The 17th Meeting of Japan CF-Research Society

JCF17 ABSTRACTS

March 19-20, 2017

National Institute of Technology, Tokyo College

Japan CF-Research Society

Program of JCF17 Meeting

Japan CF-Research Society

Date; March 19-20, 2017
Place; National Institute of Technology, Tokyo College
Presentation; Oral presentation 25 min. + Discussion 5 min.
Language; English or Japanese
Abstract Book; Only available at JCF home page (http://jcfrs.org/)

March 19 (Sun), 2017

12:00-13:00 **Registration**
13:00-13:10 **Opening Address** K. Tsuchiya (NIT, Tokyo)

Session 1 *Chairman; K. Tsuchiya (NIT, Tokyo)*
13:10-13:40 **JCF17_01** H. Numata
Microscopic structural change of Pd rod during repeated cathodic and anodic electrolysis in glycerin-phosphoric acid and during long-term electrolysis in 0.1M Li OD
13:40-14:10 **JCF17_02** T. Sawada (Hosei U.)
Role of the magnetic monopole as the catalyst in the cold fusion
14:10-14:40 **JCF17_03** F .H. Ling et al. (Anthropocene Institute)
Global Assessment of Investment in LENR: Challenges and Outlook

14:40-15:00 ***Break***

Session 2 *Chairman; S. Narita (Iwate U.)*
15:00-15:30 **JCF17_04** A. Kitamura et al. (Technova Inc.)
Heat evolution from silica-supported nano-composite samples under exposure to hydrogen isotope gas
15:30-16:00 **JCF17_05** Y. Iwamura et al. (Tohoku U.)
Anomalous Heat Generation Experiments Using Metal Nanocomposites and Hydrogen Isotope Gas
16:00-16:30 **JCF17_06** T. Hioki et al. (Nagoya U.)
Synthesis of Nano-Pd Particles Included in Pores of Mesoporous Silica and Their Thermal Stability under Hydrogen Atmosphere
16:30-17:00 **JCF17_07** M. Uchimura et al. .(Nissan Motor Co., Ltd)
Materials structure clarification for novel exothermic reaction between metal and hydrogen

17:00-17:10 ***Break***

17:10-17:40 **JCF Annual Meeting**

18:30-20:30 **Reception**

March 20 (Mon), 2017

Session 3 *Chairman; Y. Iwamura (Tohoku U.)*
10:00-10:30 **JCF17_08** T. Itoh et al. (Tohoku U.)
Anomalous Excess Heat Generation by the Interaction between Nano-structured Pd/Ni surface and D2/H2 gas
10:30-11:00 **JCF17_09** S. Narita et al. (Iwate U.)
Characterization of deuterium diffusion in multi-layered metal sample
11:00-11:30 **JCF17_10** M. Nakamura (Nissan Motor Co., Ltd)
Expectations on the new heat-generation-reaction between metal and hydrogen

11:30-13:00 ***Lunch***

Session 4 *Chairman; H. Numata*

13:00-13:30 **JCF17_11** H. Miura
Possibility of Nuclear Transmutation and Nuclear Fusion Related to Water Clusters

13:30-14:00 **JCF17_12** H. Kozima et al. (CFR Lab.)
Nuclear Transmutations in Critical and Supra-critical Electrolysis
with Graphite, Pd, W, Re, Pt and Au Cathodes Analyzed by the TNCF Model

14:00-14:30 **JCF17_13** H. Kozima et al. (CFR Lab.)
The Sociology of the Cold Fusion Phenomenon

14:30-15:00 **JCF17_14** M. Ban
Cold fusion by resonance of de Broglie wave in Multiple barrier tunnel phenomenon I

15:00-15;30 **JCF17_15** M. Ban
Cold fusion by resonance of de Broglie wave in Multiple barrier tunnel phenomenon II

15:30-16:00 **JCF17_16** K. Tsuchiya (NIT, Tokyo)
Progress of density functional methods in LENR and their problems

16:00 ***Adjorn***

Microscopic structural change of Pd rod during repeated cathodic and anodic electrolysis in glycerin-phosphoric acid and during long-term electrolysis in 0.1M Li OD

Hiroo Numata: 60 Higashidai Kaneyama-machi Iwaki City Fukushima 974-8211 Japan

Abstract: *In situ* measurement of the hydrogen/deuterium evolution of the Pd-H (D) system [1-2] and the measurement of solid-state properties of post electrolysis Pd revealed the micro structural model inside the solid, which yield insight into cold fusion related phenomena.

Electrochemical hydrogen evolution reaction for well annealed Pd rod (2.0 mmϕ) in glycerin and phosphoric acid was performed [3]. The physico-chemical properties of hydrogen dissolved in Pd have been studied by *in situ* potentiometric, resistance and dilatometric measurements of repeated hydrogen absorption/desorption electrolysis ($x<0.02$). During the applied pulse mode ($x<0.02$) the resistance increased with an increase in the H/Pd ratio and the electrode potentials of the 1st through 4th absorption cycles exhibited Nernstian behavior. For all the cycles except the 1st one, an induction period for the dilation appeared accompanying by a fluctuation, which is attributed to the followed by the abrupt β phase precipitation. At that time such unexpected phenomena of solid-state properties were interpreted in terms of disorder-order transformation. Recently similar hydration/dehydration behavior was measured on deuterium absorption/desorption in $LaNi_5$ intermetallic compound [4].

