connecting cathode and anode, respectively. They were coated with the PTFE heat-shrinkable tube. The electrolyte solution was 0.1M-HNO₃/H₂O. 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 cell was set in another vessel made of polyvinyl chloride to prevent the electrolyte from being contaminated from the atmosphere. The vessel was set in an incubator, inside of which temperature was kept to be 15 °C. The constituting elements on the Pd and Pt electrodes and the solution were identified by means of Inductively Coupled Plasma Mass Spectrometry (ICP-MS) and Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES).

Several elements were commonly observed on the surface of electrodes and in the electrolyte. We also analyzed contaminants in Pd and Pt electrodes. A few amount of several impurity elements were commonly observed in those electrodes. However, some elements observed on the surface of both electrodes and in the electrolyte were not observed in the electrodes. Such anomalous elements detection suggests that a transmutation takes place in this experiment.

Generation of DD –Reactions in a Ferroelectric KD_2PO_4 Single Crystal During Transition Trough Curie Point ($T_c = 220 \text{ K}$)

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In a recent publication B. Naranjo et al [1] presented a desktop neutron generator based on deuteron beam ionized and accelerated up to 100 keV by spontaneous polarization of LiTaO_3 in a low pressure deuterium gas. In that work accelerated deuteron beam with current of $\sim 1 \text{ nA}$ range bombards the surface of ErD_3 target generating a 2.45 MeV neutron flux $\sim 10^3 \text{ n/s}$ in 4π steradian. This work is directly related to the earlier attempts to accelerate deuterons in the strong electric field created by induced and spontaneous polarization of dielectric crystals. The idea to use spontaneous polarization in deuterated ferroelectrics to obtain DD-fusion was first explored at the Institute of Physical Chemistry, The Russian Academy of Sciences, Moscow [2,3]. The reason was a strongest electric field in the lattice ($E \sim 10^8 \text{ V/m}$) that arises in the course of spontaneous polarization during heating or cooling of KD_2PO_4 (DKDP) single crystal through the Curie point $T_c = 222 \text{ K}$ (i.e. exactly the same presupposition that is considered in [1], when explaining benefits of the spontaneous polarization for deuteron acceleration). In the A. Lipson et al. works [2,3], the neutron emission was detected during DKDP crystal passage through the Curie point resulting in spontaneous polarization. KH_2PO_4 (KDP) single crystal (similar to DKDP one, but containing just hydrogen, instead) did not demonstrate neutron emission above the background level during transition through its particular Curie point ($T_c = 123 \text{ K}$ due to isotopic effect.). In contrast to [1], in the prior experiments [2,3] a deuterium atmosphere was not used because host-deuterium in ionic form is presented in the lattice. In such a case the DKDP crystal serves both as a source of accelerated deuterons (suggesting no need for their field ionization) and as the deuterated target. These DKDP crystals have generated reproducible neutron emission (about 30 n/transition or $N_n = 0.50 \pm 0.07 \text{ n/s}$ in $4\pi \text{ ster.}$), though three orders of magnitude lower than that in [1]. (That is why, the factor of a spatial separation of deuteron source and deuterated target can be considered as critical one to obtain a significant neutron yield during the transition of ferroelectrics, including DKDP to spontaneous polarization). In addition the reproducible tritium generation of $\sim 10^8$ at .T³/transition have been detected using liquid scintillation technique [3]. Thus, the n/T ratio was found to be $\sim 10^{-7}$, typical for LENR effects in deuterated metals. Recently we studied the yield of energetic charged DD-reaction products (3 MeV protons) in a DKDP single crystal during its passage through Curie point ($T_c = 220 \text{ K}$) using CR-39 track detector technique. Results are compared with earlier measured neutron emission and tritium production rates. As expected the rate of $d(d,p)t$ reaction is comparable with the neutron emission yield and therefore is much lower than that of tritium production. This results is added confirmation for the earlier DD-reaction measurements and gives a new support for massive tritium production, which cannot be explained in the scope of simple deuteron acceleration.

The possible mechanisms of nuclear emissions in DKDP single crystal during its passage through Curie point are considered. These mechanisms are associated with deuteron acceleration and lattice induced LENR effects in the DKDP crystalline structure during the transition to a spontaneously polarized state.

References

- [1] B. Naranjo, J.K. Gimzewski and S. Putterman, *Nature*, **434**, 1115, (2005).
- [2] A.G. Lipson, D.M. Sakov, V.B. Kalinin and B.V. Deryaguin, *Sov. Tech. Phys. Lett.*, **18**, 90 (1992).
- [3] A.G. Lipson, D.M. Sakov, E.I. Saunin et al, *JETP*, **76**(6), 1070 (1993).

Multiple Resonance Scattering

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The previously proposed Multiple Resonance Scattering (MRS) theory [1] is elaborated. In addition of predicting a radiationless fusion of two deuterium nuclei into a ^4He -nucleus in its ground state, the MRS theory is also shown to be in agreement with the experimental results concerning the transmutations of heavier nuclei. Changes in the isotopic abundances due to the transmutation processes are predicted both in the metal deuterides and hydrides. New experiments are proposed to verify the MRS theory. Moreover, the nuclear active environment is discussed.

