Journal of Physics: Conference Series **591** (2015) 012039 doi:10.1088/1742-6596/591/1/012039

Helium-3 Generation from the Interaction of Deuterium Plasma inside a Hydrogenated Lattice: Red Fusion[1]

Edbertho Leal-Quiros, David A. Leal-Escalante
Neopowertech, LLC. 2224 E. Oakmont Ave, Fresno, CA 93730 (US)

E-mail: edbertho@neopowertech.us; david@neopowertech.us

Abstract. Helium-3 has been created in a nuclear fusion reaction by fusing deuterium ions from deuterium plasma with hydrogen ions in a "RED" (the Spanish word for net) or crystal lattice, a method we called red fusion ("*Fusion en la red cristalina*"), because is a new method to make nuclear fusion reaction. In this paper, it will be show the experimental results where the helium-3 has been generated for the first time in this kind of new method to confine deuterium and hydrogen inside the RED or lattice of the hydrogenated crystal and that confinement inside the RED facilitated overcoming the Coulomb barrier between them and helium-3 and phonons are produced in this fusion reaction. The results of a long time research in which helium-3, has been created in a fusion reaction inside the lattice or RED of the crystal that contained hydrogen after adequate interaction of deuterium plasma at appropriate high temperature and magnetic confinement of the Mirror/Cusp Plasma Machine at Polytechnic University of Puerto Rico, designed by the authors. Several mass spectra and visible light spectrum where the presence of helium-3 was detected are shown. The experiment was repeated more than 200 times showing always the generation of helium-3. In this experiment no gamma rays were detected. For this experiment several diagnostic instruments were used. The data collection with these control instrumentation are shown. Thus, it is an important new way to generate Helium-3. © 2013 NEOPOWERTECH, LLC. All rights reserved.

1. Introduction

This experiment consists of exploring several iterations to find a viable process for the creation of Helium-3 with Nuclear Fusion by using Julian Schwinger's theories. Helium-3 (also known as He-3 or ${}_2He^3$) is a very rare stable isotope of Helium that has two protons and one neutron in the nucleus. He-3 is an odourless, colorless, and tasteless high pressure gas. It has a mass of 3.016029310 (U), equivalent to 5.0086715x10-27 kg, and the percentage of abundance is only 0.000137 in a naturally occurring mixture of Helium isotopes. Its atomic number is Z=2 (it has two protons) and its atomic mass is A=3 (it has three nucleons, comprising two protons and only one neutron). He-3 has essential uses in cryogenics physics because in a mix alone at 2.2 K, it presents superfluidity. He-3 is also utilized in Medicine, mainly in nuclear medicine in cardiology procedures and in Hyperpolarized MRI (magnetic resonance imaging) of the lungs and respiratory system. It is possible to see more amplified details of the lungs when the patient breaths He-3 for the hyperpolarized MRI than is possible to view in conventional MRI lung images. Furthermore, He-3 has been used in radiation detectors, mostly of the proton recoil type for neutron detectors, which are of big importance in accelerators, nuclear

[1] **United States Patent AP. Pub. No.: US 2013/0329844A1, Pub. Date: Dec. 12, 2013.**
Inventors: Edbertho Leal-Quiros and David Leal-Escalante. Neopowertech LLC, Fresno, CA (US)

reactors, non-proliferation, and national Homeland Security, among others. At the present time, there is large deficit of He-3 in all countries of the world, but the greatest needs are mainly in USA and Europe. It is known in astrophysics, mainly in the stellar structure and stellar evolution theories, that in the center of a star like the Sun, the fusion reaction: ${}_1P^1 + {}_1D^2 = \hbar\omega + {}_2He^3$, may happen. Where ${}_1P^1$=Proton, ${}_1D^2$=Deuterium, $\hbar\omega$=phonon and ${}_2He^3$=Helium-3. Moreover, the stellar interior is at very high pressure, about 10^{12} atmospheres, and very high temperatures, about $15X10^6$ K. This fusion reaction has not been widely emphasized in the normal Fusion Research programs. Julian Schwinger (the writer's former professor) presented theoretical calculations that show evidence for the assertion that an H-ion in a deuterided lattice encounters a relatively narrow Coulomb barrier before fusing to form He-3 according to the reaction presented below;

$$ {}_1P^1 + {}_1D^2 = \hbar\omega \text{ (phonon)} + {}_2He^3 \tag{1} $$

Julian Schwinger in his late days suggested that the final product of the fusion reaction (1), [3-4] could be ${}_2He^3$ and Phonons instead the Photons, [3-4] if the reaction were to occur under special conditions, such as inside a particular lattice of a crystal, in which the phonon produced in the reaction could be absorbed by the crystal itself. This experiment use proprietary information that includes Plasma and targets of appropriate crystals to obtain Helium-3. From the authors' previous experiences using plasmas, and Ion sources design, there was very high probability of obtaining positive results. This meant that using Mass Spectrometry techniques, it was possible to identify the generation of He-3 and therefore to proving the Schwinger suggestion of this particular reaction. This idea pushed us to believe that the: ${}_1P^1 + {}_1D^2 = \hbar\omega$ (phonon) + ${}_2He^3$, **could be possible.**

For obvious reasons, more specifics with regards to the description of the experiment cannot be provided. The needs of Helium-3 are real and vital for our human civilization.

