Mission to Mars by catalyzed nuclear reactions of the commercialized cold fusion power - Last ambition of Dr. George H. Miley (Born 1933)

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1. Introduction

Following the challenge of deep space explorer based on the frontier spirit of America, the travel to Mar is analyzed using pragmatic nuclear power. The chemical compound source is deficient to reach to the power as much as the journey to Mars, unless the massive equipment is installed like the nuclear fusion reactor. However, there is very significant limitations of making up the facility due to the propellant power. Therefore, the light and cheap energy source, Low energy nuclear reactions (LENRs), powered rocket has been proposed. In this paper, the power conditions by LENRs are analyzed.

After the successful Apollo mission to Moon of the National Aeronautics and Space Administration (NASA) in the U.S. government, the civilian companies have proposed for the manned mission to Mars for the commercial journey purposes. The nuclear power has been a critical issue for the energy source in the travel, especially, by the LENR of LENUCO, Champaign, USA. In the historical review, the interplanetary mission from Earth to Mars was launched around 1960 when the USSR spacecraft was failed of the mission. In recent days, it was planned to arrive on the Mars, a red planet, on 2016 [1]. Especially, several robots has arrived and performed their duties in the interested Martian places. Among the detections and measurements tasks, the water evidence is one of important tasks to find out in the Martian explorer. Fortunately, there is the flowering rivulets of salty water in the summer [2]. It is necessary to travel 55,000,000 km from Earth to Mars in which the several kinds of considerations for the successful journey are including trip route, rocket facility, energy source, and spacecraft speed.

Regarding the LENR, from 1989, it has been interested in the clean and green energy with very abundant energy source, which is called simply cold fusion. Drs. Martin Fleischmann and Stanley Pons announced the success in generating nuclear reactions by laboratory experiments at the University of Utah [3]. It is also described as the Chemically Assisted Nuclear Reactions (CANR) is called following the phenomenon, where the nuclear behavior is accompanied with the metallic catalyzed reactions [4]. In the conventional meaning of nuclear fusion reactions, the electromagnetic force makes the nuclear reaction by fusing the nuclei. But, the LENR (or CANR) is considered the nuclear reactions happens in the space of some lattices like the palladium where the vacuum space exists with huge area in the point view of nanoscopic molecules of hydrogen as the physicist Richard Feynman's mention [5]. Dr. Miley has studied the LENRs incorporated with the space technologies [6-16], in which the highly dense molecular structures of palladium could produce abundant heat for the electrical energy and the proton-deuterium interactions happen in the level of 10^{24} atoms per centimeter. The researches have been done in the aspect of the commercial purposes.

2. Methods and Results

In the study of LENR applications into the space travel, the route of travel and the velocity of spacecraft are related to the trip quality, which are produced from several kinds of energy sources. In addition, the combinational operations of the systems could be considered under conditions by the unexpected accident.

In Fig. 1, the diagram of the Mars journey with the revolutions of Earth and Mars is the considered as a key matter. The flyby is a method of the gravity assisted operation where the velocity of the rocket is added by the 2 times of the planet speed [17]. Fig. 2 shows the design of the spacecraft for the trip to Mars where the system for electricity generations is equipped by heat productions.

Fig. 3 shows the configuration of the LENR in the palladium's face centered cubic (FCC) lattice where the size changes of the facility are shown where the LENR units produce summations of the energy production of each bundle. The unit produces the D_2 (or H_2) gas reactions with the palladium. Eventually, the heat of LENR is produced. In Fig. 4, the graphs of proton and palladium interactions are shown as the lateral distribution at 10 *keV* proton injection into the palladium. According to the current technology, the speed of the Martian rocket is 20,000 *km/h* (= 5.556 *km/s*) in which the period is 114.58 days (about 3 months 25 days) [4]. For the relation of power, force, and speed, it is described as follows [18],

$$Power = Force \cdot \frac{d}{t} \quad (1)$$

where the power is the unit of *kW*, the force is the unit of *N*, *d* is the distance (*m*), and *t* is time (*s*). It is possible to calculate the power source. In addition, the relationship between energy and speed of spacecraft is in Table 1 [19]. Using Eq. (1), the thrust is 0.5 *N* in Table 1. So, the velocity of LENR is 2.8 *km/s*. Hence, according to the

source from LENUCO, LLC, the speed could be described where the power is 1.5 kW [20];

$$Velocity = \frac{d}{t} = \frac{1.5\ kW}{0.5N} = 3\ km/s \quad (2)$$

In the stacked form with 30 kW [20],

$$Velocity = \frac{d}{t} = \frac{30\ kW}{0.5N} = 60\ km/s \quad (3)$$

So, the period is reduced as 10.6 days as follows,

$$\frac{114.58\text{days}}{\frac{60km/s}{5.556km/s}} = 10.6\ \text{days} \quad (4)$$