1. T.Toimela: *Effective Potential in the Deuterium Plasma and Multiple Resonance Scattering* in Eleventh International Conference on Condensed Matter Nuclear Science, 2004, Marseille, France.

Effect of an Additive on Thermal Output during Electrolysis of Heavy Water with a Palladium Cathode

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An additive to a heavy water-sulfuric acid electrolyte has been found to increase the thermal output during electrolysis with a palladium foil cathode. Eight runs , about six hours each , over a period of 16 days , gave an average of 1.8 watt excess thermal power output compared with a light water control cell . This is about twice the excess obtained in co-deposition experiments ¹. The excess thermal power output ranged from 0.5 +/- 0.1 w to 2.6 +/- 0.1 W , which was an average of about 17 % more than the input power. The additive apparently catalyzes heat producing reactions on the surface of the palladium. The results of characterization of the Pd cathode will also be presented.

1. J. Dash and A. Ambadkar, "Co-deposition of Palladium with Hydrogen Isotopes", Proc. ICCF 11, Marseille (2004).

Searching for Excess Heat in Mizuno-type Plasma Electrolysis

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Excess heat generated in the glow discharge plasma electrolysis, first reported by Mizuno and Ohmori (1), has been studied by several researchers, both in Japan (2, 3, 4) and in other countries (5, 6, 7, 8). Most reports, but not all, confirmed generation of excess heat. Facing this situation we decided to replicate the most recent experiment in which excess heat was found to increase with voltage (8). The planning for the design of this project was described in (9). Considerable progress has been made toward the building and testing of a cell able to operate at high power levels. This work, still in progress, should either confirm or contradict the results reported in (8).

References:

- 1) Mizuno, T., Ohmori, T., Azumi, K., Akimoto, T., Takahashi, A. “*Confirmation of Heat Generation and Anomalous Element Caused by Plasma Electrolysis in the Liquid.*” 2000. Lerici (La Spezia), Italy: Italian Physical Society, Bologna, Italy. Downloadable from the library at <<http://www.lenr-canr.org>>
- 2) T. Mizuno, T. Ohmori, T. Akimoto, and A. Takahashi. “*Production of Heat During Plasma Electrolysis.*” *Jpn. J. Appl. Phys. A*, 2000. **39**: p. 6055. Downloadable from the library at <<http://www.lenr-canr.org>>
- 3) T. Mizuno, T. Ohmori and T. Akimoto. “*Generation of Heat and Products During Plasma Electrolysis,*” in *Tenth International Conference on Cold Fusion*. 2003. Cambridge, MA. Downloadable from the library at <<http://www.lenr-canr.org>>
- 4) T. Mizuno, D. Chang, F. Sesftel and Y. Aoki “*Generation of Heat and Products During Plasma Electrolysis,*” in *Eleventh International Conference on Condensed Matter Nuclear Science*. 2004. Marseille, France. Downloadable from the library at <<http://www.lenr-canr.org>>
- 5) Jean-Louis. Naudin et al. Several illustrations and references are downloadable from <<http://jlnlabs.imars.com/cfr/index.htm>> and from <<http://jlnlabs.imars.com/cfr/html/cfrtpwr.htm>>
- 6) Scott R. Little, H. E. Puthoff and Marissa E. Little, “*Search for excess heat from Pt electrolyte discharge in K₂CO₃-H₂O and K₂CO₃-D₂O electrolysis.*” Downloadable from <<http://www.earthtech.org/experiments/lne-W/Mizuno.html>>

7) D. Cirillo, A. Dattilo, V. Iorio, "Transmutation of metal to low energy in confined plasma in the water (electrochemical plasma cell)," ,". in *Eleventh International Conference on Condensed Matter Nuclear Science*. 2004. Marseille, France.
Downloadable from the library at <<http://www.lenr-canr.org>>

8) Jean-Francois Fauvarque, Pierre Paul Clauzon and Gerard Jean Michelle Lalleve.
"Abnormal excess heat observed during Mizuno-type experiments;" 2005. Downloadable from the library at <<http://www.lenr-canr.org>>

9) Ludwik Kowalski <<http://blake.montclair.edu/~kowalskil/cf/252clauzon.html>>

Research into Energy and Temporal Characteristics of X-ray Emission from Solid State Cathode Medium of High-Current Glow Discharge

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The experiments were carried out using a device of high-current glow discharge, which consisted of a water-cooling vacuum chamber, water-cooling cathode and anode units. X-ray emission was removed through a diagnostic window placed above the cathode. The discharge was realized in deuterium and hydrogen at the pressure up to 10 Torr using the cathode samples made of Al, Sc, Ti, Ni, Mo, Pd, Ta, W, at current up to 200 mA and discharge voltage of 1000-2500 V. The pulse-periodical power supply of the glow discharge was used.

