File - CF

OIC Aerospace Terrestrial Marine

2714 Clarkes Landing Dr.
Oakton, Virginia 22124

TEL: (703) 620-5886
VOICE MAIL: (703) 790-2346
FAX: (703) 620-6247
E.MAIL: oicresmith@aol.com

OAKTON INTERNATIONAL CORPORATION

8 JUN 1995

Dr. Walter Polansky
Department of Energy
ER-16; F-240
Washington, DC 20585

Dear Dr. Polansky,

I am enclosing an announcement for a seminar at the Naval Research Lab by Dr. Yoshiaki Arata. You may want to attend this talk. Dr. Arata has published data on 3 cold fusion runs which appear to have produced ~30 kWh of integrated excess heat output from deuterided Pd metal powder subject to high pressure D_2 gas. He has analyzed at least 3 samples of the deuterided powder used in these experiments and found large quantities of bound ^4He. The ^4He appears to be commensurate with the heat output assuming 24 MeV per Pd atom. In 2 control runs using powder that had not been treated with deuterium he reports no helium.

Dr. Arata is here to discuss his results and to answer detailed questions about his studies. Dr. Arata is a member of the Japan Academy and a Fellow of the ASM.

If you decide to attend the talk, please call Colleen Carlson at 202 767 2885, or call me.

I am enclosing a plot showing repetitive ^4He mass spectra in a recent thermal desorption run, and Arata's earlier article on the same subject.

Sincerely.

Talbot A. Chubb

Talbot A. Chubb
Chief Scientist
Oakton International Corp.
5023 N. 38th St..
Arlington VA 22207.

(703) 536 4427

CONDENSED MATTER AND RADIATION SCIENCES DIVISION

SEMINAR

ACHIEVEMENT AND MECHANISM OF SOLID STATE PLASMA FUSION ("COLD FUSION")

PROF YOSHIAKI ARATA
Osaka University

Abstract

Drs. Yoshiaki Arata and Yue-Chang Zhang have produced experimental evidence demonstrating radiationless cold fusion excess heat in 0.4 micron palladium deuteride, and have shown that the nuclear reaction product is helium-4.

Date:	**Friday, 21 June 1996**
Talk:	10:00 A.M.
Place:	**Building 75/Room 117** Naval Research Laboratory

Visitors are welcome. Please obtain passes from the Security Office, located in the lobby of Bldg. 72, near the main gate. Passes must be countersigned by a Laboratory representative at the conclusion of the meeting. Non-citizens of the U.S. must make arrangements with Colleen Carlson (202) 767-2885 in advance of talk.

Achievement of Solid-State Plasma Fusion ("Cold-Fusion")

By Yoshiaki ARATA, M. J. A., and Yue-Chang ZHANG
Osaka University, 11–1 Mihogaoka, Ibaraki, Osaka 567

(Communicated Dec. 12, 1995)

Abstract : Using a "QMS" (Quadrupole Mass Spectrometer), the authors detected a significantly large amount ($10^{20} \sim 10^{21}$ [cm^{-3}]) of helium (^4_2He), which was concluded to have been produced by a deuterium nuclear reaction within a host solid. These results were found to be fully repeatable and supported the authors' proposition[1] that solid state plasma fusion ("Cold Fusion") can be generated in energetic deuterium Strongly Coupled Plasma ("SC-plasma"). This fusion reaction is thought to be sustained by localized "Latticequake" in a solid-state media with the deuterium density equivalent to that of the host solid. While exploring this basic proposition, the characteristic differences when compared with ultra high temperature-state plasma fusion ("Hot Fusion") are clarified. In general, the most essential reaction product in both types of the deuterium plasma fusion is considered to be helium, irrespective of the "well-known and/or unknown reactions", which is stored within the solid-state medium in abundance as a "Residual Product", but which generally can not enter into nor be released from host-solid at a room temperature. Even measuring instruments with relatively poor sensitivity should be able to easily detect such residual helium. An absence of residual helium means that no nuclear fusion reaction has occurred, whereas its presence provides crucial evidence that nuclear fusion has, in fact, occurred in the solid.

Key words : Solid-state plasma fusion; cold fusion; Latticequake; S-atom; helium.

Introduction. In earlier reports, the authors[3] showed that a huge amount of energy exceeding far than that which could be explained by chemical reactions, energy amounting to some hundred Mega-Joules, was obtained over a period as long as several thousand hours even for a small quantity of Pd fine powder (3–5[gr]), using bottle-shaped Double Structure Cathode ("DS-cathode") whose interior cavity is filled with extreme fine powders of Pd-black absorbing "Spillover-Deuterium". In other words, the authors' sample combining with pure Pd-powder and pure "Spillover-Deuterium" has released such a plentiful new excess energy. To provide a reasonable hypothesis for the excess energy's generation, the authors proposed the "Latticequake Model",[1] which explains how solid-state plasma fusion ("cold fusion") with this large amount of energy would occur.

In this report, authors describe how a great deal of residual helium was detected after energy generation, the reasons this helium would be the result of a deuterium nuclear fusion reaction within the host solid, and the likely reaction mechanism.

