

Helium-3 Production with Femto-H₂ Based on Cold Fusion Mechanism for Plasma Fusion Reactor

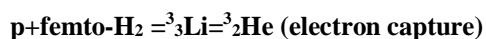
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Abstract:- Cold Fusion is caused by the femto-D₂ which covalent electron is in the deep electron orbit at a few femto meters from the nucleus. Femto-D₂ is created by the compression of D₂ at the reaction site on the surface with nano-roughness of FCC metal. Because inside the reaction site is negatively charged, D⁺ is attracted to the center of the reaction site is to be D⁻, and another D⁺ is attracted by D⁻ to join to be D₂ at the reaction site. D₂ is compressed by the surrounding metal atoms of the reaction site, and electron of n=1 transition to deep orbit to be femto-D₂.

Because the electron deep orbit is at a few femto meters from the nucleus, covalent electron of femto-D₂ can shield the coulomb repulsive force between d-d to cause Cold Fusion. With D₂ gas loading into FCC metal, femto-D₂ is created at the grain boundary of metal. With H₂ gas loading, femto-H₂ is created.

Because femto-H₂ is neutral, it can fuse the target element and it increase the atomic number of 2 because femto-H₂ has two protons. In case that femto-H₂ are in H₂ plasma, H is transmuted to Helium-3 by adding two protons to proton, and in D₂ plasma, it transmuted to helium-3 by adding two protons to d as is shown in the below reactions.

Femto-H₂ is 2 protons



Because femto-H₂ is a neutral particle, it descends by the gravity.

Femto-H₂ is created inside the plasma fusion reactor on the wall of FCC metal.

Fusion reactor of Helion energy uses D-³He fusion.



And this reactor has issue of high energy proton which damages the inner wall of fusion reactor. In other words, hydrogen is absorbed into the reactor wall of FCC metal, the reactor wall can create femto-H₂ by Cold Fusion Mechanism with H₂ gas. Therefore, the absorption of high-energy protons into the inner wall of the reactor

can be controlled by the reactor, so once D-³He fusion occurs, the fusion can continue by the supply of proton from the Fusion reaction of D+³He. I presume that plasma hydrogen is generated in the reactor before the fusion of D+³He to supply proton to the inner wall of plasma reactor to create femto-H₂ and helium -3.

However, this plasma fusion reactor needs to have femto-H₂ generator with mechanism for introducing femto-H₂ into the plasma fusion reactor because this plasma fusion reactor cannot be used in the space ship without gravity because femto-H₂ does not descend into the plasma fusion reactor without the gravity. Also, femto-H₂ generator will improve the power generation.

I propose that helium-3 mass production with generator of femto-H₂ with H₂O or with Hydrogen plasma, or direct compression of HD gas by nano-pore of nano-Zeolite for mass production of helium-3.

Keywords:- ColdFusion Helium-3, femto-D₂, femto-H₂

I. INTRODUCTION

The author has studied cold fusion, discovered the mechanism of Cold Fusion [1]-[3] and hydrogen embrittlement based on Cold Fusion [2].

Author discovered the mechanism of production of helium-3 in plasma fusion reactor and Helion's Fusion Reactor. I presume that no one understands the mechanism of helium-3 production in plasma fusion reactor, including HELION. Thus, I strongly recommend Helion and US/European/Japanese governments and ITER to study Cold Fusion mechanism to produce helium-3 in plasma fusion reactor with proper equipment to produce helium-3, and to mass-produce helium-3.

I think Plasma fusion developing by IETER is unlikely due to the heavy activation of the reactor inner wall by neutron. They should focus on D-³He fusion because helium-3 can be produced in plasma fusion's reactor.

Helion insisted in ref [4] and [5] that they use deuterium and helium-3 (D-³He) as fuel.

Helium-3 has, historically, been very difficult to produce. Scientists have even discussed going to the Moon to mine helium-3 where it can be found in much higher

abundance. Helion’s new process means we can produce helium-3 (no space travel required!).

Author proposes that Helion develop the helium-3 production equipment for their reactor.

Author also proposes that governments, institutions to develop helium-3 mass-production equipment with femto-H₂ based on Cold Fusion because helium-4 is running out on

Earth. If the mass-production of helium-3 is possible, helium-3 can replace helium-4 and can also be used as fuel for helium-3 nuclear fusion.

Therefore, author hopes that plasma fusion researchers will understand the mechanism of cold fusion because the impact of Cold Fusion is enormous.

