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Conceptualized Cold Fusion Reactor with Improved Reaction Rate by Segregating Deuterium at Grain Boundaries

(Transmutation Experiment to Prove Femto D_2 Model of Cold Fusion)

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Abstract:- Conventional Cold Fusion reactor has serious disadvantage that reaction rate is so low due to the lower concentration of D around the reaction site. Thus, I would like to propose the conceptualized Cold Fusion Reactor with D confined in the grain boundary of poly crystalline metal grain boundary, because D can stay in the grain boundary due to the smaller size of D^+. In order to increase the reaction site the reactor has the multilayer metal film stacks. This reactor can transmute element with larger current of femto H_2. Thus, I also would like to propose the conceptualized transmutation reactor with H_2 gas to prove the mechanism of Cold fusion because with H_2 femto H_2 can have two protons it will show the femto D2 hypo of Cold Fusion mechanism is correct. The transmutation reactor needs to have target metal on the downside for femto H_2 to fall on it, and target metal need to be heated to increase the reaction rate of transmutation.

Keywords:- *Cold Fusion Femto D2, Femto H2, Transmutation Nucleus Model Neutron*

I. INTRODUCTION

Cold fusion is a technology that will play an important role in hydrogen energy for the coming hydrogen society. Due to its high energy density and the use of deuterium as fuel, there is no concern of the depletion.

The authors are developing a cold fusion reactor with high power generation efficiency which can produce steam hot enough to turn a turbine to replace nuclear power plant. In addition, we are planning to prove the correct model of Cold fusion by femto D_2 model, and in order to prove the femto- D_2 we will show the existence of femto H_2 because hydrogen has only proton, and Deuteron is believed to have one proton and one neutron. In fact, the experiments showed that d is constituted by two protons.[1],[2],[3].

II. HISTORY OF COLD FUSION

On March 23, 1989, Martin Fleischmann of the University of Southampton, UK, and Stanley Pons of the University of Utah, USA, announced to the media that they had discovered a phenomenon in which nuclear fusion occurs at room temperature, and the term cold fusion was coined. It became widely known to the world. In this presentation, Fleischmann and Pons placed a palladium rod and a platinum plate electrode in a test tube filled with heavy water, left them for several days under deuterium absorption conditions, and passed an electric current. An exotherm to the extent that the part melted was observed. It was simply the very simple heavy water electrolysis experiment shown in FIG.1

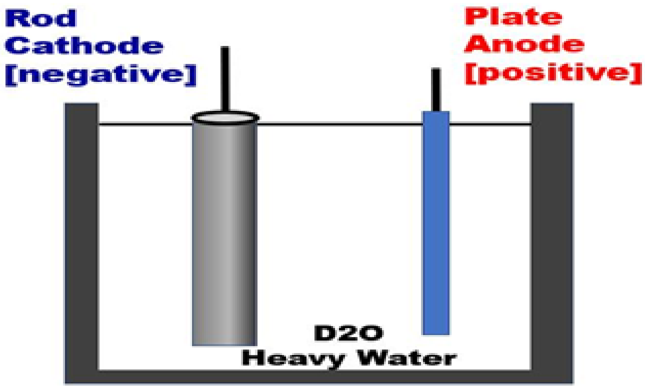

Fig 1 Experimental Equipment in the Early Days of Cold Fusion

However, in this experiment, nuclear fusion just happened to occur at the stage of absorbing deuterium in the metal, is now called FPE(Fleischmann and Pons Effect).

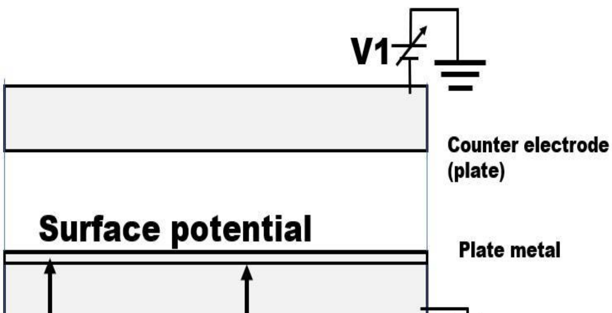

Fig 2 Correct Typical Cold Fusion Reactor to Control Metal Surface Potential with Parallel Plate

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Fig. 2 shows a typical early experiment of cold fusion. The counter electrode is a metal parallel plate with a positive potential for Cold Fusion. I explain the mechanism of FPE and Cold Fusion [4].