Experiments and results. *Tremendous "released helium" concluding the achievement of nuclear fusion within solid.* When a nuclear fusion reaction occurs in the host solid, the reaction energy remarkedly heats the solid and simultaneously the reaction products form within solid-state. Some products would be instantly released, while others are retained. A sample that gives off a large amount of exothermic energy over a long period, though the instantaneous energy is small, should contain a high accumulation of such reaction products, particularly if the atoms of the "Residual Products" could not be absorbed or released by the host solid. The authors felt that if a nuclear fusion reaction had actually occurred in the DS-cathode containing fine Pd-black powder, which produced several hundred mega-joules of energy over an extended period, there should be a large accumulation of "Residual Helium". The next step was thus to see if such "Residual Helium" could be detected.

It was confirmed that when deuterated powder of fine Pd-black which discharged huge excess energy was heated, significantly large amount of helium (^4_2He)

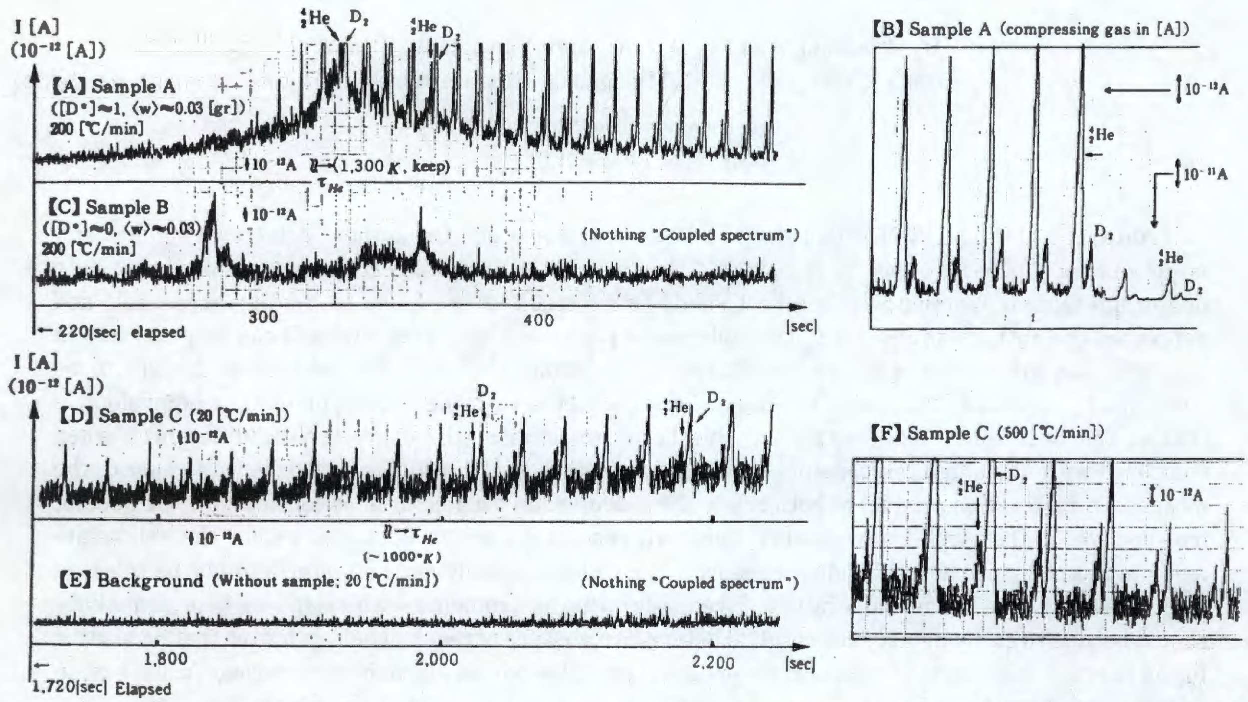


Fig. 1. Characteristics of "Released Helium" concluding the achievement of solid-state plasma fusion ("cold fusion"). Note: When ${}^4_2He$ as "released helium" and D_2 gas coexist, "coupled spectrum" (${}^4_2He$: 4.00260, D_2: 4.02820) appears repeatedly in time-sequence of the intensity distribution setting the dial of "mass-indication" from 3.95 to 4.05 in "QMS". For instance, 【A】 demonstrates fully crucial condition of appearance of such "coupled spectrum" which came into QMS from deuterated sample A (concentration $[D^*]\approx1$, weight <w>≈0.03[gr], powder $dia\approx400$[nm] in Pd-black) heated up to 1300 [K] as shown by τ_{He}. Here, heating rate was 200[°C/min]. When mixed gas released from sample A in 【A】 is compressed about several times and eliminated only deuterium, each intensity distribution of "coupled spectrum" is inverted as shown in 【B】and ${}^4_2$He only can remains. On the contrary, sample B (same size and weight with sample A, but without deuterized: $[D^*]=0$) does not absolutely indicate any "coupled spectrum" as shown in 【C】. On the other hand 【D】 demonstrates the characteristic of intensity distribution for Sample C ($[D^*]\approx1$, <w>≈1.1 [gr]) heated up to 800 [°C] with low rate-heating (≈20 [°C/min].) 【E】 shows backgrand (without sample and characteristic of only "QMS" apparatus). 【F】 demonstrates characteristic of "coupled spectrum" for quick-heated sample C heated up to 800 [°C] with about 500 [°C/min] (same sample C in 【D】). The authors note here that we couldn't detect ${}^3_2He$ and ${}^3_1T$ as we have detected much ${}^4_2He$ in this experiment.