II. MECHANISM OF COLD FUSION

A. Expandable T Site of FCC Metal to Cause Cold Fusion

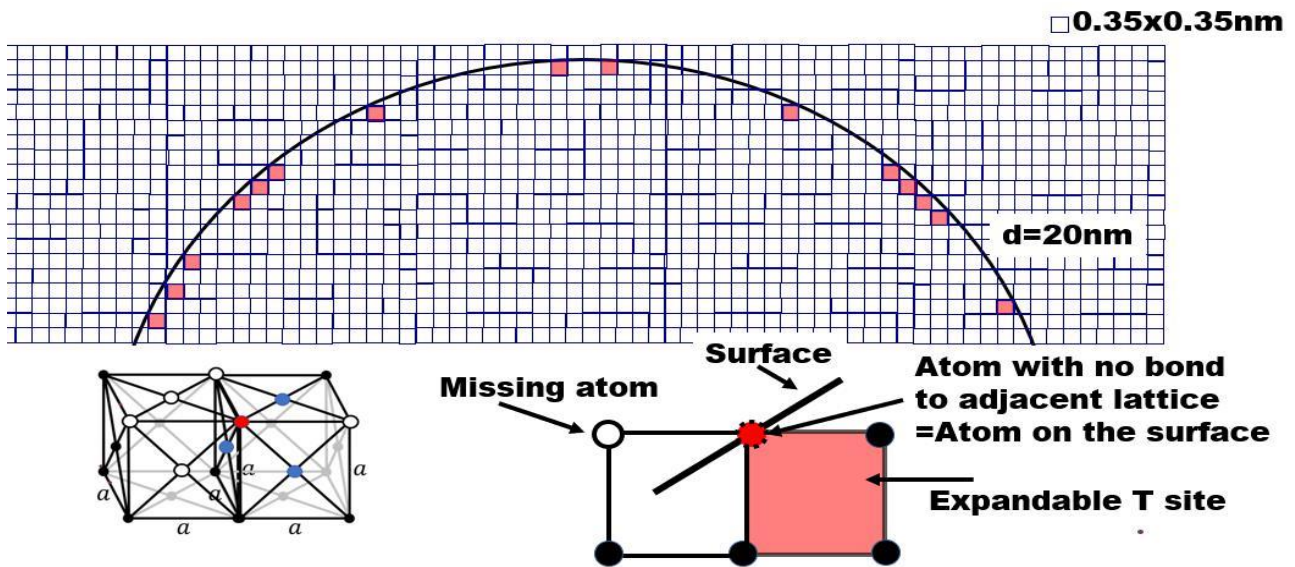


Fig 1 Expandable T Site of FCC Metal

Cold Fusion occurs only on the surface of FCC metal with nano-roughness. The cross section of the surface with nano-roughness on the surface is shown in Fig.1. The surface has the figure shows that there are several unique sites on the surface. T-site vertex atom without any bond to the atoms of adjacent lattice can move away from its lattice, which I named expandable T site.

B. Electron Deep Orbit Theory

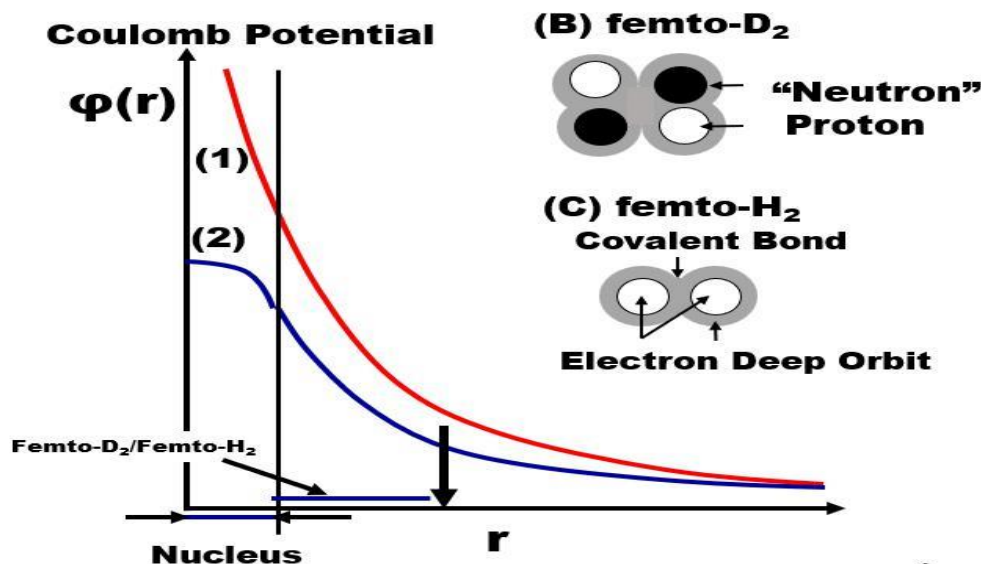


Fig 2 Modified Coulomb Potential to Prove Electron Deep Orbit Theoretically, and Femto-D₂ and FemtoH₂ Coulomb Potential.

Maly and Vávra ELECTRON TRANSITIONS

TABLE I.A
Relativistic Schrödinger Levels for Hydrogen (Z = 1)*

	$E(N, Z)$	N	M	L	E_{1S}	E_{2S}
1s	-13.605826	1	0	0	-13.606597	-507 271.937500
2p	-3.501457	2	0	1	-3.401449	-13.605632 ^a
2s	-3.401457	2	1	0	-3.401570	-13.603699
3d	-1.511759	3	0	2	-1.511747	-3 401425 ^a
3p	-1.511759	3	1	1	-1.511755	-509 755.250000
3s	-1.511759	3	2	0	-1.511790	-3.401207
4f	-1.511764	4	0	3	-0.850357	-1.511744 ^a
4d	-0.850364	4	1	2	-0.850358	-13.605434 ^a
4p	-0.850364	4	2	1	-0.850361	-13.604666
4s	-0.850364	4	3	0	-0.850376	-1.511683
5g	-0.850364	5	0	4	-0.544228	-0.850356 ^a
5f	-0.544233	5	1	3	-0.544228	-3 401415 ^a
5d	-0.544233	5	2	2	-0.544229	-510 264.468750
5p	-0.544233	5	3	1	-0.544231	-3.401328
5s	-0.544233	5	4	0	-0.544238	-0.850331
6h	-0.544233	6	0	5	-0.377936	-0.544228 ^a
6g	-0.377940	6	1	4	-0.377936	-1.511743 ^a
6f	-0.377940	6	2	3	-0.377936	-13.605356 ^a
6d	-0.377940	6	3	2	-0.377937	-13.604863
6p	-0.377940	6	4	1	-0.377938	-1.511719
6s	-0.377940	6	5	0	-0.377942	-0.544215

*In electron volts.