III. MECHANISM OF COLD FUSION

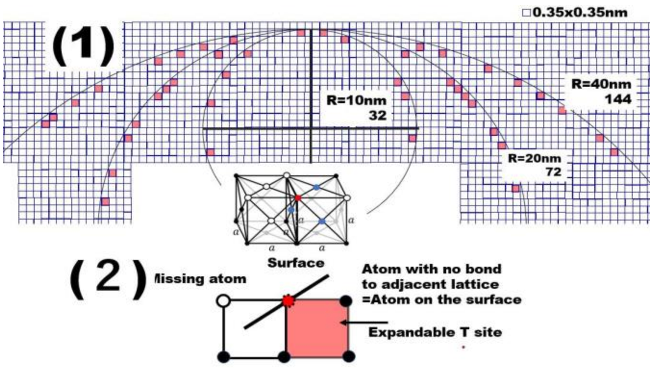

Fig 3 (1) Reaction site on the grain boundary side wall (2) expandable T site with metal atoms without no bond to the adjacent atoms.

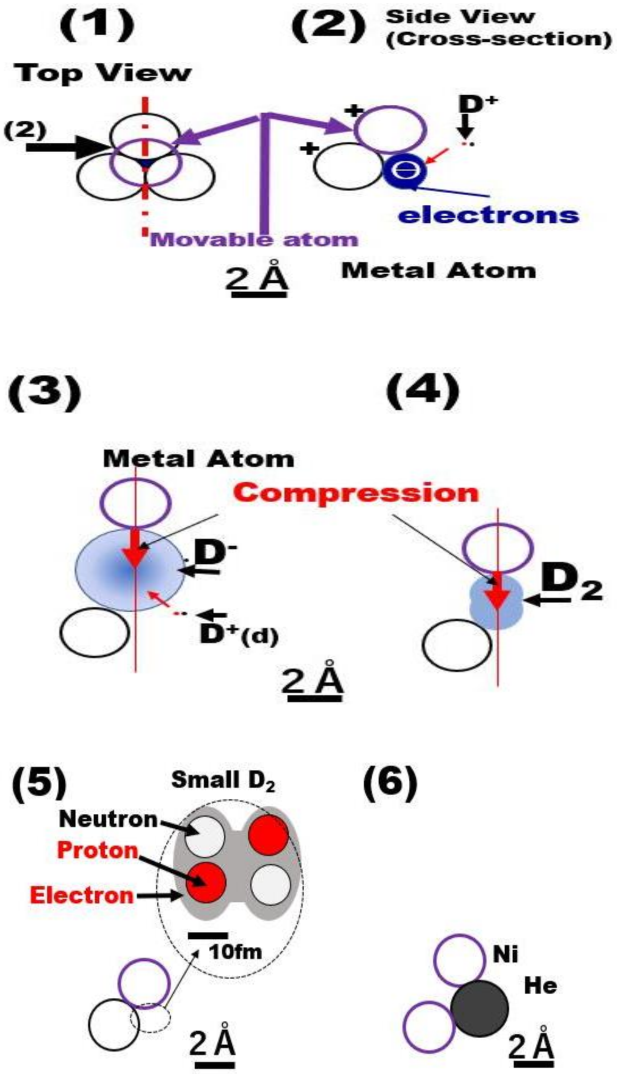

Fig 4 Cold Fusion Mechanism of D-D Covalent Bond Compression to Generate Femto D_2