in host solid than that expected in natural abundance was released and detected by a "QMS" (Quadrupole Mass Spectrometer). This result makes us conclude that deuterium strongly coupled plasma nuclear fusion ("cold-fusion") has been achieved within Pd-host solid.

Fig. 1 shows typical example of characteristics of the helium released when 0.03 and 1.1 [gr] of deuterated Pd-black were put into a vacuum chamber equipped with "QMS" and heating apparatus. It can be seen that a large quantity of helium (${}^4_2He$) with concentration of $10^{20}\sim10^{21}$[cm^{-3}] was released at a such high temperature of 1000~1500 [K]. Such "Residual Helium" is extremely insoluble in solid Pd and cannot be released at room temperature, thus requiring thermal desorption.[4)] In fact, even at $[H^*_e](\equiv[He/Pd])\approx0.02$ less than only 1% is released at 1300°K.[4)]

Generation mechanism of solid-state nuclear fusion. (a) *Seismic atom ("S-atom") and lattice displacement.* The mechanism of "cold fusion" can be compared to an strong "Earthquake", which is caused when a localized Ultrahigh Energy Density ("UED") zone in the earth explosively releases a tremendous amount of energy. In the case of cold fusion, a strong "quake" occurs when a "UED" zone suddenly appears in a localized area about the size of an atom-cluster including a unit cell.

A high energy "S-atom" (Seismic atom or particle) which violently shakes an extream localized lattice, causing what we term a "Latticequake". Though violent, latticequakes are extremely short and last just a few pico-seconds, affecting only the immediate location within the lattice.

This mechanism provides the necessary condition for cold fusion, i.e., the generation of solid-state