^aNegative energy states, not observable.

Fig 3 Theoretical Study of Electron Deep Orbit in Ref [6],[7]

It has been proved by theoretical studies that there is a deep orbit, deeper than conventional base atomic orbit(n=1). Marie and Vavra used a new Coulomb potential that the positive charge is uniformly distributed in the nucleus, shown in Fig.2(2), instead of the point charge, as is shown in Fig.2(1). [6]-[8]

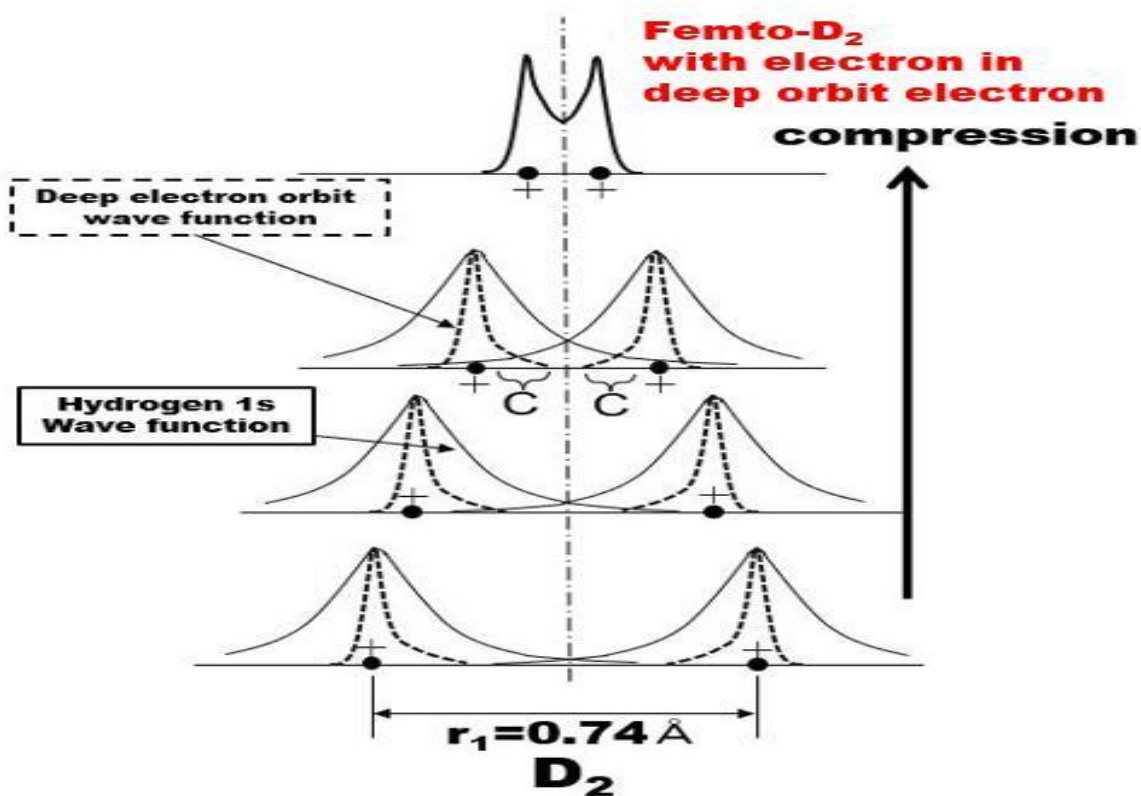


Fig 4 mechanism of Electron Transition from n=1 to Electron Deep Orbit.

Compression of D₂ can transition of electron of n=1 to deep orbit due to the overlap of wave function of n=1 to deep orbit. Cold fusion can occur because the duration of the compression is so long to have high probability of transition.