2. Experiment and location

The experiment was performed at the Polytechnic University of Puerto Rico's Plasma Laboratory on the Mirror/Cusp Plasma Machine [5-8]. According to Schwinger's Theoretical reaction, the PUPR Plasma Machine was used to create the necessary conditions for the reaction to take place inside the crystal lattice of several hydrogenated lattice materials.

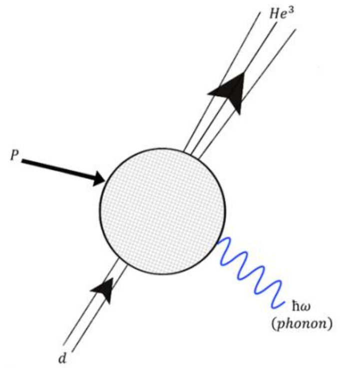

Figure 1. Feynman Diagram of the Reaction ${}_1P^1 + {}_1D^2 = \hbar\omega$ (phonon) + ${}_2He^3$ to get Helium-3.

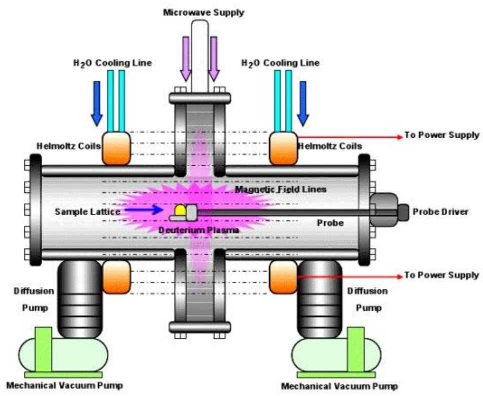

Figure 2. Helium-3 experimental diagram using the PUPR plasma machine.

For this experiment several Diagnostic instruments were used such as: Langmuir Probes (Single and Double), Mass Spectrometer, Visible Spectrometer, NaI Detector, Geiger Mueller, Hall Probe, Vacuum Pressure Gauges, Laser Thermometers, among others. Using a Sodium Iodine detector (NaI Detector), no gamma or beta radiation was detected during this experiment. By using Mass

Spectrometry techniques available at the PUPR Plasma Laboratory, such as the Quadrupole mass analyzer, the detection of Helium-3 was possible. During every step of the experiment, data was recorded to constantly monitor all the experimental plasma parameters. The experiment was repeated more than 200 times showing always the generation of Helium-3.

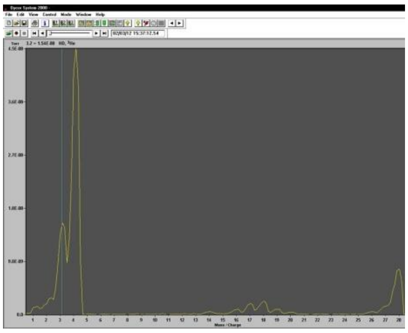

Figure 3. Mass Spectrum of a hydrogenated sample 1. He-3 is clearly identified.

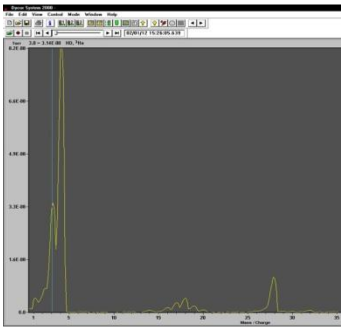

Figure 4. Mass Spectrum of a hydrogenated sample 2. He-3 is clearly identified.

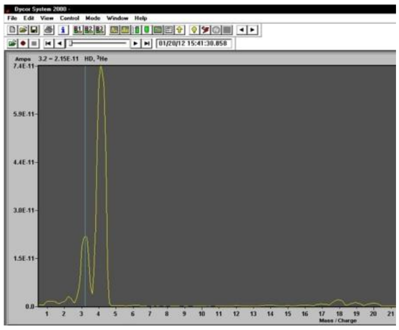

Figure 5. Mass Spectrum of a hydrogenated sample 3. He-3 is clearly identified.

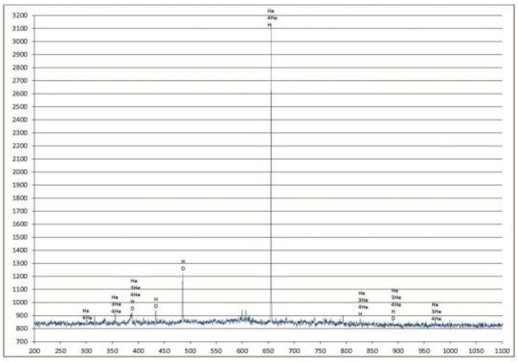

Figure 6. Optical Spectra. Intensity vs. Wavelength. He-3 peaks are clearly identified.