IV. STUDY ON DEEP ELECTRON ORBIT FOR FEMTO D_2

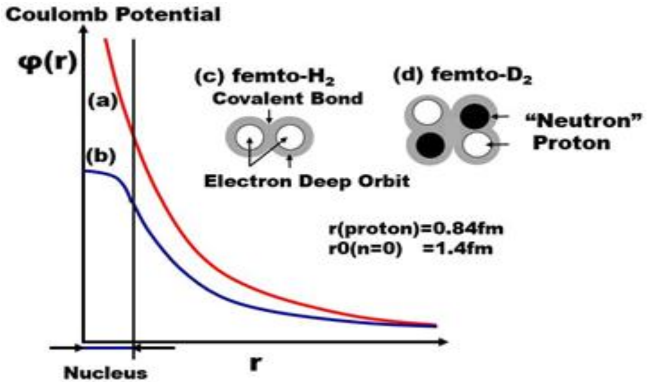

Fig 5 Electron deep orbit based on (b) the correct coulomb potential with the comparison of （a） point charge coulomb potential.(c) femto D_2, (d) femto H_2

It has been proved by theoretical studies that there is an orbital closer to the nucleus than n=1 orbit. the current base orbital in the hydrogen electron orbital [5]-[7]. Marie and Vavra used a new Coulomb potential, in which the charge is uniformly distributed in the nucleus, instead of the point charge hypothesis of the Coulomb potential in Fig. 5(b).

V. DETTERIUM CONFINED COLD FUSION REACTOR

- Disadvantages of the Conventional Type and how to Improve them

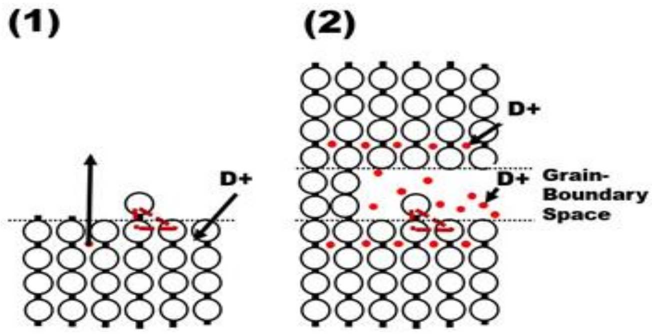

Fig 6 (1) Conventional Cold Fusion Reactor (2) improved Cold fusion reactor by deuterium confined in metal grain boundary.

In cold fusion, positive deuterium ions are trapped in a expandable T-site in the dotted rectangle in the figures and transition to negative deuterium ions. As a result, femto D_2 molecules are formed, causing nuclear fusion.as is explained in [1] ,[2] and [3].

In a conventional cold fusion device, referring to FIG. 6(1), femto D_2 molecules are generated at reaction sites (dotted triangles) on the surface of the metal. Because two deuterium positive ions need to occupy at the reaction site to cause Cold Fusion, it is clear that probability of Cold Fusion reaction is very low due to no deuterium positive ions around the reaction site.

VI. DETTERIUM CONFINED COLD FUSION REACTOR IN SMALL CHAMBER

➢ *Structure of Conceptualized Cold Fusion Reactor*

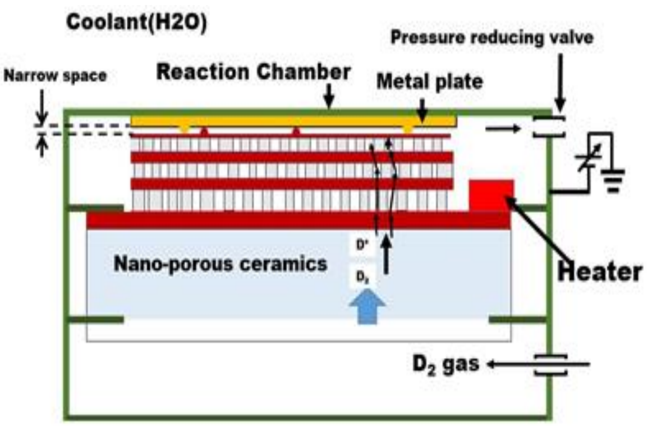

Fig 7 Conceptualized Cold Fusion Reactor in Small Chamber to Confine Deuterium in the Grain Boundary Space

The authors are developing the cold fusion reactor with deuterium confined in the stacked metal grain boundary in a small chamber. The total heat generation can be scaled with larger number of metal stacks. Because the purpose of this reactor is to generate very high temperature H_2O vapor hot enough to turn a turbine, the reacting metal film is confined in the reaction chamber to prevent the emitting D_2 gas into H_2O coolant.