Registration of X-ray emission was carried out using thermo-luminescent detectors (TLD) on the base of Al_2O_3 , obscure chamber (objective diameter is 0.3mm) with fixation of X-ray emission onto X-ray film and nuclear emulsion, and scintillating detectors provided photo-electronic multipliers for registration of time response characteristics. All the detectors were covered with a protective shield made of Be having the thickness of 15 μ m. The X-ray spectra were registered in film using the curved mica crystal X-ray spectrometer.

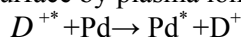
The images obtained using obscure chamber show that the central part of the cathode area has the largest luminosity.

The following modes were brought during the experiments: 1- diffusion X-ray emission was observed in the form of separate X-ray flashes (up to 10^5 X-ray flashes/sec and up to 10^4 X-ray quanta in a beam). 2- emission of X-ray beams by small angular divergence occurs during the discharge burning and up to 100 msec after the current turning out. The X-ray spectrum were registered both as bands of the continuum with energies ranging 0.6 - 4.0 keV and as spots resulting from the emission of series of high-density monoenergetic X-ray beams (with energies of 0.6 - 20.0 keV) characterized by small angular divergence. The energetic position within the above spectrum range is dependent upon the cathode material used (specific for a given cathode material) and looks similar to characteristic X-ray spectra. Of particular importance is the persistence of the spectrum registration for several hours after the GD current switch off. All the experimental results have 100% reproducibility.

The temporal radiation spectrum of the primary laser X-ray was of a discrete character. The kind of the temporal radiation spectrum of the primary laser X-ray was defined by the cathode material. The separate burst (up to 10^9 X-ray of quanta in a burst) were registered up to 100 ms after the current turning off.

The obtained results are the direct experimental evidence of existence of the excited metastable energy levels with the energy of 0.5-20.0 keV in the solid of the cathode sample. Hypothetically, the inverse medium population with the energy of 1.2-3.0 KeV was created in the volume of separate crystals having the sizes of 0.1-0.01 mm. When generating the X-ray in the mode of super intensification, the duration of the separate X-ray beams must be $\tau = 3 \cdot 10^{-13} - 3 \cdot 10^{-14}$ sec, the separate beam power must be $10^7 - 10^8$ W.

Hypothetically, the formation mechanism of the metastable energy levels with the energy of 0.5-20.0 keV in the solid is conditioned by excitation of the inner electrons and nucleus of atoms shells of the solid when bombarding the cathode surface by plasma ions.



Relaxation of these long-living energy levels occurs with fast electrons emission and X-ray emission.

Hitler's Cold Fusion Bomb?

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Recently, the historian Rainer Karlsch presented evidence for a German fusion bomb test in 1945. Here I suggest that this bomb project has been inspired by an early report on cold fusion.

Two atomic bomb explosions occurred at the military training area Ohrdruf in Thüringen/Germany on 3 and 12 March 1945. The spherical bombs had a diameter of 130 centimetres and a weight of two tons each. People directly in the centre of the explosion were killed without leaving a trace. People at a larger distance from the centre were burned. Trees were felled by the explosion up to a distance of 600 metres. The explosion was accompanied by a detonation wave and high temperature. A strong radioactive effect was observed which included weariness, headache, nosebleed, coughing blood and nausea of the residents several kilometres distant from the explosion.

This was reported both by the Soviet secret service GRU (internal report from March 1945, public report from 2002) and by German eyewitnesses (in interviews by the GDR's secret service MfS in 1962) [1].

These bombs cannot have been A-bombs nor H-bombs, because they would have caused larger devastation.

I wonder whether this bomb project has been inspired by a later retracted [2] report on the generation of cold nuclear fusion [3]. Its modern version [4 – 6] is still controversial [7 – 10]. An attempt to explain all aspects of cold fusion is the “extended micro hot fusion scenario” [11]. It predicts the possibility of cold fusion bombs [11].

1. R. Karlsch, *Hitlers Bombe* (München, Deutsche Verlags-Anstalt, 2005) pp. 216 – 221.
2. F. A. Paneth, *Nature* 119 (1927) 706.
3. F. A. Paneth and K. Peters, *Naturwissenschaften* 43 (1926) 956 – 962.
4. V. A. Kluev et al., *Sov. Tech. Phys. Lett.* 12 (1986) 551 – 552.
5. M. Fleischmann et al., *J. Electroanal. Chem.* 261 (1989) 301 – 308.
6. S. E. Jones et al., *Nature* 338 (1989) 737 – 740.
7. anonymous, *Nature* 432 (2004) 664.
8. C. Seife, *Science* 306 (2004) 1873.
9. anonymous, *New Scientist* 184, 2477 (11 Dec 2004) 5.
10. C. Q. Choi, *Sci. Am.* 292, 3 (March 2005) 21.
11. R. W. Kühne and R. E. Sioda, *Fusion Technol.* 27 (1995) 187 – 189.