Long-term electrolysis for well annealed thick Pd rod (9.0 mmϕ) in 0.1M LiOD was performed [1]. Microscopic observation of post electrolysis Pd showed that long-term electrolysis did not resulted in any cracking but surface voids, two long faults, voids arranged in a straight line and peculiar surface traces: vortex. Yet there has been remained unsolved a phenomenological explanation, and even more microscopic mechanism for the vortex formation and other surface morphology.

In this study, it is again considered that the surface morphology and solid-state properties could be related with phase transition and elastic interaction of Pd-absorbed H, etc. We focus recent progresses: *In situ* Synchrotron and Neutron Diffraction experiments and material scientific analysis with hydrogen embrittlement in clarifying structure changes of Pd. We also pay enough attention in dissimilarity of materials preparation (pretreatment and hydration cycling) methods, intermetallic compound/pure metal, *In situ/ex situ* measurement and phenomenon with Nano or more large scale.

References

1 H. Numata et al.: Neutron Emission and Surface Observation During a Long-term Evolution of Deuterium on Pd in 0.1 LiOD; Conf. Proc. **Vol.33 of ACCF2**, "The Science of Cold Fusion", pp.71-79 (1991)

2 H. Numata et al.: In situ Potentiometric, Resistance and Dilatometric measurements of Pd Electrode During Repeated Electrochemical Hydrogen Absorption; Fusion Technol., **38**, pp.206-223（2000）

3 H. Numata et al.: Proc. **JCF7**, pp.6-15 (2006)

4 M.P. Pitt et al.: Evolution of microstructure in the $LaNi_5$–D system during the early absorption–desorption cycles; J. of Alloys and Compounds, **330-332**, pp.241-245(20002)

Keywords: electrolytic hydrogen absorption, Pd, phase transition, resistance, dilation, electrode potential

Role of the magnetic monopole as the catalyst in the cold fusion

Tetsuo SAWADA

Hosei University, Tokyo, Japan

It is well-known that in the vacuum, d + d reaction of the small incident energy is d + d → p + t and d + d → ^3He +n with the branching ratio 50% each. On the other hand, in the nuclear cold fusion reaction, these two channels are closed, and the only open channel is d + d →α. Since this reaction is the two-body to the one-body type, from the momentum conservation, we need the external particle *e, which absorbs the momentum transfer. It is interesting to regard the nuclear cold fusion occurs when two deuterons are trapped by the same external particle *e and fuse to become alpha particle. If we remember the binding energy B of t and ^3He are 8.5 and 7.7 MeV. respectively, the spectrum of p + t channel appears at E≧- 8.5MeV. whereas the spectrum of the He(3)+n channel appears at E≧- 7.7MeV. When the binding energy of the deuteron (d) with the external particle (*e) is λ, the condition for the both channels t +p and n +He (3) to close is -2(λ + 2.2 MeV.) < -8.5MeV. .

The most important candidate of the external particle is the magnetic monopole *e, which produces the magnetic Coulomb potential V=(*e²/ħc) 1/ r , and from the charge quantization condition of Dirac , the strength becomes super-strong: *e²/ ħc = 137/4. By using such a value, we can calculate the binding energy of the deuteron and the magnetic monopole. By applying variation calculation we get λ=2.3 MeV. and the radius of the deuteron orbital is around 10 fm. Since the spin of the alpha-particle is zero, it cannot be attracted by *e, and it must leave the monopole *e. The fresh monopole begins to attract fuel deuterons anew. In this way the magnetic monopole *e plays the role of the catalyst of the nuclear cold fusion reaction.

Finally, we consider on trapping the magnetic monopoles *e which are floating in space, especially in the domain where the strength of the magnetic field is high such as the north or the south poles of the geo-magnetic field of the earth. We shall also consider the big-bang theory of the universe, in that time it is believed the magnetic monopoles are created abundantly especially when the higher symmetry SU(n) of the elementary particles break down to U (1) × SU(m) symmetry. As the universe expands the density of the magnetic monopole in the space decreases largely.

[T. Sawada: Foundation of Physics,**23**,291(1993)]

Global Assessment of Investment in LENR: Challenges and Outlook

Frank Hiroshi Ling[1], Grant Draper[2]

[1] Anthropocene Institute, Menlo Park, CA, USA,
[2] CapstreamX, San Francisco, CA, USA

An assessment of the players in the LENR space shows that at the beginning of 2017, there were at least 114 entities actively engaged in LENR R&D across four continents – Asia-Australia, Europe and North America. A total of 45 are US-based, 31 are from European nations, 19 from Japan and 6, 5, and 5 are from Russia, China and India respectively. The other 3 entities are from Australia, Canada and Korea.

Our survey of LENR entities identified the following stakeholders: Maker, Investor, Non-Profit, R&D Organization and Equipment Supplier. To date, LENR has attracted more than $250 million in funding from industrial companies, research institutions, private equity billionaires and high-net-worth investors. Indeed investments are only expected to increase as LENR attracts greater interest and players into the field.

This assessment also gauged the technical and regulatory challenges that LENR faces to reach commercialization and discusses how these barriers can be overcome. The study also looks at what applications are being envisioned.