C. Femto-H₂ and Femto-D₂ Creation Based on Cold Fusion Mechanism

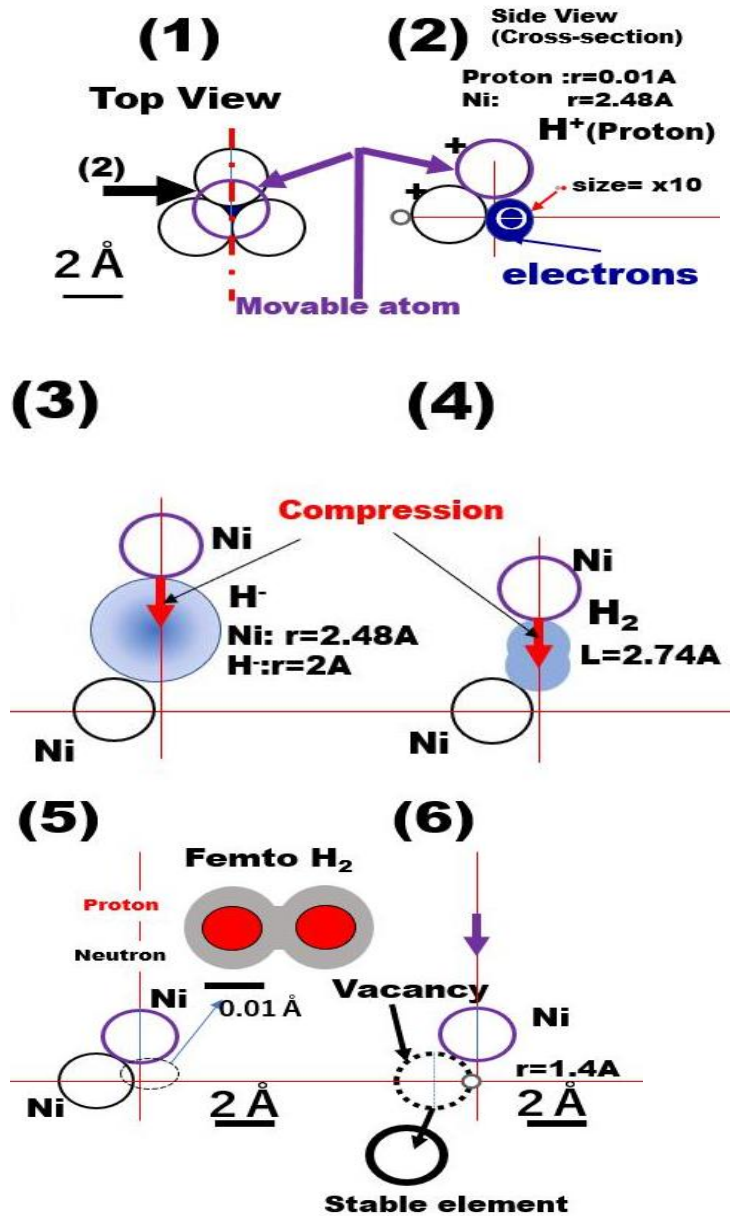


Fig 5 Mechanism of Femto-H₂ Creation

Because T site center is negatively charged due to the electronegativity of metal atoms which tend to emit electron outside as is shown in Fig 5(2).

Because FCC metal has movable metal atoms which can expandable T site on the surface with nano-roughness as is shown in Fig.1. Thus, Hydrogen can occupy expandable T site to be hydrogen negative ion(H⁻) by attracting H⁺ ion around the expandable T site.

Another H⁺ is attracted by H⁻ to join to be H₂ at the expanded T site, and H₂ is compressed by surrounding metal

atoms of the expanded T site. Compression of covalent bond of D₂ transition electron of n=1 to electron deep orbit, which orbit is at a few femto meters from the nucleus to make D₂ femto-H₂, which is a neutral molecule.

Femto-D₂ can cause Cold Fusion because its covalent electron in electron deep orbit can shield the coulomb repulsive force. Femto-H₂ can not cause fusion and it descends without interaction to metal nucleus because the size these nuclei is so small.

Thus, it is very important that the higher speed of nucleus can increase the collision and transmutation

probability between femto-H₂ and target nucleus for the D. Transmutation Experiment by Femto-D₂

transmutation. This is possible by plasma fusion reactor.

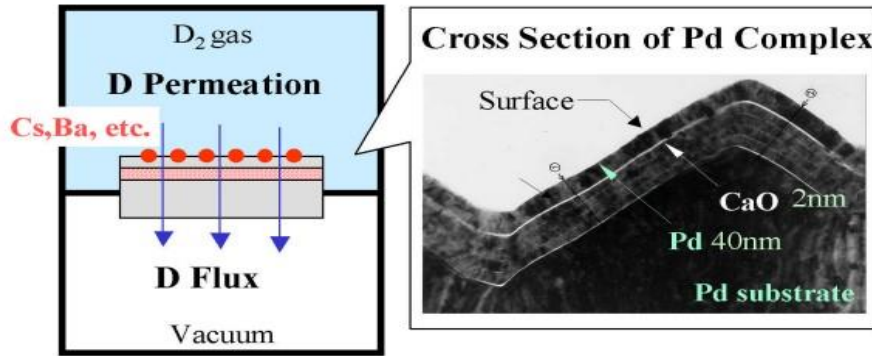


Fig 6 Transmutation Experiment by Iwamura [9]

Transmutation experiment of the stacked structure of target metal/Pd at 70degree to prevent cold fusion is reported in ref [9].

This is a fusion of femto-D₂ to the target metal and results of transmuted element are as follows.

- $^{88}_{38}\text{Sr} + 2d = ^{92}_{42}\text{Mo}$, (atomic number difference=4)
- $^{133}_{55}\text{Cs} + 2d = ^{137}_{99}\text{Pr}$
- $^{182,183,184}_{74}\text{W} + 2d = ^{186,187,188}_{78}\text{Pt}$
- $^{20}_{20}\text{Ca} + 2d = ^{22}_{22}\text{Ti}$

(4-2) $^{20}_{20}\text{Ca} + 2d = ^{44}_{24}\text{Cr} \Rightarrow ^{44}_{23}\text{V} \Rightarrow ^{44}_{22}\text{Ti}$ (if d=2)

Note that (4-2) is under assumption that d=2 by electron capture to decrease the atomic number.

Therefore, all of the experiment shows that increase of atomic number is 4. $2d=4$ and $d=2$.

These results contradict the current nucleus model, and neutron model, and are consistent with the nucleus model prior to neutron introduction. Thus, current nucleus model is incorrect, in ref[10] and is shown in the next section.