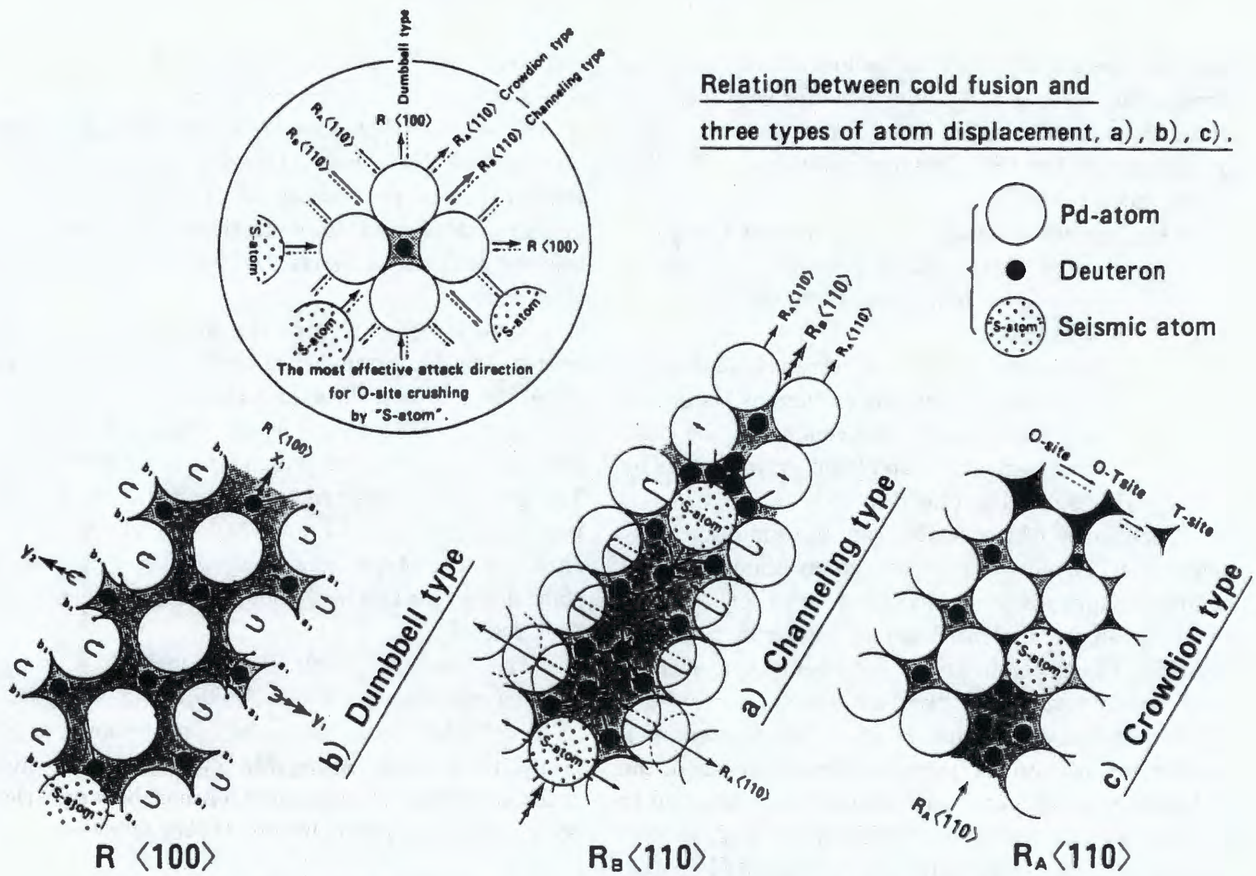


Fig. 2. Illustration of three types of atom displacement inducing cold fusion by crushing O-sites and producing high energy deuterons in the solid-lattice, O-sites primarily need to broken, therefore the most effective attack direction for O-site crushing by "S-atom" is demonstrated inside of upper-side circle, and three types of atom-displacement and "deuteron cluster" are shown in lower side. (In general, "S-atom" contains "S-particle" and/or "S-energy".)

strongly coupled plasma composed of the high energy, high density "deuterium clusters and electron dense clouds". The major feature of strongly coupled plasma ("SC-plasma") is that electrons prominently exhibit the characteristics of the Fermi particles which satisfactory reduces the Coulomb potential between ions in deuterium clusters as explained in Appendix.

To briefly summarize, the majority of enormous energy suddenly appears in a localized area of solid is immediately converted to the elastic energy of the lattice. This energy is released when the expansion is turned to the compression stage, resulting in the implosion of the said site. This implosion is similar to the "laser implosion" characteristic in "hot fusion", and thus we have termed it a "Lattice implosin".[1)]

The intensity of a latticequake is primarily dependent on the direction of atom displacement caused by the "S-atom", the type of "S-atom" and its energy. Three types of atom displacement and the most effective directions for crushing O-sites are shown in Fig. 2. The intensity of the latticequake may not be large enough if the first "S-atom" or "S-particle" is a high energy light particle such as an electron, neutron, deuterium, tritium, helium, etc. As we stated in the previous report,[1)] however, if the energy is concentrated along the "focusson road" (reaction road) <110>, it is possible to effectively and directly create a high energy deuterium cluster. But, if the direction of energy concentration deviates from that direction, the lattice atom absorb the energy which produces the "S-atom". These points to an important mechanism for the chain reaction of cold fusion.

(b) *Characteristics of "Latticequake"*. Deuterons in a Pd lattice are generally distributed in the rigid octahedron isolated each other, and the deuterons energy in solid is too small to overcome Coulomb barriers even when the "tunneling effect" is considered. This meanes it is improbable for cold fusion to occur in a normal solid. Cold fusion is most likely possible only when the following conditions are fulfilled within host solid.

(A) Deuterons easily meet to form a cluster.

(B) (a) A deuteron cloud energetic enough to overcome individual Coulomb barrier is generated.

(b) An energetic dense electron cloud displaying behavior similar to "muons" is generated and sufficiently condenses the positive coulomb cloud of deuteron clusters by "screening effect".

Conditions (A) and (B) can be simultaneously achieved when a littice in an extremely abnormal state suddenly appears in a localized area of a solid, resulting in a "Violent-State of Electron Shaking" (VSES). These condition do not occur in a normal-solid, and it causes by "Latticequake".

When deuterium ions are stably distributed in an isolated octahedron and the octahedron is crushed, the neibouring O-site and T-site are strongly displaced to form a wide "Lattice Hall", as shown in Fig. 2. In such state, condition (A) appears when the isolated deuterium ions are easily encountered and forms clusters. This "Lattice Hall" is instantly crushed by the accumulated elastic strain energy of lattice, which was generally distributed at the time of "Hall" formation, and then a "VSES" is achieved. In this stage, conditions (B) (a) and (b) are simultaneously realized, generating the strongly coupled plasma with energetic deuteron clusters and dense electron cloud, and enabling the occurrence of cold fusion. The necessary abnormal state for cold fusion is thus achieved by the "Latticequake".

In the next will be described how the Pd cold lattice is vibrated by "S-atom" which causes latticequake. In order to make clear the basic idea, the authors will describe the phenomena by a simplified model. It will be allowable to put in $<\varepsilon_{\text{"S"}}>=1$[MeV] as energy of "S-atom" (Mass: Ms, energy: $<\varepsilon_{\text{"S"}}>$) in order to grasp characteristic of cold fusion reaction. When such "S-atom" crushes an O-site in Pd lattice with the threshold energy, $\varepsilon_{\text{crush}}$, it crushes a number of O-site, n ($\equiv<\varepsilon_{\text{"S"}}>/\varepsilon_{\text{crush}}$). In the case of a Pd lattice without deuterium, $\varepsilon_{\text{crush}}=60$–$80$[eV], $n \fallingdotseq 10^4$ and $l_{\text{"S"}} \fallingdotseq 5[\mu m]$ (moving distance of "S-atom"), because "S-atom" energy is transferred to make a cascade and Wigner energy (20–30 [eV]), etc. with "inelastic" and "elastic" collisions Pd-lattice without a deuteron.