References

Draper, G and Ling, F.H. *LENRaries: A New Era of Renewable Energy*, February 2017

Heat evolution from silica-supported nano-composite samples under exposure to hydrogen isotope gas

Akira Kitamura[1,5], Akito Takahashi[1], Koh Takahashi[1], Reiko Seto[1], Takeshi Hatano[1],
Yasuhiro Iwamura[2], Takehiko Itoh[2], Jirohta Kasagi[2],
Masanori Nakamura[3], Masanobu Uchimura[3], Hidekazu Takahashi[3], Shunsuke Sumitomo[3],
Tatsumi Hioki[4], Tomoyoshi Motohiro[4], Yuichi Furuyama[5],
Masahiro Kishida[6], Hideki Matsune[6]

[1] Technova Inc., 100-0011 Japan,
[2] Research Center for Electron Photon Science, Tohoku University, 982-0826 Japan,
[3] Research Division, Nissan Motor Co., Ltd., 237-8523 Japan,
[4] Green Mobility Research Institute, Institutes of Innovation for Future Society,
Nagoya University, 464-8603 Japan,
[5] Graduate School of Maritime Sciences, Kobe University, 658-0022 Japan,
[6] Graduate School of Engineering, Kyushu University, 819-0395 Japan

E-mail: kitamuraakira3@gmail.com

Hydrogen isotope absorption by palladium and nickel-based nanocomposite samples has been examined as a collaborative work using the experimental apparatus installed at Kobe University in order to share scientific understanding of the anomalous heat effects both at room temperature (R.T.) and elevated temperatures (E.T.). The samples tested so far include “PSf1” fabricated by M. Kishida, Kyushu University, and “CNS3” synthesized in Kobe University, whose D (or H) absorption and heat release characteristics are discussed in the present paper.

The PSf1 sample consists of Pd nanoparticles embedded in silica balls. The detailed description of this sample will be published elsewhere. The CNS3 sample consists of $CuNi_{10}$ nanoparticles supported by mesoporous silica (mp-silica). It was synthesized from a solution of nickel chloride and copper chloride containing the mp-silica powder as a suspended material to adsorb Ni and Cu in nano-pores. After filtration, the mp-silica was annealed at 800 °C for 3 hrs. Each sample containing 8.4-g-Pd (PSf1) or 1.2-g-Cu and 11.4-g-Ni (CNS3) occupied the 500-cc volume of the reaction chamber without any filler.

The results of the absorption/heat measurements are summarized as follows in comparison with those obtained previously for other nano-composite samples:

(1) Heating up to around 200 °C is necessary to reduce the NiO in CNS3 sample.
(2) It is not impossible to ascribe hydrogen absorption and heat evolution in the initial phase at R.T. to reduction of PdO and hydrogen absorption by Pd nanoparticles in the PSf1 sample.
(3) The reduction of PdO at R.T. was conceived to induce the reduction of NiO as a result of catalytic effect of Pd, in most of the PdNi system, but the concept did not stand for the heavily re-oxidized PNZ3r sample that took up only 0.1 D/M of D-gas.
(4) In the E.T. phases, excess heat is observed in the runs with binary nanocomposite samples, while no excess heat is observed with single-element nanoparticles.
(5) In the CNS3#2 run, the excess heat amounts to 29 MJ/mol-Ni or 0.11 GJ/mol-H without any observable change in the sample composition, which cannot be explained by any chemical process.

Anomalous Heat Generation Experiments Using Metal Nanocomposites and Hydrogen Isotope Gas

Yasuhiro Iwamura[1], Takehiko Itoh[1,7], Jirohta Kasagi[1],
Akira Kitamura[2,5], Akito Takahashi[2], Koh Takahashi[2], Reiko Seto[2], Takeshi Hatano[2],
Tatsumi Hioki[3], Tomoyoshi Motohiro[3],
Masanori Nakamura[4], Masanobu Uchimura[4], Hidekazu Takahashi[4], Shunsuke Sumitomo[4],
Yuichi Furuyama[5], Masahiro Kishida[6], Hideki Matsune[6]

[1] Research Center for Electron Photon Science, Tohoku University, 982-0826 Japan
[2] Technova Inc., 100-0011 Japan,
[3] Green Mobility Research Institute, Institutes of Innovation for Future Society,
Nagoya University, 464-8603 Japan,
[4] Research Division, Nissan Motor Co., Ltd., 237-8523 Japan,
[5] Graduate School of Maritime Sciences, Kobe University, 658-0022 Japan,
[6] Graduate School of Engineering, Kyushu University, 819-0395 Japan
[7]CLEAN PLANET Inc., 105-0022 Japan

E-mail: iwamura@lns.tohoku.ac.jp

Anomalous heat generation experiments using metal nanocomposites and hydrogen isotope gas based on Kitamura and Takahashi paper [1] have been performed at Kobe University and Tohoku University as a collaborative work in order to confirm the existence of the anomalous heat effects and to reveal the nature of the effects. In this paper, we describe experimental results recently obtained at Tohoku University.

First sample is “CNZ5s” composed of Cu, Ni and ZrO_2. The molar fractions for Cu, Ni, Zr and O are 1.7, 11.6, 24.5 and 62.3 %, respectively. Second sample is “PSn1” which contains Pd nanoparticles embedded in commercially available mesoporous silica named TMPS-4R. At Kobe University, experiments using “PSf1” was done, which was composed of Pd nanoparticles embedded in silica balls. Third sample is “CNS3s”, which consists of $CuNi_{10}$ nanoparticles supported by mesoporous silica. The CNZ5s was prepared by the melt spinning method and oxidation processes mainly at Kobe University. The PSn1 was fabricated by T. Hioki at Nagoya University. The CNS3s was manufactured by A. Kitamura at Kobe University. The CNZ5s and CNS3s have “twin brothers” named “CNZ5” and “CNS3”. The CNZ5s&CNZ5 and the CNS3s&CNS3 were subjected to the same material fabrication processes, respectively. Excess heat experiments were conducted using the twin brothers (CNZ5 and CNS3) at Kobe University.