3. Results

The analysis for LENR based spacecraft is performed. In Fig. 5, there is the relation of power and velocity in thrust mass flow rate of 10, 20, and 30 *kg/s*. Therefore, as the velocity of the rocket increases, the mass flow rate decreases. It could be imaginable to take the reasonable velocity of spacecraft.

4. Conclusions

Following the highly advanced nanoscale technology, the exploration for the space colony is discussed. The cold fusion, LENR, has been applied to the Martian rocket in the commercial product based analysis. There are some findings in this work,

- The LENR power source is investigated.
- Advanced energy source is applied to the spacecraft.
- The civilian Martian travel is proposed.
- The successful colony in Mars could be imagined.

The energy of the travel system is and will be created for the better one in economical and safe method. There is the imagination of boarding pass for spacecraft ticket in Fig. 6. Fig. 7 shows the selected companies of cold fusion products. In order to solve the limitations of the conventional power sources like the chemical and solar energies, it is reasonable to design LENR concept. Since the economical and safe spacecraft is very important in the long journey on and beyond the Mars orbit, a new energy source, LENR, should be studied much more.

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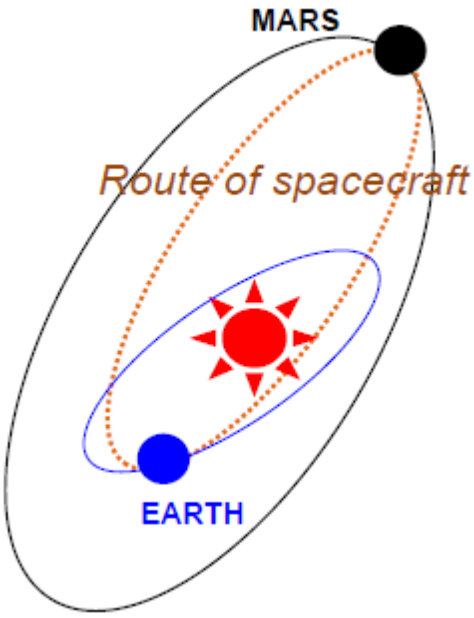


Fig. 1. Route of the Mars travel.

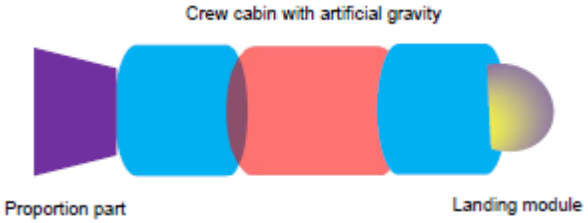


Fig. 2. Imaginary feature of Martian spacecraft.