E. Correct Nucleus Model and Neutron Model Based on Transmutation Experiment

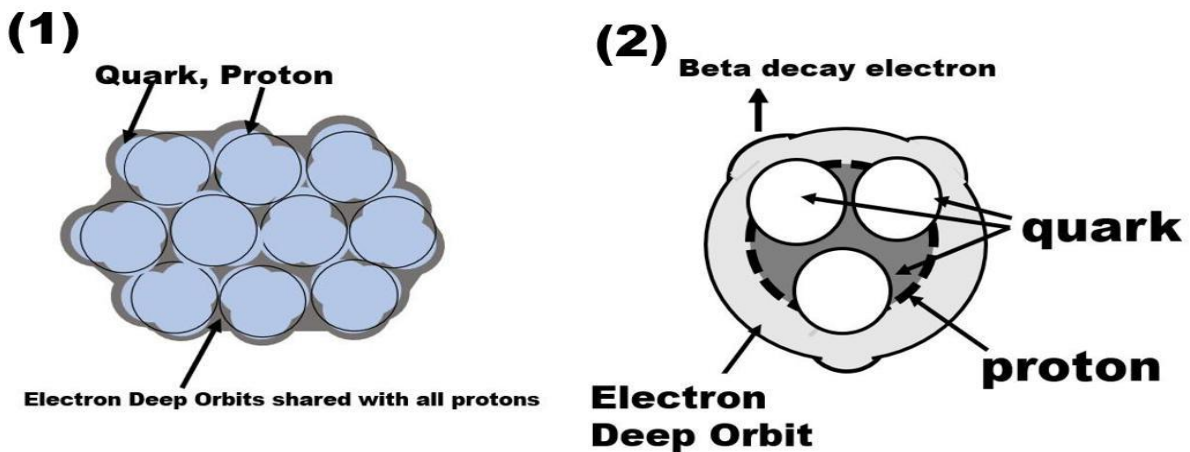


Fig 7 Correct Nucleus Model (1) and Neutron Model (2)[10]

Background of nucleus model and introduction of neutron is explained in ref [10]. The nucleus is constituted only by protons and internal electrons, and neutron is a pair of proton and electron in deep electron orbit.

Beta decay of neutron is caused by the departure of electron in deep orbit at the protrusion of proton surface due to the quarks, and broad energy distribution of emitted electron can be explained by the proton shape and electron deep orbit, showing that neutrino hypothesis is incorrect, and

neutrino is the new particle in a sense that neutrino hypo is incorrect.

I do not think most researchers accept this but this used to be the standard theory before the introduction of neutron.

F. Transmutation Experiment by femto-H₂ to prove the correct nucleus model

Because femto-H₂ creates helium-3 in plasma fusion reactor, conclusion of Fig.7 is correct by the following fusions.

p+femto-H₂ =³Li=³He (electron capture)

d+femto-H₂ =⁴Li=³He+p (proton emission)

This probes that femto-H₂ is constituted by two protons, so femto-D₂ must be constituted by two deuterons, and d is constituted by two protons.

Thus, it is important to study the helium-3 production in plasma fusion reactor and you will prove the cold fusion mechanism explained here, and will correct nuclear physics.

III. HELIUM3 IN PLASMA FUSION

A. Helium3 exists in plasma fusion reactor

Quoting from [11] below:

Among many fusion reactions, the following reactions are of interest as they can be used in fusion reactors.

- D+T=⁴He+n+17.5MeV
- D+D=³He+n+3.27MeV
- D+D=T+p+4.0MeV
- D+³He=⁴He+p+18.3MeV
- p+⁶Li=³He+⁴He+4.0MeV

Although reaction (2) does not contain tritium, reaction (3) also occurs with almost the same probability as (2), so tritium is produced as a reaction product.

Reaction (4) seems unrelated to tritium at first glance, but the fuel ³He is obtained mainly as a β-decay product of tritium. (End of quote)

Ref [12] has the following description.

Assuming that the LHD deuterium plasma is spatially isotropic, we analyzed the deuteron velocity distribution function and the ³He emission spectrum. (End of quote)

In other words, it would be clear from these studies that helium-3 is actually present in fusion reactors.

B. Helium3 exists in HELION's plasma fusion reactor

HELION's helium-3 fusion reactor is different from conventional fusion reactors [4],[5].

It also differs from other companies in that it uses deuterium and helium-3 as fuel.

D+³He=⁴He+p+18.3 MeV

HELION's fusion reactor operates in pulsed mode without igniting the plasma, unlike conventional fusion reactors. This approach facilitates the construction and operation of fusion reactors, including installation in standard containers. Since this fusion reactor generates electricity through induction by the interaction of the plasma magnetic field and magnets, damage to the inner wall by high-energy protons should have been reduced.

HELION claims that helium-3 is produced in its own fusion reactor. The HELION patent insists that helium-3 is produced by the decay of a previous reaction by-product (tritium).

However, since the half-life of tritium is about 12 years, tritium should not decay at all in a fusion reactor. In other words, the presence of helium-3 in the nuclear fusion reactor in plasma fusion is recognized as a publicly known fact, but the author thinks that the cause is misunderstood because the mechanism of helium-3 generation can be explained by the fusion of femto-H₂ molecules to proton and deuteron based on Cold Fusion mechanism. Thus, I would like to provide information on the generation mechanism of helium 3 to the Plasma Fusion Society in order to develop femto-H₂ generator to generate helium-3.

IV. FEMTO H₂ CREATES HELIUM-3 IN PLASMA FUSION REACTOR

Femto-D₂ molecule and femto-H₂ molecule are virtual molecules based on Cold Fusion mechanism.

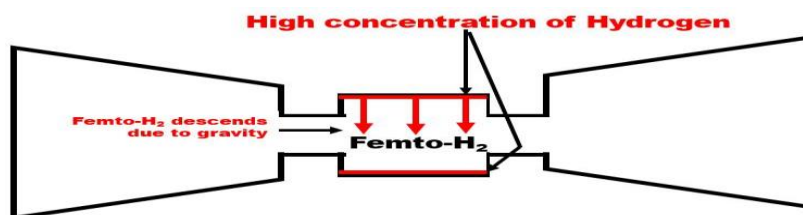
They have covalent electron in deep orbit at a distance of several femtometers from the nucleus, which cause fusion to proton because femto-H₂ is neutral.