Main results are as follows.

1) Anomalous excess heat generation was observed for CNZ5s and CNS3s with H_2 gas at elevated temperature (150℃-300℃), although NO anomalous excess heat generation for PSn1 with D_2 gas even at the elevated temperature.
2) Integrated excess heat amounted to 6.5 MJ/mol-H for CNZ5s and 11MJ/mol-H for CNS3s, which could NOT be explained by any known chemical process.
3) Coincident burst-like increase events of the pressure of reaction chamber and gas temperature, which suggested sudden energy releases in the reaction chamber, were observed many times in the case of CNZ5s.
4) Experimental results for CNZ5s&CNZ5 and CNS3s&CNS3 agreed with each other qualitatively. No excess heat was observed for PSn1 and PSf1. Qualitative reproducibility between Kobe and Tohoku experiments was good.

Reference

[1] A. Kitamura and A. Takahashi et. al, Current Science, vol. 108, no. 4, pp. 589-593, 2015.

Synthesis of Nano-Pd Particles Included in Pores of Mesoporous Silica and Their Thermal Stability under Hydrogen Atmosphere

Tatsumi Hioki, Akihisa Ichiki and Tomoyoshi Motohiro

Materials Science and Energy Engineering Division
Green Mobility Research Institute
Institutes of Innovation for Future Society
Nagoya University, 464-8603 Japan

E-mail: hioki@gvm.nagoya-u.ac.jp

The interaction of hydrogen isotopes and metallic nano-sized particles of Pd, Ni, and their alloys has been of great interest concerning the anomalous heat generation effect [1, 2]. Recently, the effect has been reported to be more remarkable at elevated temperatures than at room temperature [3]. However, in order to clarify the mechanism of the anomalous heat generation, the reproducibility of the phenomenon seems to be still insufficient.

It has been known well that nano-sized metallic particles are easy to coalesce and grow under reductive environments at elevated temperatures. Nano-sized Pd or PdO particles were observed to grow once they were exposed to hydrogen even at room temperature [4]. The heat of hydrogen absorption for Pd and/or the heat of reduction of PdO are enough to cause the growth. Therefore, if the anomalous heat generation effect is caused by the existence of nano-sized metallic particles, the growth of the particles under hydrogen atmosphere should be suppressed to improve the reproducibility and to clarify the mechanism of the phenomenon.

In this paper, a trial to stabilize nano-sized Pd particles under hydrogen atmosphere is reported: we have tried to precipitate Pd particles only inside the pores of mesoporous silica's (MPS) using the conventional incipient wetness impregnation method followed by a process of washing out the mixture of MPS powder and Pd precursor with n-octane [5]. With the washing out process, the Pd precursor adhered to the outer wall of the mesoporous silica could be removed thoroughly. The resultant Pd/MPS system only contained Pd particles with sizes ranging from 2 to 5 nm and showed excellent stability under hydrogen atmosphere, i.e., X-ray diffraction patterns and transmission electron microscopy confirmed that the sizes of the Pd particles in these systems were unchanged when the systems were exposed to hydrogen even at an elevated temperature of 773 K.

In conclusion, we have succeeded in preparing a Pd-nanoparticle/MPS system, where a large part of Pd particles are confined in the pores of MPS host, using ^{TR}TMPS-4R with a pore size of 4.2 nm: the average size of the Pd crystals was less than the pore size of host MPS. The Pd nanocrystals confined in the pores of ^{TR}TMPS-4R were thermally well stable: there sizes were nearly unchanged when the sample was heated up to 773K under hydrogen atmosphere.

Reference

[1] Y. Arata and Y. Zhang, J. High Temp. Soc. **34** (2008): 85.

[2] A. Kitamura et al., Phys. Lett. **A373** (2009):3109.

[3] A. Kitamura et al., Current Science, **108(**4) (2015) : 589.

[4] T. Hioki et al., J. Condensed Matter Nucl. Sci. **13** (2014): 223.

[5] Y. Ichikawa et al., J. Nanosci. Nanotechnol. **16** (2016) : 12947

Materials structure clarification for novel exothermic reaction between metal and hydrogen

Masanobu Uchimura[1], Masanori Nakamura[1], Yuichi Furuyama[2], Akira Kitamura[2, 3], Koh Takahashi[3], Reiko Seto[3], Yasuhiro Iwamura[4], Takehiko Itoh[4, 5], Jirohta Kasagi[4], Tatsumi Hioki[6], Tomoyoshi Motohiro[6], Masahiro Kishida[7], Akito Takahashi[3]

[1]Advanced Materials Laboratory, Research Division, Nissan Motor Co., Ltd.

[2]Graduate School of Maritime Sciences, Kobe University

[3]Technova Inc.

[4]Research Center for Electron Photon Science, Tohoku University

[5]CLEAN PLANET Inc.

[6]Green Mobility Research Institute, Institutes of Innovation for Future Society, Nagoya University

[7]Graduate School of Engineering, Kyushu University

Kitamura *et al.* and Iwamura *et al.* reported that they observed about 10W excess heat when hydrogen isotope gas was introduced into the nano-metal and oxide composite at ICCF20. For the sake of practical realization of this technology, further output power enhancement is required. Yamaura *et al.* reported nano-sized (5-10 nm) Pd particles embedded in ZrO_2 matrix absorb large amount of hydrogen compared to conventional Pd powders [1] and Arata and Zhang reported an anomalous exothermic reaction takes place at this nano-sized metal particles [2] but few studies have focused on systematic and detailed material analysis.