➢ *High Thermal Conductivity Design*

As shown in FIG. 7, a metal plate which is highly heat conductivity to the small chamber. The metal plate is High temperature resistant metals such as molybdenum or tungsten.

Direct contact to metal stacked layer can transfer heat efficiently to the small chamber to cool down by coolant H_2O.

Both metal plate and stacked metal layer has rough so the contact by such roughness so Helium and D_2 can diffuse through the very narrow space and very narrow space and they can be discharged via valve.

➢ *Trigger by Voltage Control of Cold Reactor*

As is explained in 4.1, the reactor is designed to have very high heat conductance to reaction chamber and to H2O coolant. Therefore, the reactor has a high risk not to trigger Cold Fusion due to the difficulty to have higher temperature for Cold Fusion.

Thus, reaction chamber can have capability to adjust heat conductance by changing chamber voltage.

For negative metal voltage metal has free electron which can carry heat and negative voltage metal has less electron to have lower capability to carry heat.

Thus, during the trigger of Cold fusion metal voltage is negative and after the trigger metal voltage to be negative to have high heat conductance to coolant H2O.

Note that metal in H_2O can be an electrolysis condition, special design to control the inner side of the large bath containing Coolant H_2O need to be controlled to the same voltage of the small reactor of Cold fusion to prevent the mixture of O2 or H2 in high temperature vapor.

VII. TRANSMUTATION EXPERIMENTS BY MITSUBISHI HEAVY INDUSTRY

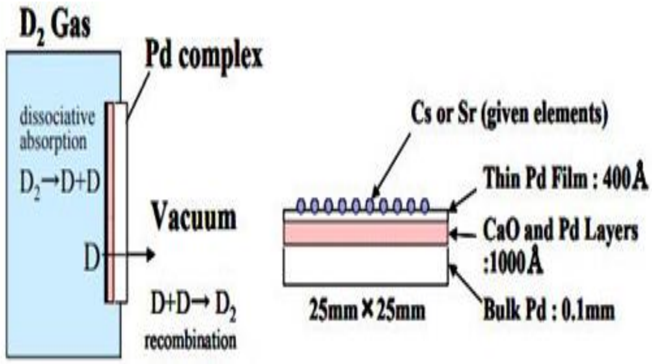

Fig 8 Transmutation Experimental Setting in ref [8]

Iwamura et al. of Mitsubishi Heavy Industries, Ltd. reported a study on transmutation in cold fusion using deuterium gas [8].

Based on the results of the first Iwamura reference, the author determined that this d is composed of two protons, and submitted his interpretation in papers [1], [2] and [3]. Especially [3] is important because this transmutation experiment can probe the cold fusion mechanism and that current nucleus model is incorrect.

Disadvantage of transmutation experiment is very slow speed of transmutation caused by several factors.

Femto D_2 molecules fall by the gravity and it has less interaction with deposited target metal layer because the temperature of Pd is so low to prevent Cold Fusion, thus, the reaction rate seems to be lower than in case the heated target metal to have rapid vibration of metal atoms, shown in Fig.9

$$(1)\ {}_{38}^{88}Sr + 2d = {}_{42}^{92}Mo$$

$$(2)\ {}_{55}^{133}Cs + 2d = {}_{59}^{137}Pr$$

Further research shows the following results.

$$(3)\ {}_{74}^{182,\ 183,\ 184}W + 2d = {}_{78}^{186,\ 187,\ 188}Pt$$

$$(4)\ {}_{20}Ca + d = {}_{22}Ti$$

Among the above four experiments, (1), (2), and (3) have an atomic number difference of 4 and the femto-D_2 molecules are fused, so the atomic number difference of 4 and 2d are equal, and d = 2, so the deuteron is two nucleons with an electric charge of 1, so d is composed of two protons.