Helium-3 can be produced by the following fusion reactions.

Femto-H₂ is a pair of two protons with covalent electron in deep orbit.

- p+2p(femto-H₂) =³Li=>³He (electron capture)
- d+2p(femto-H₂) =⁴Li=³He+p (proton emission)

V. HYDROGEN EMBRITTLEMENT IN PLASMA FUSION REACTOR



Plasma accelerator

Fig 8 Hydrogen Embrittled Wall of Plasma Fusion Reactor

Fig 8 shows the mechanism of helium-3 production in plasma fusion reactor (plasma accelerator of Helion Energy).

In case larger number of hydrogens is absorbed on the inner wall of the reactor, it can produce femto-H₂ on the wall of the reactor. Because femto-H₂ is neutral, it descends by gravity from the wall of the upside of reactor.

I think Helion's reactor use the following fusion reaction and it emit high energy proton which damages the inner wall of reactor, Thus, once the fusion starts, it will continue by adjusting fusion to make proton absorbed on the wall of reactor.

Before the start of fusion of $D+3He=4He+p$, they may have H₂ plasma to absorb proton by the Fusion reaction into the wall of reactor to supply femto-H₂.

And helium-3 can be produced by the adjustment of reaction of $D+3He$ to absorb the protons into the inner wall of the reactor.

However, note that this is possible on the earth due to the gravity, and it will not work in space. Because HELION's reactor is smaller and has the capability to generate electricity and it will be used in the spaceship. Therefore, they need to have the reliable mechanism to create helium-3 in the fusion reactor or to use helium-3 as a fuel.

Author would like to propose that Helion develop femto-H₂ generator [3], for this purpose as is explained in the following sections.

VI. FEMTO-H₂ GENERATOR (1)

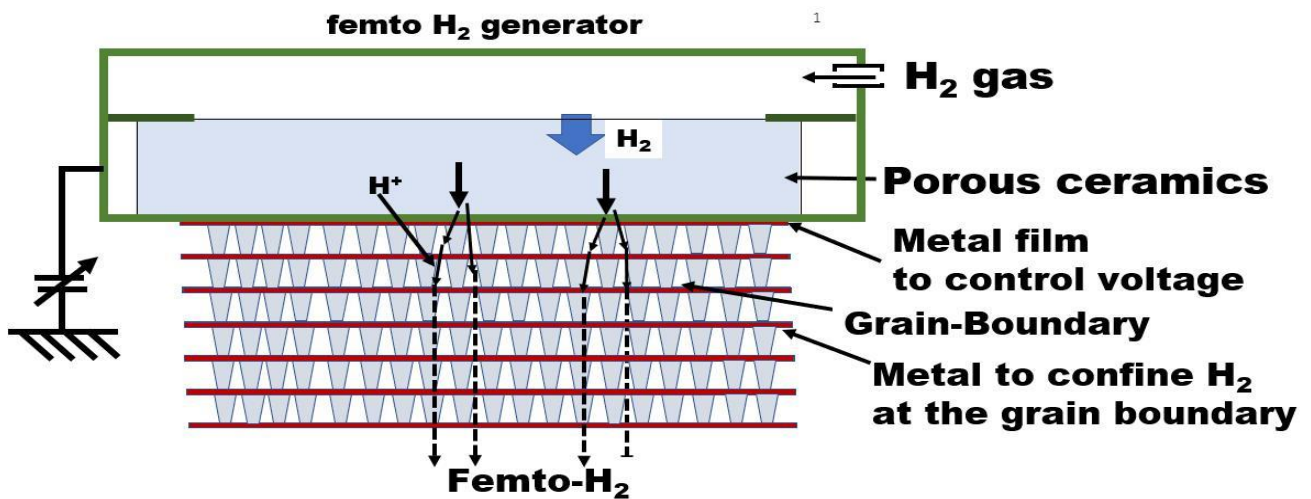


Fig 9 Femto-H₂ Generator Based on Cold Fusion Reactor [3]

We have a plan to develop new cold fusion reactor that segregating H₂ in polycrystalline grain boundaries of the multi-stacked layers, shown in Fig.9 in ref [3]. This reactor can have very high reaction rate due to high concentration of H₂ around the reaction site (expandable T site on the grain boundary sidewall).