Therefore, we synthesized metal and oxide composites including Pd, Ni and ZrO_2 then performed an oil flow calorimetry in hydrogen/deuterium atmosphere at room/elevated temperature, and XRD, micro structure observation by electron microscopy (SEM, TEM) and elemental mapping by STEM-EDS before and after calorimetric measurement was conducted to clarify structure change of the material.

XRD patterns showed this material mainly consists of monoclinic ZrO_2 and tetragonal $NiZr_2$. Moreover, micro structure observation and elemental mapping demonstrated inner and outer composition of this material was found to be $NiZr_2$ and ZrO_2 respectively and the thickness of outer ZrO_2 was around 3 - 5 micrometers. In addition, a Pd rich band and a Ni rich band were observed at the interfaces between $NiZr_2$ and ZrO_2 bulk, and a Ni band was observed in the ZrO_2 layers. Comparing the structures before and after calorimetry, we found that Ni band structure at the interfaces may change due to the reaction.

We will control material structure such as thickness of ZrO_2 layer and number of Pd and Ni band with modifying oxidation condition and evaluate enthalpy of formation to clarify the impact of material structure on the anomalous exothermic reaction in the future.

References

[1] S. Yamaura et al., J. Mater. Res., 17 (2002) 1329.

[2] Y. Arata and Y. Zhang, J. High Temp. Soc. Jpn. 34 (2008) 85.

Anomalous Excess Heat Generation by the Interaction between Nano-structured Pd/Ni surface and D_2/H_2 gas

Takehiko Itoh[1,2], Yasuhiro Iwamura[1], Jirohta Kasagi[1] and Hiroki Shishido[3]

[1]Condensed Matter Nuclear Reaction Division, Research Center for Electron Photon Science, Tohoku University, Sendai 982-0826, Japan
[2]CLEAN PLANET Inc., Tokyo 105-0022, Japan
[3]Department of Quantum Science and Energy Engineering, Graduate School of Engineering, Tohoku University, Sendai 980-8579, Japan

E-mail:itoh@lns.tohoku.ac.jp

Tadahiko Mizuno and his colleagues have been developing excess heat generation methods and devices for the past few years [1]-[2]. They fabricated the nano–structured Ni and Pd surface using plasma discharge and then D_2 gas (0~300 Pa) was subjected to the nano–structured Ni and Pd at 200℃. They observed excess heat several times. For example, they observed about 78W excess power that is almost the same as input power.

A similar experimental setup based on the Mizuno's work was introduced in our lab in order to confirm the existence of the declared anomalous heat effects and to reveal the nature of the effects. Here, we report on the replication experiments at Tohoku University.

At first, temperature measurements were performed using a non-fabricated Pd wire with 7W and 40W heater input powers under few Pa and 250 Pa as blank runs. The temperature was measured by a thermocouple built in a heater rounded by the non-fabricated Pd wire. We fabricated nano-structured material composed of Pd and Ni by glow discharge on the heater located in the center of a vacuum chamber. And then, the nano-structured Pd/Ni was filled with D_2 or H_2 gas (~250Pa) for more than 10 hours. After the nano-structured Pd/Ni material absorbed D_2 or H_2, electrical power was applied to the heater covered with nano-structured Pd/Ni while evacuating the chamber, and observed the heater temperature behavior. Excess heat was estimated by comparing the heater temperatures for the nano-structured and blank experiments. Next, we introduced D_2 or H_2 gas about 250Pa to the chamber while keeping the heater input. And then, temperature measurement was performed and the excess heat was estimated.

For all the cases except for an insufficient nano-structured Pd/Ni case, significant temperature increases compared to the blank experiments were observed. In particular, in experiments with 7 W input, we observed 123℃ heater temperature increase compared to the blank experiment. It would be possible to say that we successfully replicated Mizuno's work.

Since the heater was covered with nano-structured material, there was a concern that emissivity change affected heater temperature measurement. Numerical calculation was conducted to estimate the effect of the change of the surface emissivity. It is concluded that even if the emissivity would drop extremely from 0.7 to 0.3 due to the coating of the nano-structured Pd/Ni, the temperature rise would be only 70℃ at the most. The postulated emissivity change cannot be explain the observed temperature increase 123℃.

These experimental and numerical results strongly suggest that anomalous excess heat was generated by the interaction between nano-structured Pd/Ni surface and D_2 or H_2 gas.

Acknowledgment
The authors would like to acknowledge Dr. Tadahiko Mizuno for his advices and Prof. Hidetoshi Hashizume and Prof. Noritaka Yusa for their corporations on the numerical analysis. The authors also would like to thank Mr. Hideki Yoshino and Mr. Masanao Hattori for their supports.

References

[1] T. Mizuno, "REACTANT, HEATING DEVICE, AND HEATING METHOD", Patent Application, WO2015/008859 A2.
[2] H. Yoshino, E. Igari and T.Mizuno, Presentation at 2014 CF/LANR Colloquium at MIT, March.21-23, 2014, Massachusetts Institute of Technology, Cambridge, MA, USA.

Characterization of deuterium diffusion in multi-layered metal sample

S. Narita†, S. Kataoka, Y. Sato, K. Negishi, K. Ota

Department of Physical Science and Materials Engineering, Iwate University
Morioka, Iwate, 020-8551, Japan

Anomalous heat evolution has been observed in deuterium desorption experiment with binary (ternary) nano-particles such as Pd-Ni-ZrO [1]. In the experiments, the phenomenon could be attributed to a specific property in deuterium diffusion with metal complexes as well as the fine-structure of the sample. Now it is important to investigate deuterium diffusion behavior systematically in various types of metal complexes to clarify the anomalous phenomena.