Possible Generation of Neutron Bursts in Framework of Erizon Model & Their Registration

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In framework of Erzion model charged cosmic ray Erzion, stopping in special substance, begins to create Erzion nuclear catalysis chains with generation of neutrons bursts during $\sim 1-1000$ mks. It is proposed to use 2 methods for such neutrons bursts registration: as with registration of thermal neutrons in gas counters, so with fast neutrons registration in large ($> m^3$) plastic scintillator. It is expected that such thermal neutron bursts in real Neutron Monitors must be appeared every day. Such events from fast neutrons can be observed every day also on the Spectrometric Scintillation Super-Telescope (SSTIS) creating in IZMIRAN for cosmic rays monitoring.

Measurements of Resistance Temperature Coefficient at H/Pd Overloadings

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As reported in previous papers, we performed many electrolytic loading tests using thin Pd wires (50 or 100 μm in diameter) achieving loading ratio $\text{H/Pd} \cong 1$ (H/Pd over-loading).

In particular way, we defined a reproducible "loading protocol" to obtain such a over-loading using a very diluted acid electrolytic solution (with addition of tenth micro-moles of Ca or Sr or Li cations and hundred nano-moles of Hg ions) and operating with electrolytic current cycles (from a few mA up to one hundred mA).

Observing stable, long term, H/Pd loadings fluctuating at room temperature (day/night cycles) we were able to calculate the resistance temperature coefficient (K_{TR}) of Pd-H system at very high H/Pd loadings.

Many years ago (on 1998) we reported an unexpected value which showed that this K_{TR} parameter rises up when H/Pd overcomes 0.75 (i.e. after that R/Ro overtakes on the right the 1.8 peak value). This fact was confirmed by the ISR-Stanford Group (McKubre and Tripodi) and Pirelli-Research Group (Fontana and Garbelli).

In this paper we show several measurements of K_{TR} at H/Pd different overloading values up to $\text{H/Pd} \geq 1$ (corresponding at $\text{R/Ro}=1.12$) where $K_{\text{TR}}=(13\pm 1)\cdot 10^{-3} \text{ K}^{-1}$, more than six times higher than the minimum value achieved at the $\text{R/Ro}=1.8$ peak value.

This result can corroborate the hypothesis that a new Pd-H phase (full β -phase or the beginning of $\beta+\gamma$ phase) could occur after the $\text{H/Pd}=0.75$ loading ratio (at the end of $\alpha+\beta$ phase) claimed by many authors as the necessary condition for heat in excess from Pd-D system (at $\text{D/Pd} \geq 1$).

Description of a Sensitive Seebeck Calorimeter used for Cold Fusion Studies

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Abstract

A sensitive and stable Seebeck calorimeter is described and used to determine the heat of formation of PdD. This determination can be used to show that such calorimeters are sufficiently accurate to measure the LENR effect and give support to the claims.

Benson, T. B and T.O. Passell. *Excess Heat from Glow Discharges in Deuterium Gas* in *Twelfth International Conference on Condensed Matter Nuclear Science*. 2005. Yokohama, Japan.

Excess Heat from Glow Discharges in Deuterium Gas

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ABSTRACT

Following our previous publication of the design and calibration of low- powered glow discharge units at ICCF-11, work is reported here on results from several tubes that have evolved from the earlier designs. Early results indicate output heat is obtained with deuterium gas at a pressure of a few Torr at ratios relative to input total electrical energy of 1.5 to 2.0. The same tubes operated at similar pressures of light hydrogen and argon revealed ratios of 1.0 to 1.2. The tubes giving the best results have been in a point to point geometry rather than the original cylindrical one. Anodes were steel rods of ~ 4 mm diameter. Cathodes were bundles of fine wires of palladium or platinum with an overall diameter of less than 3 mm, or palladium nano-crystals deposited in porous Vycor glass or in porous alumina, with pores ranging from 4 to 100 nm. Anodes were coated with crystals of lithium borate salt. Anode-cathode gaps of about 1 to 2 mm were used. Power to the tubes was DC of about 500-800 volts having an AC ripple of less than 0.75%. Tubes were operated with a total input power of 0.4 watts. Calorimetry on the low voltage DC to high voltage DC power supply converters showed efficiencies around 35 to 70%. Further results with similar tubes now under construction will be reported at the meeting.

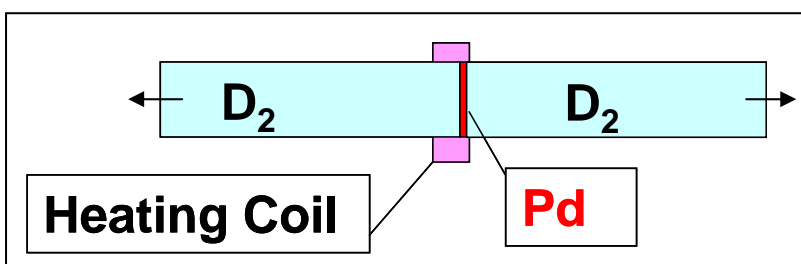
“Excess Heat” Induced by Deuterium Flux in Palladium Film