However, when there is a deuteron (mass: m_D, energy: $<\varepsilon_{\text{"D"}}>$) at each O-site, the energy of "S-atom" greatly decreases because of the large amount of energy transferred to deuteriums, and hence the number of O-site to be crushed by "S-atom" considerably reduces.

Here in order to give the most effectively high energy for deuterium within solid lattice, there are three kinds of best directions and atom-displacements to attack O-site effectively: a) channelling type b) dumbbell type and c) crowdion type as shown in Fig. 2. Though prime consideration is applied to a) channelling type, the b) and c) types are almost similar situation to a) type, and it is possible to accelerate some deuterons to a high enough energy level even for "hot fusion".

The "S-atom" with initial energy of $<\varepsilon^{(0)}_{\text{"S"}}>$ crushes successive O-sites. Taking the energies of "S-atom" and deuteron to be $<\varepsilon^{(n)}_{\text{"S"}}>$ and $<\varepsilon^{(n)}_{\text{"D"}}>$ respectively, and $A \equiv m_D/Ms$, when the "S-atom" reaches to n-th O-site, the relations between these parameters are given by eq. [1] as follows.

$$<\varepsilon^{(n)}_{\text{"D"}}>=A<\varepsilon^{(n)}_{\text{"S"}}>=\frac{A}{(1+A)^n}\left(<\varepsilon^{(0)}_{\text{"S"}}> -\varepsilon_{\text{crush}}\sum_{n=1}^{n}(1+A)^{(n-1)}\right) \quad \text{(a)}$$

$$=\frac{A}{(1+nA)}\left(<\varepsilon^{(0)}_{\text{"S"}}>-n\,\varepsilon_{\text{crush}}\right),\ (A \ll 1) \quad \text{(b)} \qquad [1]$$

or

$$n=\frac{<\varepsilon^{(0)}_{\text{"S"}}>-<\varepsilon^{(n)}_{\text{"D"}}>/A}{<\varepsilon^{(n)}_{\text{"D"}}>+\varepsilon_{\text{crush}}}. \quad \text{(c)}$$

Fig. 3 shows eq. [1] in graphic form for easier understanding how energy is transfered from "S-atom" to deuterons and also how drastically decreases in energy of "S-atom" $<\varepsilon_{\text{"S"}}>$. In other words, eq. [1] demonstrates existence of "snowplow" action.

If the maximum number of deuterium confined in the n-th O-site by "first snowplow effect" is taken to be $N^{(n)}_{\text{"D"}}$, the maximum density is $n^{(n)}_{\text{"D"}} \fallingdotseq n_{pd} N^{(n)}_{\text{"D"}}[\text{cm}^{-3}]$ (n_{pd}: density of Pd atom). Therefore, if assumed that $[D^*]=1$, $A=1/50$, $<\varepsilon^{(0)}_{\text{"S"}}>=1000$ [KeV], and $\varepsilon_{\text{crush}} \fallingdotseq 0.1$ [KeV], deuteron in the range of 10–20 [KeV] is given as $N^{(n)}_{\text{"D"}} \fallingdotseq 50$ and its maximum density becomes $n^{(n)}_{\text{"D"}} \fallingdotseq 3\times10^{24}[\text{cm}^{-3}]$. In a little bit wider energy range of

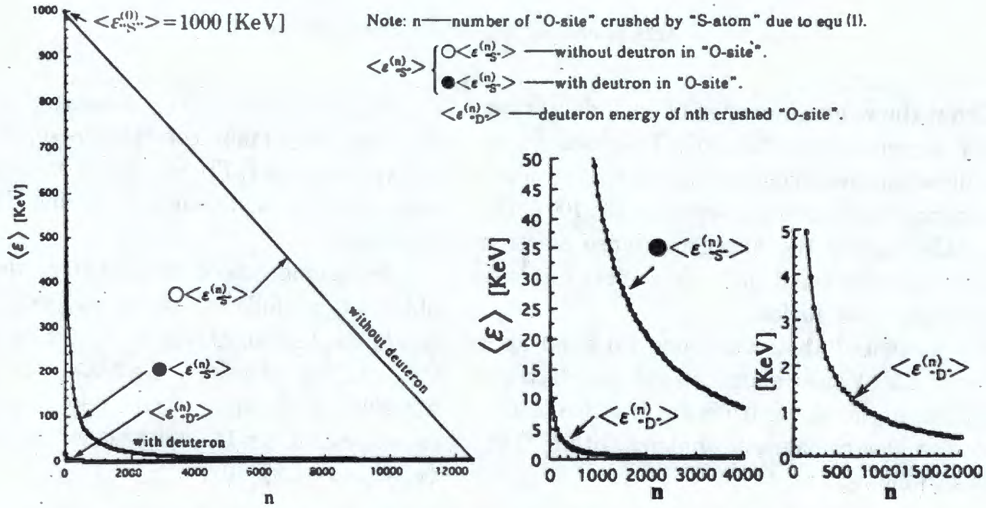


Fig. 3. Energy change of "S-atom" and deuterons, crushing up to n-th O-site with and without deuteron due to eq [1]. note: right side two diagrams magnified ● $<\varepsilon^{(n)}_{\text{"S"}}>$ and $<\varepsilon^{(n)}_{\text{"D"}}>$ in small n-range.