It should be noted that the half-life time of the nucleus stability of the new nucleus by transmutation need to have longer time of transmutation, however, it is reported that it takes 100 hours to obtain nano-gram transmuted element, thus the half-life and transmutation time need to be at least equivalent.

Detailed explanation on these experiments is in ref [2], and [3].

Note that current transmutation experiment is inconsistent with nuclear physics, and we are planning to run transmutation experiment with our reactor to use H_2 gas in place of D_2 gas. Because femto H_2 is constituted only by proton and electron in deep orbit, no neutron exists in its nucleus.

VIII. CONCEPTUALIZED TRANSMUTATION REACTOR WITH FEMTO-H_2

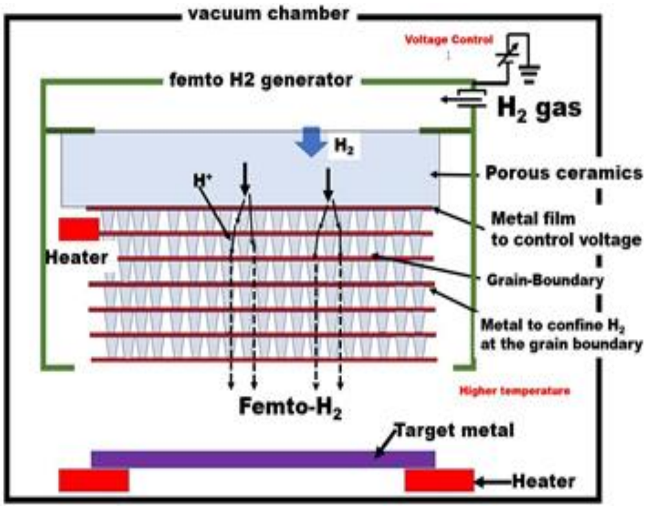

Fig 9 Conceptualized Transmutation Reactor based on Fig.7

- *Fig 9 Shows A Transmutation Reactor Based On Cold Fusion Reactor In Fig. 7.*

This reactor supplies the femto H_2 generated the stacked metal film which grain boundary as a reaction site. Thus, I think that no heat is needed to just generate femto-H_2 the temperature of the reactor is low, and most generated femto-H_2 do not react with stacked metal layer and just they fall by the gravity.

The target metal must have high temperature to have large vibration of metal atoms to improve the transmutation rate.

I think that this is a kind of neutron production tool and it must be regulated by the law for development and experiment but in Japan we do not have any regulations. However, we think that the emission of femto-H_2 will be very large and we will not develop this reactor. In place of this, we will use reactor in Fig.7 because all are confined in the small reactor and it is by far safer than transmutation reactor in Fig.7.

IX. REQUESTS FOR HYDROGEN ENERGY-RELATED INDUSTRIES

Our goal is to develop a Cold Fusion power generator based on its mechanism to improve the heat efficiency. Heat generation efficiency can be improved drastically by the D_2 confinement in grain boundary space.

Because our conceptualized Cold fusion Reactor will achieve unprecedented high temperature and high efficiency, so safety measures for experiments and safety design are essential.

Therefore, we plan to first develop a small-scale transmutation experiment to verify the existence of femto H_2 molecules, and through that, to verify the existence of femto deuterium molecules.

However National project in Japan or in US or EU must handle such important experiment because it needs the systematic study by multiple institution and it need the budget to develop the safe transmutation reactor. We would like to request industry to request their governments to have national project on transmutation experiment by Cold Fusion.

X. SUMMARY

The performance of the current cold fusion reactor is not making full use of its high potential. In conventional cold fusion reactors, fusion occurs only when deuterium is accidentally trapped at the reaction site, so the reaction rate is extremely low. In order to improve this, the authors plan to develop a deuterium-filled cold fusion reactor with polycrystalline metal multiple stacks. To prove the cold fusion efficiency, we are planning to run transmutation experiment because proper design of higher heat conductance is difficult for us and because it will show that Cold Fusion mechanism of femto D2 is correct, meaning that uncles model and neutron model are incorrect.

We would like to have the support of related companies and the governments.

- *Acknowledgment*

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