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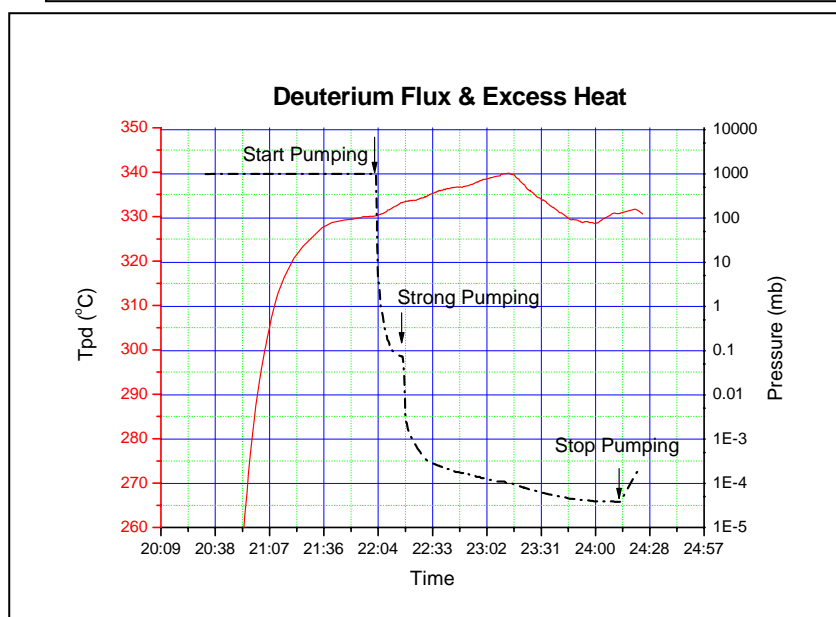
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Early in 1989, G.C.Fralick et al., of NASA, USA conducted an important experiment to search for the neutron radiation using gas-loading method in a D/Pd system instead of electrolysis. They could not find any evidences for the neutron radiation in a D/Pd system; however, they discovered unexpectedly the “excess heat” in a D/Pd system. In a hydrogen purifier (HP-25, commercial available through Johnson & Matthey Inc.), 13.8 atm. deuterium gas was fed into the palladium tube from both the inner side and outer side. It was heated electrically to 383°C. When the deuterium gas was pumped out using the mechanical pump, the temperature of the palladium tube increased suddenly from 383°C to 400°C in 15 seconds. It was not caused by the reduction of heat conductivity, because there was no such temperature variation when hydrogen gas was used instead of deuterium gas. It was



further confirmed by switching off the electrical power before starting the pump. This NASA experiment was very similar to our gas loading experiments which have conducted at Tsinghua University since 1989. Thanks to J.P. Biberian, we became aware of this NASA work [1] after ICCF-11. There are a lot of similarities between our gas loading work and Fralick’s work. However, in W. Wu & X.Z.Li’s work [2], we were using electrical current through Pd tube to heat it. This is different from Fralick’s



heating from outside heater. On the other hand X.Z.Li & J. Tian [3] were using outside heater, but the pumping was done only at one side of the Pd tube. Now we use a Pd disk heated by outside heater, and pump down from both sides of the Pd film (upper figure). This experiment is done at Inficon Balzers, Liechtenstein, and at Tsinghua University. It is reproducible as that in NASA. The plot shows the temperature of the Pd film which rises when pumping starts. The temperature rising stops when the deuterium gas are pumped out totally.

1, G.C.Fralick, et al., Technical Memorandum 102430 (1989)

2, W.Wu & X.Z.Li, Proceedings of ICCF-9 (2002), p.412.

3, Xing Z. Li, et al., Correlation between Abnormal Deuterium Flux and Heat Flow in a D/Pd System, *Journal of Physics D: Applied Physics* **38** 3095 (2003)

*This work is supported by the Natural Science Foundation of China (#10475045), Ministry of Science and Technology (Division of Fundamental Research), and Tsinghua University (985-II, Basic Research Funds)

Introduction to a Novel Method for Cold Fusion/Condensed Matter Nuclear Reactions

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This is an introduction to a novel method for cold fusion/condensed matter nuclear reactions.

The method is the result of research performed by principal investigators Hyunik Yang of Hanyang University and Alexander Ivanovitch Koldamasov (ret.) of the Russian National Research Institute of Atomic Engineering.

An introduction surveys a few of the most well-known methods of hot and cold fusion. A summary shows the current limitations of all previous fusion research.

A report describes the June 6-8, 2005, demonstrations in Edmonton, Canada. A report presents observations of devices that appear to be 100 percent repeatable and of practical, commercial magnitude.

Observation and Investigation of He⁴ Fusion and Self-Induced Electric Discharges in Turbulent Distilled Light Water

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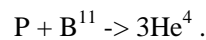
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He⁴ production has been observed in an experimental setup which induces turbulence and cavitation in a flowing light-water solution containing B11. The assumed nuclear reaction, one of the most promising and ecologically benign, results from the absorption of a proton by the B11 nucleus, and yields three He4 nuclei:



In this reaction, a substantial amount of energy (8.7 MeV) is released without the emission of neutrons or hard radiation, and the reaction products are non-radioactive.