We have been performing deuterium desorption experiments using multi-layered samples which were prepared by depositing thin metal films on a Pd foil, and investigated the deuterium diffusion associated with the thermal behavior. We have tested Pd-Ni, Pd-Ag, Pd-Ti, Pd-Zr, and Pd-Ni-Zr so far, and found the diffusion behavior can be characterized for each type of samples. For the sample with fine-structured interface, we observed the short-period fluctuation in temperature which lasted 2–4 h at the beginning of the desorption experiment. Besides, in some experiments with Pd-Ti sample, a sudden temperature increase was observed 1–2 h after applying DC current which was for stimulating desorption. We proposed speculative scenarios to explain such behaviors considering the properties of the sample metals and the deuterium diffusion in the sample. Some of results were reported at JCF16 [2].

In this paper, we will be presenting the latest results our desorption study.

[1] A. Kitamura *et al.*, Proc of JCF16 (2016) 1.
[2] S. Kataoka *et al.*, Proc of JCF16 (2016) 29.

†narita@iwate-u.ac.jp

Expectations on the new heat-generation-reaction between metal and hydrogen

M. Nakamura*, M. Uchimura, H. Takahashi, S. Sumitomo
Nissan Motor Co., Ltd.
*mas-nakamura@mail.nissan.co.jp

The development of technologies friendly to the global environment is a major theme in the automotive industry today. Especially, to reduce CO_2 emission and to achieve cleaner exhaust emissions, Electrical Vehicle, EV, has received a lot of attention in recent years. The sales numbers of 100%-EV was around 6 times higher for the past 5 years. 100%-EV means that it does not have any other power source except motors. Nissan launched it, named LEAF, in 2010 and the total number of sales exceeded 250,000. But some customers complains the mileage per 1 charge, around 200km. In particular, the mileage in winter season could decrease by half due to using of heater, this should be solved.

In 2010, A. Rossi reported E-cat, Energy Catalyzer. This equipment can generate heat energy from Ni and H_2 reaction and the energy is larger than input one. This experiment was replicated by A Parkhomov but the reaction mechanism has NOT been clarified [1-2]. If we can use this heat energy as a heater application into EV, the problem of short mileage caused by using heater will be solved, the EV with this equipment will be a candidate for customers who have a sense of dissatisfaction that they should charge very often.

In this report we will report 2 things. The first one is the experimental results regarding to reproducing Parkhomov's experiment with some disclosing experimental conditions using Differential Scanning Calorimetry (STA-PT1600, Linseis Inc.). This DSC can measure generated heat within a tolerance of 2%. The second one is our expectation on this reaction for automotive potential.

[1] A.G. Parkhomov; International Journal of Unconventional Science issue 7(3), pp. 68-72, 2015
[2] A.G. Parkhomov; International Journal of Unconventional Science issue 8(3), pp. 34-38, 2015

Possibility of Nuclear Transmutation and Nuclear Fusion Related to Water Clusters

Hidemi Miura
Izumi-ku, Sendai. 981-3109, Japan

One of the hydrogen-including oxy-hydrogen gases is obtained through electrolyzing of water under vibratory agitation by vibration blades and can be stored as the oxygen (O) and hydrogen (H) mixture gas. In recent years, there have been some reports related to this gas that heavy elements are generated under vibratory agitation of the electrolytic solutions with alkali or alkaline-earth metal ions such as magnesium (Mg), calcium (Ca) or cesium (Cs). Furthermore, titanium (Ti), tantalum (Ta), tungsten (W) metal or glassy carbon (C) melts instantly as if it vaporizes at about 3000°C or more when it comes into contact with the flame of burning gas at about from 600 to 700°C, and so on.

In order to investigate these phenomena, we simulated the states of Mg atom with tube-like large water clusters, the states of H atoms in cage-like small water clusters and other states with them by use of a computer simulation program MOPAC based on the semi-empirical molecular orbital method on a personal computer.

As a result, we observed the oscillation of Mg atom combined with an O atom of the tube water clusters. These tube water clusters would be formed on the edge of vibration blades and cavitation wrapping them would occur. When a cavity would crush at the different structure of tube water cluster, the part of tube water cluster would be collapsed. Then, when electrons could shield the repulsion of condensed nuclei or electron distribution could enhance the electron capture, some kind of nuclear transmutations would possibly occur. And we observed that the cage water clusters could exist and one, two or three H atoms could enter them. These cage water clusters would be made from the tube water cluster when the large cavity wrapping them would separate from the edge of vibration blade and be divided to ball-like small cavities. Interestingly, encapsulated three H atoms in the cage water cluster were observed to stand on slightly curved line and collide together by their strong oscillations excited by absorption of infrared emitted from the heated metals or glassy carbon. These three H atoms observed to be able to oscillate even if the cage water clusters broke up by the heat of burning gas, metal or glassy carbon. Then, when electrons could shield the repulsion of protons or deuterons, or electron distribution could enhance the electron capture, protons or deuterons would possibly collide to cause nuclear fusion and high burning temperature on the metal surface. Furthermore, carbon dioxide or hydrocarbon molecule was observed to combine with encapsulated H atoms in the cage water clusters, and chlorine atom was observed to bond to the cage water clusters.