$1\text{–}20$[KeV], $N^{(n)}_{\text{"D"}} \doteqdot 1000$ and $n^{(n)}_{\text{"D"}} \doteqdot 10^{26}[\text{cm}^{-3}]$, and $N^{(n)}_{\text{"D"}} \doteqdot 3000$ in the energy range of 0.2–20 [KeV].

From the above, we can conclude that about 3000 O-sites are effectively crushed as deuteriums are accelerated by "first snowplow effect" of "S-atom". If one assumes that an O-site is not crushed until it absorbs more than 1000 deuterium atoms, the density becomes 1000 times higher than that of solid, i.e., $10^{26}[\text{cm}^{-3}]$. This means that the extremely strong coupled "Deuteron Cluster" is formed. However, as the capacity of O-site to confine deuterium is limited, if it is assumed to be several to several tens of deuteron cluster, the several tens to several hundred high energy clusters are formed and flow into "Lattice Hall". We have named this type of high energy incoming cluster an "Influx Cluster".

If the "deuteron cluster" $N^{(n)}_{\text{"D"}}$ which has enough energy even for hot fusion in the strong cluster field can initiate the direct fusion reaction, the reaction products immediately generate new "S-atom" and thus "chain reaction" will be achieved. However, even if this reaction is not realized the energy is adiabatically transferred to the lattice that the "S-atoms" have passed, explosively heating that localized area. These phenomena take place at the "Lattice Hall" formed behind "S-atom" and its vicinity as illustrated in Fig. 2.

In other words, a local intense explosion takes place in the area of the "Lattice Hall" within the bulk. If there is no cold lattice surrounding this area, the "Lattice Hall" and its neighboring atoms must be

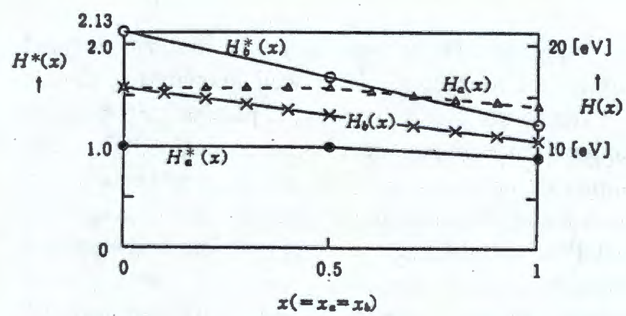


Fig. 4. Strong "Screening Effect" of the Strongly Coupled Plasma within host solid. Not: Relation between screening effect $H^*(x)(H^*_a(x_a), H^*_b(x_b))$, $H(x)(H_a(x_a), H_b(x_b))$ and small distance $x(xa, xb)$ corresponding $r \approx 0$.

blown away by the explosion. Instead, what will usually happen is that the surrounding cold lattice absorbs most of the explosion energy in the form of "strain energy", which induces "Lattice Implosion" when it is released.

If the "Lattice Hall" disappears, it generally leaves behind various lattice defects and allied strain energy in the solid. If this energy is considered "irreversible energy" ε_{irr} and the elastic strain energy associated by simple deformation of lattice is considered "reversible energy" ε_{rev}, then the condition of $<\varepsilon^{(0)}_{\text{"S"}}> = \varepsilon_{irr} + \varepsilon_{rev}$ holds. If about 3000 O-sites are crushed, and the deuterium atoms and high energy "influx-clusters" flowing into "Lattice Hall" from the neighboring O-sites are considered, with 8 individual sites being crushed in each O-sites, it is estimated that each "Lattice Hall" will have deuterium atoms of $N_L \doteqdot$

9000, and that the average energy of each deuterium will be $<\varepsilon^{(L)}_{\text{"D"}}>$ $(=\varepsilon_{rev}/N_L) \doteqdot 100$ [eV]. This means that about ten thousand deuterons in the state of strongly coupled plasma with average energy of 100 [eV] violently shake among the energstic dense electron cloud within the "Lattice Hall". This energy is sufficient to initiate cold fusion.