Production of He⁴ was detected by observing the spectral emissions from a stationary luminous region of turbulent cavitating fluid immediately downstream from a flow-controlling orifice channel. He4 emission lines identified in the spectra were emitted with intensities indicating concentrations of helium substantially above background. These emissions were only observed when using B¹¹ solutions in the experimental setup, and after careful parametric optimization of the system.

Additionally, a high rate of self-induced electrical discharges was observed traversing the luminous region and extending downstream for several centimeters. The effect of these discharges on helium production is currently under study.

Initial calorimetric measurements indicate a significant evolution of thermal energy along with the production of helium, as expected from the mass deficit of the reaction products.

Some runs have also been carried out using the same experimental apparatus, but substituting machine oil for the boron solution. With the system optimized for the use of oil, directed beams of hard x-rays were observed leaving the luminous region. The x-ray spectra resembled the emissions from heavy elements, possibly those present as contaminants in the oil. The beam directions appeared to be correlated with asymmetrical features of the luminous region.

Further studies, possible models and other theoretical considerations are discussed.

Excess Heat observed during Electrolysis of Deuteriated Phosphoric Acid with Palladium Electrodes and a Solid State Electrolyte in Deuterium Gas

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We start with the hypothesis that the production of excess heat is occurring at the recombination $H+H \rightarrow H_2$ gas. If the pressure of hydrogen at the time of recombination is high enough, nuclear reactions can occur. In the case of hydrogen $H+H \rightarrow D + e^+$ and in the case of deuterium $D+D \rightarrow He-4$.

The high pressure can be obtained using Nernst law, the potential between an hydrogen electrode and the cathode is given by: $E = E_0 + RT \ln \frac{P}{P_0}$. For example when iron is placed in a sulfuric acid solution with

pH=1, the electrode voltage is -0.25 Volt. Under these conditions, the equilibrium pressure of hydrogen is 250,000 atmospheres. There are two sources for the potential: on one side the electrochemical potential which is a characteristic of the metal in the presence of the metal ions, and on the other side the over-potential for the formation of the hydrogen molecules. In this study we use palladium anodes and cathodes, but the cathode is covered with a thin film of a metal having either a low chemical potential or a high over-voltage for hydrogen formation. When deuterium molecules form at the surface of the electrode, the application of Nernst law indicates that very high pressures can be produced. However, this occurs during a very short time during which possible nuclear reactions can happen.

We have developed a unique electrolytic cell comprising two palladium foils as electrodes, and polyethylene oxide doped with deuterated phosphoric acid as electrolyte. The cell is placed in a deuterium gas atmosphere. The whole system is located in a thermostat chamber regulated at 80°C. The precision of the calorimeter is +/- 1mW, with a time constant of about 10 hours.

At first deuterium gas is introduced in the system, and the electrodes load with deuterium. The loading ratio is easily determined by the deuterium pressure drop. Then a DC voltage is applied between anode and cathode, and the temperature of the cell is monitored. We show that excess heat is observed with clean palladium foils, and more excess heat is produced when the cathode is covered by a thin film of various metals.

Theoretical Comparison between Semi-Classic and Quantum Tunneling Effect

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We compare the trends, at constant temperature, of the probability of tunneling and of the effective quantum and semi-classic potentials, which describe, under these conditions, the interaction between deuterons in pure and impure Palladium lattices.

It is seen that only the quantum case is characterized by an amplified tunneling effect on increasing the concentration of impurities present in the lattice, as previously observed.

Further, it is hypothesized that the phenomenon of fusion is not only conditioned by structural characteristics and the thermodynamic conditions of the system, but also by the concentration of impurities present in the metal, correlated with the deuterium loading within the lattice itself.

The analysis will attempt to determine whether, in the case of the three-dimensional isotropy, D_2 loading can lead to the formation of micro-cracks in an analogous manner to that suggested for temperature variation. This would constitute an ulterior verification of the hypotheses proposed.

Enhanced First Wall Damage in ITER Type TOKAMAK Due to LENR Effects

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A study of glow discharge (GD) plasma interactions with metal cathodes at 1 - 10 torr D₂ has been carried out by our research team [1]. The results of high current deuteron bombardment of various metal targets gives rise to an unexpected enhancement of DD-reaction yield accompanied by intense soft X-ray emission from the target.

In recent experiments [1] the pulsed periodic high current ($J \sim 300\text{-}500 \text{ mA/cm}^2$) used a Ti cathode to study DD-reaction yield and cross-section in a range of deuteron energies as low as 0.8-2.45 keV. Thick target yield measurement show unusually high DD-reaction enhancement (about 9 orders of magnitude larger than the standard Bosch & Halle extrapolation of DD-reaction cross-section to lower energies) The enhancement can be described by the screening potential $U_e = 610 \pm 150 \text{ eV}$. We also observed a strong deuteron current effect on DD-reaction enhancement suggesting a crucial role of deuterium loading and diffusivity with respect to the DD-reaction yield in the metal targets. The thick target yield and the enhancement factor in Ti target for the glow discharge bombardment is several orders of magnitude larger than that obtained in accelerator experiments at higher deuteron energies ($E_{\text{lab}} \geq 2.5 \text{ keV}$) but lower current density (50- 500 $\mu\text{A/cm}^2$). The last finding was not anticipated from simple consideration. The X-ray measurements performed in parallel with the DD-reaction product detection showed intense ($I_x = 10^{13}\text{-}10^{14} \text{ s}^{-1}\text{-cm}^{-2}$) soft X-ray emission (with a mean energy of quantum $E_x = 1.2\text{-}1.5 \text{ keV}$). The X-ray yield is strongly dependent on a deuterium diffusivity at the near –the – surface cathode area, similarly to that for DD-reaction yield.