VII. FEMTO-H₂ GENERATOR (2)

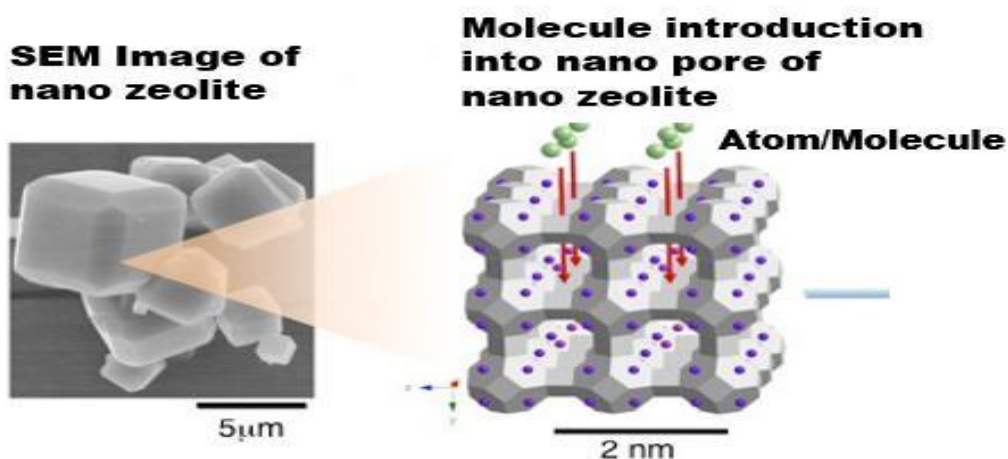


Fig 10 Nano Zeolite Structure

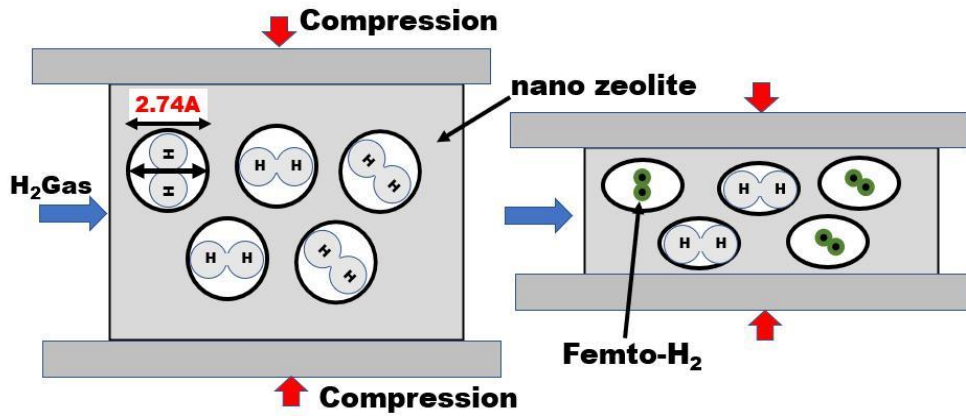


Fig 11 Femto-H₂ Creation by Nano Zeolite Structure

VIII. FEMTO-H₂ GENERATOR TO SEND THEM INTO PLASMA FUSION REACTOR FOR SPACE USE

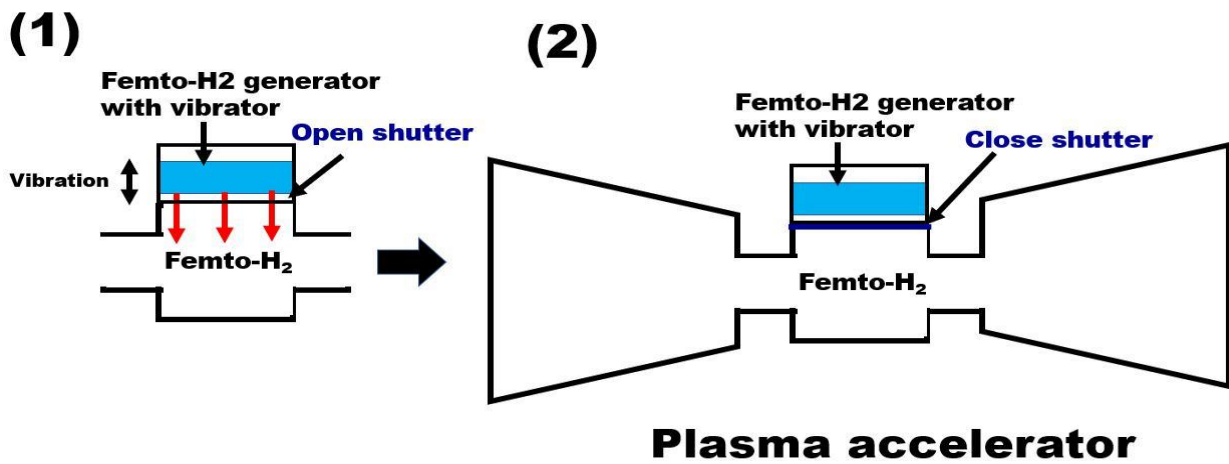


Fig 12 Femto-H₂ Generator with Vertical Vibration to Supply Femto-H₂ Inside the Plasma Fusion Reactor

Because femto-H₂ just descends by the gravity, femto-H₂ generator need to be vibrated vertically to eject femto-H₂ from the generator into plasma fusion reactor by inertial force. During the generator is moving downward, H₂ molecules have the downward inertial force generated femto-H₂ can be ejected from the generator. Helion’s plasma accelerator has 1Hz cycle it is convenient to use this femto-H₂ generator with the shutter to open for generator to supply femto-H₂ to inside of the accelerator.

IX. HELIUM-3 MASS-PRODUCTION WITH PLASMA REACTOR

I think that it is very useful to mass produce helium-3 on the earth with very low cost, Thus, I would like to propose to helium-3 generator based on femto-H₂ generator.

A. Compression of DH Molecules by Nano-Zeolite

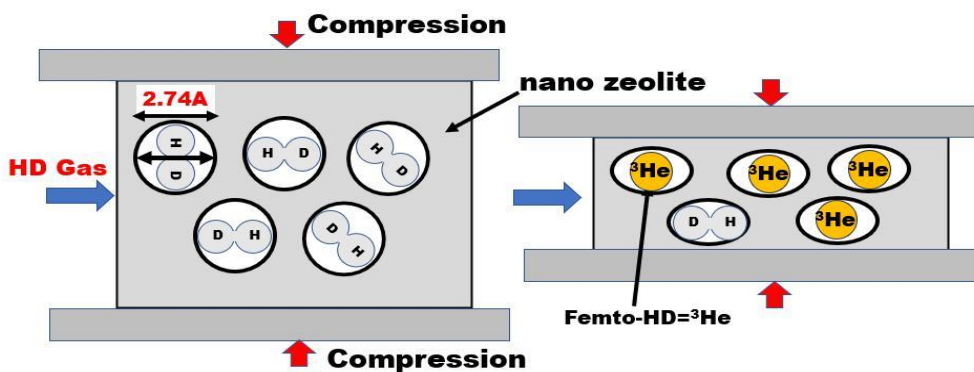


Fig 13 Helium-3 Creation by Nano-Zeolite

In case that HD molecules confined at nano-pore can be compressed by the compression of nano-zeolite. Thus, the mass-production of helium-3 is possible due to the larger number of nano-pores in nano-zeolite.