It was calculated that when one Pd-atom as a "S-atom" with 1[MeV] lose about ten valence electrons during its flight in the lattice (to make "Lattice Hall"), induces violent electromagnetic shaking within "Lattice Hall" as follows,

$$\left.\begin{array}{l} E \simeq 4.5\times10^{7}[\frac{V}{cm}],\ B \simeq 4.3\times10^{4}[\text{gauss}] \\ (H \simeq 3.4\times10^{6}[\frac{A}{m}]),\ i \simeq 4.5\times10^{12}[\frac{A}{cm^2}]. \end{array}\right\} \qquad [2]$$

Appendix. *Deuterium "strongly coupled plasma" within Pd host solid.* It is well known that metals behave as the "strongly coupled plasma" (SC-plasma) under "one component plasma model" (OCP). The highly dense deuterated sample is constructed with "composite-strongly coupled plasma" (CSC-plasma) in "OCP" of a system composed of both ions and electrons from Pd and deuterium, respectively, with plasma parameters of Γ_e $(\equiv \varepsilon_{[C]e}/\varepsilon_F) \approx 4.2$, $Be^*(\equiv a_e/a_B) \approx 1.3$ and $F^*(\equiv k_B T/\varepsilon_F) \approx 0.02$ in an electron system, where $\varepsilon_{[C]e}$; coulomb energy, ε_F; Fermi energy, a_B; Bohr radius, a_e; electron sphere radius, k_B; Boltzmann constant.

The conditions for nuclear fusion are not present in normal "CSC-plasma". However, extremely localized "CSC-plasma", when shaken violently in "Lattice Hall" due to latticequack, can be changed into energetic deuterium "SC-plasma" of over 100[eV], composed of both high energy deuteron-clusters and electron dense clouds. It is considered that nuclear fusion generates in deuterium "SC-plasma" when it changes from state **[A]** $(\varepsilon_F \gtrsim k_B T \approx 100[eV]$, $F^* \leq 1$, $\Gamma_e < 0.23$, $Be^* \approx 1.2)$ to state **[B]** $(\varepsilon_F \approx 5[eV]$, $k_B T \approx 0.1[eV]$, $F^* \approx 0.02$, $\Gamma_e \approx 4.6$, $Be^* \approx 1.2)$ within a short period of several picoseconds.

A Special feature of "SC-plasma" is a screening effect with potential H(r) which decreases by effective potential $\varepsilon_{eff}(r)$, giving "potential of average force" between charged particles with a coulomb energy of $\varepsilon_{[C]}(r)$, where screening potential, $H(r) \equiv \varepsilon_{[C]}(r) - \varepsilon_{eff}(r)$, or $\varepsilon_{eff}(r) \equiv \varepsilon_{[C]}(r) - H(r)$.

When $\varepsilon_{[C]}(r) \equiv (Ze)^2/r$, since $\varepsilon_{[C]}(r) \to \infty$ in case of the most important condition $r \to 0$, it becomes g(r) $(\equiv \exp[-\varepsilon_{eff}(r)/k_B T]) \to 0$, which means particles can not exist for a distance $r \to 0$ and H(r) cannot be calculated.

Screening ratio $H^*(x)$ and $H(x)$, therefore, can be obtained as follows, using $\varepsilon_{[C]}(a)(\equiv (Ze)^2/a)$ and/or $\varepsilon_{[C]}(b)$ $(\equiv (Ze)^2/b)$ instead of $\varepsilon_{[C]}(r)$, provided $a \equiv 0.62/\sqrt[3]{n_i}$, n_i: ion density), $b \equiv 2.03a$, $d \equiv 1.76a$, $x_a \equiv r/a$, $x_b \equiv r/d$, $y \equiv 1 - x_b$, when $r \to o$, parameters are $(x_a = x_b = x = 0,\ y = 1)$, and $r = a$ (or d), parameters are $(x_a = x_b = x = 1,\ y = 0)$.

$$H^*(r) \equiv \frac{H(r)}{\varepsilon_{[C]}(r)} \text{ and } H^*(x) \equiv \frac{H(x)}{\varepsilon_{[C]}(\text{a or b})} (r = x \text{ in } r \simeq 0)$$

then,[5]

$$H^*_a(x_a) \equiv \frac{H_a(x_a)}{\varepsilon_{[C]}(a)} \approx 1.06 - 0.25x_a^2$$

or using "Lattice model"[6,7]