Nuclear Transmutations in Critical and Supra-critical Electrolysis with Graphite, Pd, W, Re, Pt and Au Cathodes Analyzed by the TNCF Model

Hideo Kozima, Tadayoshi Ohmori*and Masayuki Ohta,
Cold Fusion Research Laboratory
http://www.geocities.jp/hjrfq930/
597-16 Yatsu, Aoi, Shizuoka, 421-1202 Japan
*Advanced Technology, Inc., Hokkaido Institute of Technology,
7-15 Maeda, Teine, Sapporo, 006-8585 Japan

Abstract

Nuclear transmutations observed in the surface region of C (graphite), Pd and 5d elements (W, Re, Pt and Au) cathodes used in critical and supra-critical electrolysis with light water are analyzed using the trapped neutron catalyzed fusion (TNCF) model in accordance with the cold fusion phenomenon (CFP) observed in such 3d and 4d transition-metal hydrides and deuterides as NiH_x and PdD_x at the normal electrolysis. In the critical electrolysis, the temperature of the cathode, e.g. Pd, was raised to ca. 85 ℃ from that at normal electrolysis of about 60 – 70 ℃ and the electrode potential began to fluctuate up and down like a wave. After a few minutes reaching this stage, there occurs a glow discharge and the electrode became incandescent condition (this stage of electrolysis is termed “supra-critical electrolysis”).

Surprisingly enough, there have been observed CFP in C (graphite) and 5d elements (W, Re, Pt and Au) electrodes used in light water electrolysis at these critical and supra-critical electrolysis similar to the events of CFP observed in 3d- and 4d-transition metals in light and heavy water electrolysis.

The occurrence of the cold fusion phenomenon in critical and supra-critical electrolysis resulting in the nuclear transmutation in these cathodes is consistently interpreted by the TNCF model with the CFP in PdD_x and NiH_x at the normal electrolysis; it should be noticed that the higher temperatures of the material realized by the critical and supra-critical electrolysis are favorable for the non-localization of protons(/deuterons) wavefunctions in these hydrogen non-occluding materials at near room temperature which is one of the necessary conditions for formation of trapped neutrons in the TNCF model.

The Sociology of the Cold Fusion Phenomenon

Hideo Kozima, Masayoshi Ohmori and Hiroshi Yamada

Abstract

In the modern society, science and technology are called sometimes “science and technology” (science-technology complex, science-technology conglomerate) all together and supposed to be the same thing. However, they should be considered different thing in nature. Science and technology contain the same knowledge together but differ in which they aim at. The object of the science is just to know about the target and ends its activity when it is obtained. However, the technology does not finish its activity only by knowing the target but uses it for another purpose. And for these purposes, the scientific knowledges are sometimes rearranged, i.e. “A causes B” is transformed into “To get B, find out A.” Of course, it is usual to cultivate new techniques for scientific activity but only for the scientific objects. In technology, however, the purpose of the innovation is not only for the new scientific knowledge but also for the technical application. The pile up of the technical endeavor forms a system of technical methodology different from the system of scientific methodology.

Even if the former is overwhelming the latter in the modern world of technological economy, it should be emphasized that the scientific spirit has its special value for human society. In reality, the scientific spirit is diminishing as well as aesthetic and moral spirits in our society. Especially in the history of the cold fusion phenomenon, we see how the scientific spirit is overwhelmed by the entrepreneur desire and a science is in agony to be well-born in the world and be recognized its true value.

The history of the controlled nuclear fusion research substantially started in 1950s on one hand and that of CFP started in 1989 on the other show the overwhelming influence of the former on the latter, i.e. researches on the cold fusion phenomenon, as shown by the sociology of the science developed in the 20th century. The necessary conditions for the recognition of the cold fusion phenomenon as a part of the modern science are pointed out. It is pointed out that the most important factors preventing recognition of the CFP as a scientific research field are (1) the biased preference of deuteron systems affected by the hot fusion research, (2) neglect of unified perspective of the experimental facts obtained in protium and deuterium systems and (3) lack of recognition that the CFP belongs to an interdisciplinary science between nuclear and solid-state physics.

Cold fusion by resonance of de Broglie wave in Multiple barrier tunnel phenomenon Ⅰ

Masanobu Ban,

4-8-16-104, Gyoutokuekimae, Ichikawasi, Chibaken, 272-0133
masanobuban@m.ieice.org

Abstract

A phenomenon of resonance by fluid of the quantum is a primary cause of cold fusion. I indicate the calculation and the example which become a reason of the idea, and insist on a hypothesis from those 7 reasons.

Cold fusion is resonance phenomenon of de Broglie wave.

Fluid of the quantum of the cold fusion generates self-organization by this resonance.

By the self-organization, the structure of the multiple piled layer by the quantum is made in the space.

So a phenomenon with resonance of de Broglie wave penetrated from a tunnel phenomenon is cold fusion while showing the special nature to multiple layer structure.

The nature of the change in the phase of de Broglie wave and the tunnel resonance as a frequency response can be applied to cold fusion.

The nature of the tunnel resonance is applied and 4 conditions that an emerging quantum may be born are reported.

And, 4 conditions that occurrence of heat may be promoted will be reported.

The principle by which a phenomenon of 2 kinds, material generation and heat is a tunnel phenomenon, and, it was regarded as the phenomenon which occurs to the different condition.

The condition will be the tendency against each other in the nature of de Broglie wave.

Context

1. Thermal phenomena of sudden change-ization which occurs to an electric circuit with a gap in space and introduction of other academic meeting cases.
2. The phenomenon which regarded its cause as flotation of the balance of gravity and electric force in Physical Society of Japan is introduced with a picture about a case of the numerous layered structure organizations which occur to a spatial gap.