B. Plasms Fusion Reactor to Fuse Femto-H2 and Proton

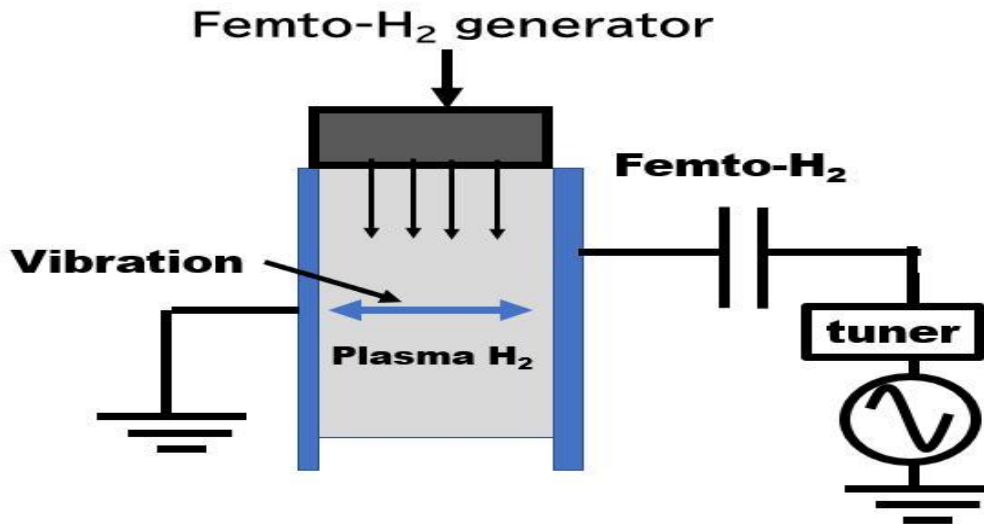


Fig 14 Plasma Fusion Reactor to Mass Produce Helium-3

C. Transmutation of H2O by Femto-H2

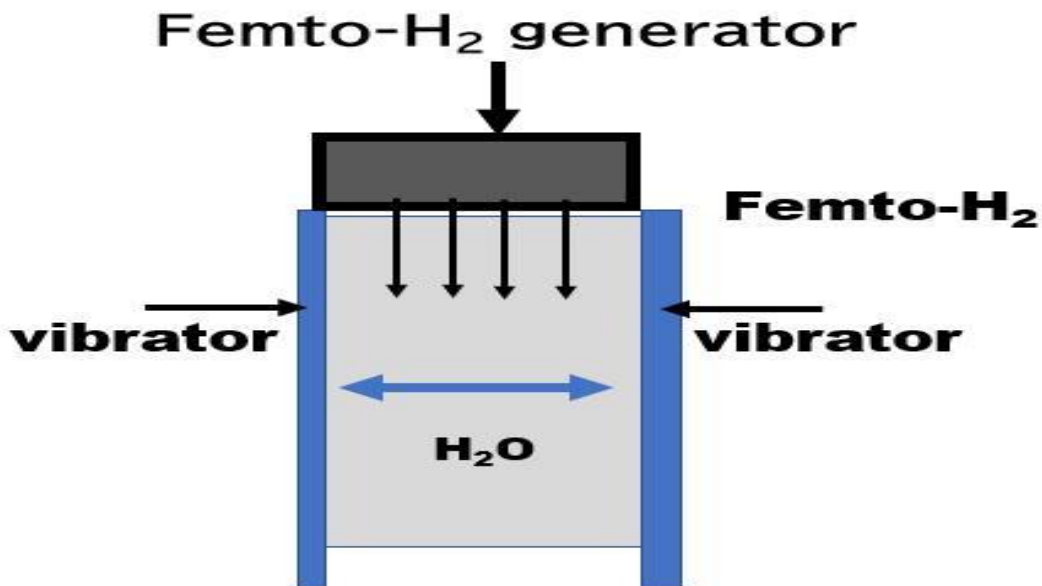


Fig 15 Transmutation Reactor of H₂O Generate Helium-3 and Oxygen-18

As is explained in Fig.14, it is important to move target atoms laterally to increase the collision probability between femto-H₂ and nucleus. Thus, it will have a plasma hydrogen reactor with vertical plate to move plasma laterally and collision of femto-H₂ and proton probability is higher.

Fig.15 also shows helium-3 generator by transmutation of H₂O with lateral vibration of H₂O. because the density of H₂O is denser, probability of collision is higher and also it can be increase by the lateral vibration of H₂O.

X. SUMMARY

Helium-3 in plasma fusion reactor is created by fusion reaction between proton and femto H₂ molecule, and femto-H₂ generator is needed for D-³He fusion reactor.

Especially for the space use femto-H₂ generator need to have a function to eject it from the generator due to no gravity. If the proposed femto-H₂ generator or helium-3 generator is developed, helium-3 will be available by mass production with lower cost and helium-3 can substitute helium-4.

Therefore, I would like the researchers, institutions and venture company of plasma fusion to develop the proposed generators.

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