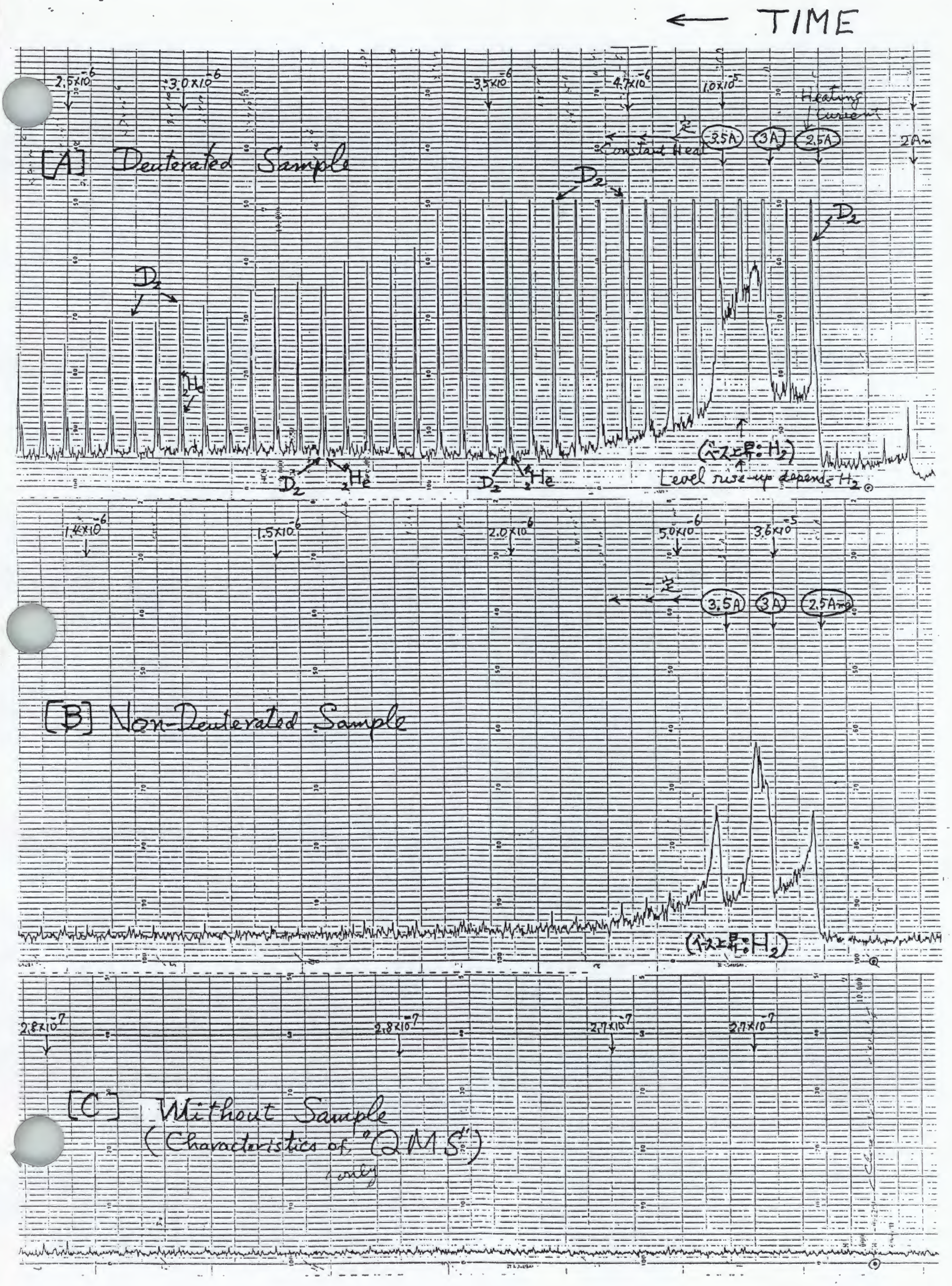
$$H^*_b(x_b) \equiv \frac{H_b(x_b)}{\varepsilon_{[C]}(b)} \approx 1.15 + 1.15y - 0.99y^2 + 4.34y^3 - 5.39y^4 + 1.87y^5.$$

Using these parameters, Fig. 4 can be obtained.

Acknowledgments. This research has been supported by a research grant from The Japan Academy. The authors would like to express their appreciation for the discussion of Prof. H. Fujita of Kinki University and for the helpful measurement by "QMS" of ULVAC JAPAN Ltd. and Mr. K. Yanagishita.

References

1) Arata, Y., and Zhang, Y. C. (1995) Proc. Japan Acad. 71B, 98–103; (1995) J. High Temp. Soc. Japan 21, 43–51; 130–141.
2) Proc. Third, Fourth, and Fifth Int. Conf. on Cold Fusion (ICCF3, 4 and 5, 1993–1995).
3) Arata, Y., and Zhang, Y.C. (1993) J. Plasma and Fusion Research 69, 963–968; (1994) Proc. Japan Acad. 70B, 106–111.
4) A bell, G.C., Matson, L.K., and Steinmeyer (1990) R.H. Phys., Rev. B41, 1220–1223.
5) Widom B. (1963) J. Chem. Phys. 39, 2803.
6) Salpeter, E.E., and Van Horn, H.M. (1969) Astro Phys. J. 155, 183.
7) Itoh, N., and Ichimaru, S. (1977) Phy. Rev. A16, 2178.



← TIME
2.5×10^-6
3.0×10^-6
3.5×10^-6
4.7×10^-6
1.0×10^-5
Heating Current
3.5A
3A
2.5A
2A
定
Constant Heat
[A] Deuterated Sample
D2
D2
D2
2He
D2
2He
D2
2He
(ベース上昇: H2)
Level rise-up depends H2
1.4×10^-6
1.5×10^-6
2.0×10^-6
5.0×10^-6
3.6×10^-5
定
3.5A
3A
2.5A
[B] Non-Deuterated Sample
(ベース上昇: H2)
2.8×10^-7
2.8×10^-7
2.7×10^-7
2.7×10^-7
[C] Without Sample
(Characteristics of "QMS" only)