The results obtained in experiments with glow discharge suggest non-negligible edge plasma effects in the ITER TOKAMAK that were previously ignored. In the case of the ITER DT plasma core, it is possible to estimate the DT reaction yield at the metal edge due to plasma ion bombardment of the loaded first wall and/or divertor material. Then the yield of 3.6 MeV alpha-emission (DT reaction charged product) near the surface of the wall would be enhanced during the metal bombardment (e.g. W as a divertor material) similarly to DD-reaction GD studies. This estimate indicates that during one year of ITER operation (maximal power deposition up to $P \sim 0.1 \text{ GW/m}^2$ [2]), about $10^{14} \text{ cm}^{-2} \text{ He}^4$ atoms (formed from the stopped 3.6 MeV alpha particles) would be stored within the near surface metal (tungsten) layer of $\sim 6 \mu\text{m}$ depth. The helium atoms will be precipitated at dislocation cores or captured in dislocation atmospheres (Cottrell atmosphere) and serve as an obstacle with respect to dislocations motion. Thus, the helium capture could induce a micro crack formation at the metal surface caused by reduction of plasticity due to the decreased dislocation mobility. The first wall erosion and sputtering caused by low energy d, t and He ion bombardment would be also enhanced by intense soft X-ray quanta during the bombardment of the wall by keV deuterons. This effect is expected due to full deposition of X-ray quanta energy in the thin layer of the wall.

In this connection, the high current glow discharge could be considered as an ideal instrument for simulation of the plasma edge effects at the metal surface. Experiments performed with metals serving as construction materials of first wall of ITER would provide necessary information on DD and DT reaction enhancement and emission of accompanied intensive X-ray quanta caused an excessive helium storage and radiation stimulated corrosion near their surface layers [3].

References

- [1]. A.G. Lipson, A.S. Roussetski, A.B. Karabut and G.H. Miley, "Strong Enhancement of DD-reaction Accompanied by X-ray Generation in the High-Current Pulsing Deuterium Glow Discharge with Ti-Cathode at the Voltage Range of 0.8-2.45 kV", JETP, **100**, 1175 (2005).
- [2]. D. Reiter, "Edge Plasma Physics Overview", Trans. Fusion Tech., **33**, 249, (1998).
- [3] G. Brumfiel "Just Around The Corner", Nature, **436**, 318 (2005).

Stimulation Mechanisms of Low Energy Nuclear Reactions Using Superlow Energy External Fields

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The review of possible stimulation mechanisms of LENR (low energy nuclear reaction) is represented. We have concluded that transmutation of nuclei at low energies and excess heat are possible in the framework of the known fundamental physical laws – the universal resonance synchronization principle [1] and based on its different enhancement mechanisms of reaction rates are responsible for these processes [2]. The excitation and ionization of atoms may play role as a trigger for LENR. Superlow energy of external fields may stimulate LENR [3]. Investigation of this phenomenon requires knowledge of different branches of science: nuclear and atomic physics, chemistry and electrochemistry, condensed matter and solid state physics,...

The puzzle of poor reproducibility of experimental data is due to the fact that LENR occurs in open systems and it is extremely sensitive to parameters of external fields and systems. Classical reproducibility principle should be reconsidered for LENR experiments. Poor reproducibility and unexplained results do not mean that the experiment is wrong. Our main conclusions:

1) LENR may be understood in terms of the known fundamental laws without any violation of the basic physics. The fundamental laws of physics should be the same in micro- and macrosystems.

2) Weak and electromagnetic interactions may show the strong influence of the surrounding conditions on the nuclear processes.

3) The conservation laws fulfill for a closed systems. Therefore, the failure of parity in weak interactions means that the corresponding systems are the open systems. Periodic variations (24 hours, 27, and 365 days in beta-decay rates indicate the failure of parity in weak interactions have a cosmophysical origin. The modern quantum theory is theory for closed systems. Therefore, it should be reformulated for open systems. The closed systems are idealization of nature, they do not exist in reality.

4) Universal resonance synchronization principle is a key issue to make a bridge between various scales of interactions and it is responsible for self-organization of hierarchical systems independent of substance, fields and interactions. We bring some arguments in favor of the mechanism – ORDER BASED on ORDER, declared by Schrodinger in [4], fundamental problem of contemporary science.

5) The universal resonance synchronization principle became a fruitful interdisciplinary science of general laws of self-organized processes in different branches of physics because it is the consequence of the energy conservation law and resonance character of any interaction between wave systems. We have proved the homology of atom, molecule and crystal structures including living cells. Distances of such systems are commensurable with the de Broglie wave length of an electron in the ground state of a hydrogen atom, it plays the role of the standard distance for comparison.