But the power balance of the vertical direction of a floating principle doesn't equal on the vertical straight line, and the size of the power doesn't balance, so the power which can't be proved by an established concept is operating on those phenomena.

3. The power of the floating balance is proved from theory of semiconductor engineering and a definition of work.
4. The nature which keeps growing stubbornly is necessary to numerous layered structures. It's calculated by a way of semiconductor engineering, and ascertains that to become a specific frequency response.

Cold fusion by resonance of de Broglie wave in Multiple barrier tunnel phenomenon Ⅱ

Masanobu Ban,

4-8-16-104, Gyoutokuekimae, Ichikawasi, Chibaken, 272-0133
masanobuban@m.ieice.org

Abstract

Context

5. The specific frequency response can also be derived from Schroedinger wave equation with the special condition in "Not have random probability." It can be proved that AM is modulated by a numerical formula like radiobroadcast. A specific frequency response indicates a relation between speech signal of radiobroadcast and a carrier, and a fine structure spectrum can be predicted.

6. A specific frequency response always indicates the special quality of the power function in an envelope of two logarithm charts. A mathematics relation of differential and integral calculus is indicated in power index.

For example retention of a flow and discharge show in the index.

Therefore when there is energy stored up in a flow channel, the inclination of the envelope decreases. A change in the power can be understood from a definition of fractional calculus of mathematics, and sudden heat of cold fusion can be explained..

7. When a wave penetrates it by Tunneling Effect, a corrugation isn't kept by changing phase, but when the phase goes around while repeating penetration , it return to an original corrugation.

There is a specific frequency response in a soliton. A soliton is observed by movement of the quantum of the electron. Being heat energy when losing a corrugation of a soliton, and when taking back a corrugation of a soliton, generation of an emerging substance occurs. Therefore heat generation and generation of an emerging substance are the phenomenon which can't do to see at the same time, but it's replaced with the same equipment by the condition.

By the way a wave is reflective at phase boundary in a barrier by a tunnel phenomenon, and the direction transmitted is changed. So even direct-current circuit causes transmission for the opposite.

Therefore even a circuit of alternating current meets the condition of the same tunnel phenomenon. Therefore even alternating-current circuit can grant a tunnel phenomenon. A case of a generation phenomenon of a AC circuit emerging substance is introduced here.

8. The nature of the tunnel resonance is applied and 4 conditions that an emerging quantum may be born are reported and also occurrence of heat may be.

Progress of density functional methods in LENR and their problems

Ken-ichi Tsuchiya
Department of Chemical Science and Engineering
National Institute of Technology, Tokyo-College
1220-2 Kunugida, Hachioji, Tokyo 1193-0997, Japan
e-mail; tsuchiya@tokyo-ct.ac.jp

The properties of hydrogen-metal systems depend on the charge distribution around hydrogens. In our previous works [1,2,3], we discussed the quantum distribution of hydrogens or deuterons by using the method of Y.E.Kim et al. [4,5]. In order to obtain the numerical solutions to them, we introduced doubly connected flow chart, which is drown in Fig.1 for the case of two hydrogens in metal. As shown in Fig.1, it is an iterative calculation including Schrödinger and Poisson equations, however two hydrogens exist in the system with interacting each other. Therefore, we should obtain the solutions for the doubly connected iterative problems.

In this study, we show some results and discuss the problems for the convergence aspect of the iterative calculations. At the end, we discuss the method how to estimate the nuclear reaction rate between two charged bose particles.

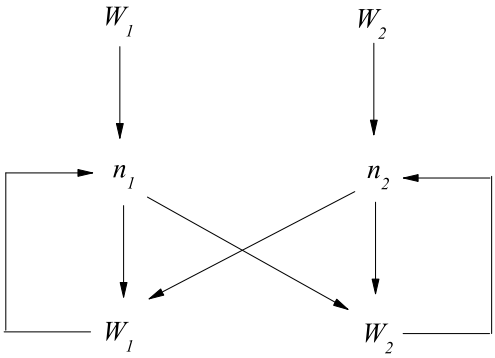

Fig.1 Flow chart of the iterative calculation and for the system including two hydrogens.
W_i and n_i mean static potential and charge density for particle I, respectively.

References

[1]. Ken-ichi Tsuchiya,"A Self-Consistent Iterative Calculation for the Two Species of Charged Bosons Related to the Nuclear Reactions in Solids",Journal of Condensed Matter Nuclear Science, Vol.13, pp.594-602

[2]. Ken-ichi Tsuchiya, Aska Okuzumi, Aiko Watanabe, "The Quantum States of the System Including Two Species of Charged Bosons In Ion Traps V", Proc. of JCF14, pp.161-167

[3]. K. Tsuchiya and S. Kounlavong,"Convergence Aspect of the Self-consistent Calculations for Quantum States of Charged Bose Particles in Solids", Proc. of JCF15, pp.91-99

[4]. Y.E.Kim and A.L.Zubarev, "Mixtures of Charged Bosons Confined in Harmonic Traps and Bose-Einstein Condensation Mechanism for Low Energy Nuclear Reactions and Transmutation Process in Condensed Matter",Condensed matter Nuclear Science, Proc. of ICCF11, France, p.711-717

[5]. Y.E.Kim, "Generalized Theory of Bose-Einstein Condensation Nuclear Fusion for Hydrogen-Metal System", Purdue Nuclear and Many Body Theory Group (PNMBTG) Preprint PNMBTG-6-2011 (June 2011).