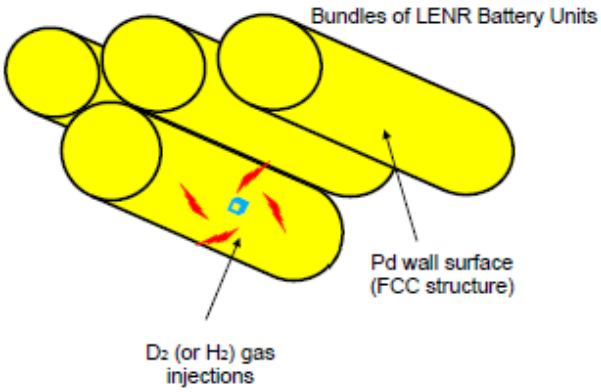
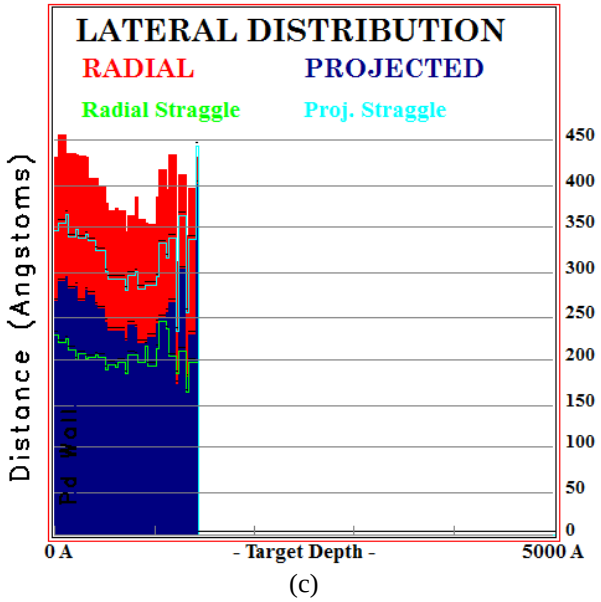


Fig. 3. Configuration of the LENR in the palladium's FCC lattice.



(c)

Fig. 4. Graphs of proton and palladium interactions as lateral distribution (10keV).

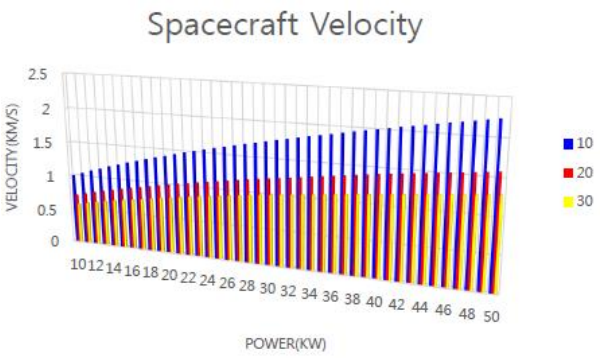


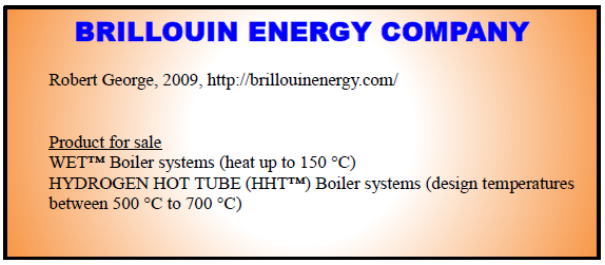
Fig. 5. Velocity by mass flow rates of 10, 20, and 30 kg/s.

Fig. 6. Imaginary boarding pass for spacecraft ticket.

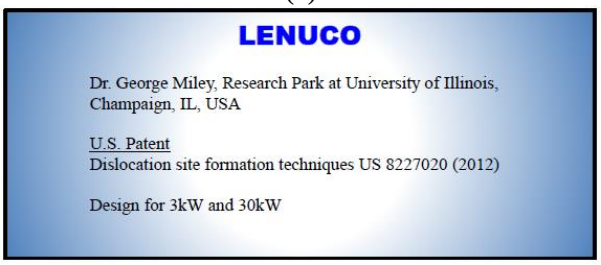
(a)

(b)

(c)



(d)



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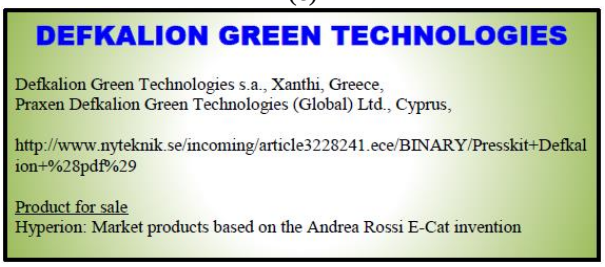

(f)

Fig. 7. Selected companies of cold fusion products (a) Leonardo corporation (b) Nichenenergy (c) Lattice energy, Ltd (d) Brillouin energy company (e) Lenuco, and (f) Defkalion green technologies.

Table I. Relationship between energy and speed of spacecraft [19]

	Min. power/thrust (kW/N)	Effective exhaust velocity(km/s)
Soil fuel rocket	0.5	1
LENR rocket	1.4	To obtain