6) First of all the structure of hydrogen atom should be established. Proton and electron in hydrogen atom move with the same frequency which created attractive forces between them, their motions are synchronized. A hydrogen atom represents radiating and accepting antennas (dipole) interchanging of energies with the surrounding substance. The sum of radiate and absorb energy flows by electron and proton in stable orbit is equal to zero [5] – the secret of success of the Bohr model (nonradiation of the electron on stable orbit). “The greatness of mountains, the finger sized drop, the shiver of a lake, and the smallness of an atom are all related by simple laws of nature” – Victor F. Weisskopf [6]

7) These flows created a standing waves due to the resonance synchronization principle. A constant energy exchange with substances (with universes) create stable auto-oscillation systems in which the frequencies of external fields and all subsystems are commensurable. The relict radiation (the relict isotropic standing waves at $T=2.725$ K – the Cosmic Microwave Background Radiation (CMBR)) and many isotropic standing waves in cosmic medium [7] should be results of selforganization of the stable hydrogen atoms according to the universal resonance synchronization principle as consequence of fundamental energy conservation law. One of the fundamental predictions of the Hot Big Bang theory for the creation of the Universe is CMBR.

8) The cosmic isotropic standing waves (many of them are not discovered yet) should play a role of conductor responsible for stability elementary particles, nuclei, atoms, ..., galaxies ranging in size more than 55 orders in magnitude.

9) The phase velocity of standing microwaves can be extremely high therefore all objects of Universe should get information from each other almost immediately using phase velocity.

References

- [1] F.A. Gareev, In: FPB-98, Novosibirsk, June 1998, p.92; F.A.Gareev, G.F. Gareeva, in: Novosibirsk, July 2000, p.161.
- [2] F.A. Gareev, I.E. Zhidkova and Yu.L. Ratis, Preprint JINR P4-2004-68, Dubna, 2004 (in russian); in Proceedings of the 11-th Russian Conference on Cold Nuclear Transmutation of Chemical Elements and Ball Lighting, Dagomys, city Sochi, September 28 – October 5, 2003, Moscow 2004, p. 169.
- [3] F.A. Gareev, I.E. Zhidkova and Yu.L. Ratis, in Program Abstracts on ICCF-11, Marseille: France: 2004, 31 October – 5 November; F.A. Gareev, I.E. Zhidkova, E-print arXiv Nucl-th/0505021 9 May 2005.
- [4] E. Schrodinger, WHAT IS LIFE ? The Physical Aspects of the Living Cell, Cambridge University Press, 1967.
- [5] F.A. Gareev, I.E. Zhidkova, Yu.L. Ratis <http://www.iscmns.org/siena05/program.htm>
- [6] V.F. Weisskopf, American Journal of Physics, Vol. 54, No.2, p.110, february1986
- [7] A.M. Chechelnsky, E-print arXiv: physics/0105056 5 May 2001.

Developing Creative Thinking Methodologies for CMNS, aiming Complete Understanding and Technology Level Reproducibility

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For the time given- autumn 2005, the condensed matter nuclear phenomena of potential technological interest, i.e. heat excess, can be characterized as a **scientific miracle** (despite the certainty of their existence) because they cannot be explained completely in the frame of the actual paradigm of physics, and as a **technological embryo**, due to lack of reproducibility. In plain words, CMNS is not well understood and cannot be controlled well technologically. A recent survey performed by Steven Krivit and this author, demonstrates this convincingly [1] There are some chances that both understanding and reproducibility will be solved by serendipity- that is, one of the known or unknown groups doing systematic experimentation will find by chance the key, the secrets of practical, usable heat generation, either for a wet system (electrolysis) or- even better, for a gas phase system.

However, more than 16 years of such effort and many failures show that CMNS is a **really difficult problem** and for finding a solution we need actually a new level of thinking, new ideas and concepts, a creative paradigm.

Some essential features of this thinking are: the acceptance of the extreme complexity of the phenomena, their multi-level -phase and -step dynamics including electronic and nuclear effects- all these leading to the impossibility to describe CMNS by a **single theory**. (This situation is similar to that of photosynthesis or of nitrogen fixation, that are also not completely understood and can not be reproduced and industrialized) An other essential part of the new paradigm is the use of the huge quantity of negative information accumulated in the field, by converting it to positive knowledge. Why something does not work is an information as valuable as knowing when it works and why.

The author has applied the creative thinking methods as summarized in [2] and revealed in [3]. as well as his own original ones, in order to elaborate a new experimental strategy that will be discussed with the colleagues at ICCF-12. Besides the creation of active sites, their protection against destruction is an essential point of the new strategy.

References

- [1] The 2005 Gluck-Krivit Cold Fusion Survey: <http://newenergytimes.com/news/NET11.htm#SURVEY>
- [2] Creativity Techniques: <http://www.mycoted.com/creativity/techniques/>
- [3] Anti-Knowledge Unlocking the power of question: <http://www.anti-knowledge.com/>