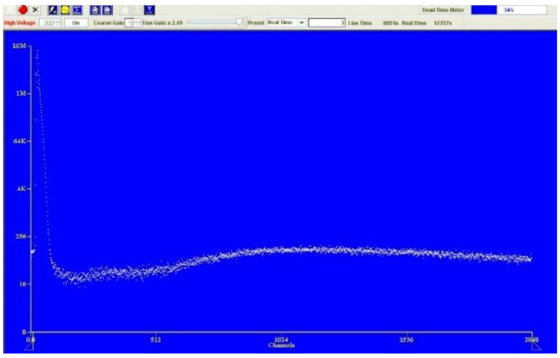

Figure 7. The Sodium Iodine Detector graph showed ***no spikes of Gamma radiation*** during the experiments.

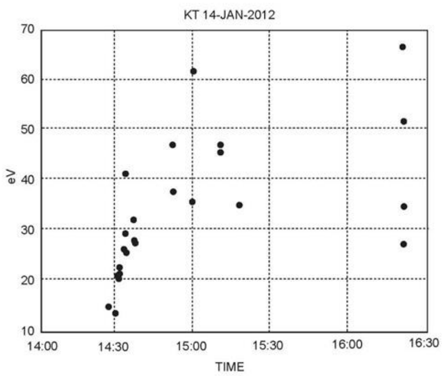

Figure 8. Temperatures measured during the deuterium plasma experiment with the Single Langmuir probe. None of the temperatures are lower than 10 eV.

3. The PUPR plasma machine advantages

The PUPR Plasma Machine can generate a very stable plasma (several days) and it is possible to obtain a range of plasma densities from n=10^4 to 10^{12} ions per cubic centimeter and temperatures from 2×10^3 to 30×10^6 Kelvin degrees in the hot electron beams region.

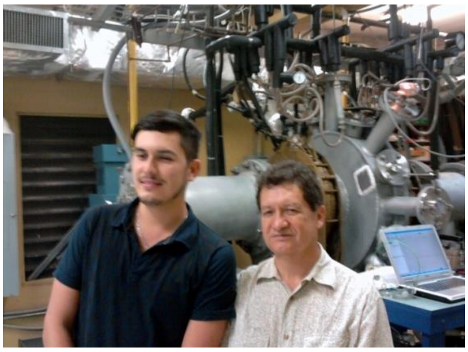

Figure 9. Dr. Edbertho Leal-Quiros (right) and David A. Leal-Escalante with the PUPR Mirror Cusp Plasma Machine, San Juan, Puerto Rico

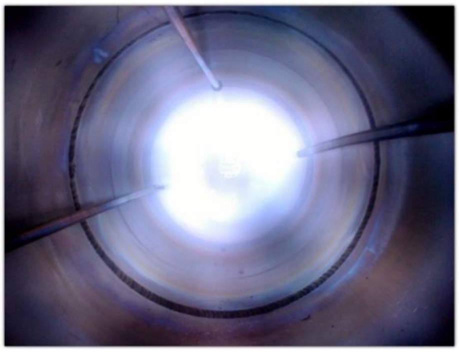

Figure 10. Stable plasma at the PUPR Plasma Lab.

4. Conclusions

It was to demonstrated that Helium-3 could be produced using Deuterium-Ions interacting with Hydrogen-Ions already inside our Hydrogenated Lattice or "Red", according to Julian Schwinger's Hypothesis. The results obtained with the Quadrupole Mass Analyzer show masses of three (3) in the mass spectra. Because the average kinetic energy of the plasma was over 10 eV, which is larger than the bonding energy of the molecule of H-D (4.6 eV), H-D molecules are dissociated in the Deuterium Plasma. The Optical Spectra show the distinct peaks that are the visual fingerprint of Helium-3. Therefore, the Atomic Mass three (3) corresponds to Helium-3, as Schwinger predicted.

5. Acknowledge

This work has been supported by Omar Leal-Quiroz and Neopowertech, LLC.

6. References

[1] Private communication in Los Alamos National laboratory (LANL), spring 1985. Wheatley J was the first Physicist to obtain experimentally less than 1 K degree of temperature; I had the fortune to be in his cryogenic research group in LANL since June to Dec 1986 working with Ecke R and Swift G, Post Docs of Prof John Wheatley and also my mentors

[2] Private communication of Prof. Doulas Osheroff (Nobel Laureate 1996) to E.Leal-Quiros in Cuzco, Peru; Sept 1998. He discovered the Superfluidity of He-3, for which he was awarded the Nobel Prize in Physics

[3] Private communication at UCLA 1986. Prof. Julian Schwinger (Nobel Laureate 1965) was professor of E.Leal-Quiros of three courses in Advanced Quantum Mechanics at UCLA in 1984-1985, and Leal-Quiros translated his Advanced Quantum Mechanics book to Spanish.

[4] Schwinger J collection papers 1920-1994, UCLA Library Dept. of Special Collections, Collection 371. Box 25, Folder 8, Physics 221A Mecanica Cuantica Avanzada, traducida por Edbertho Leal, manuscript in spanish, fall 1984.

[5] Leal-Quiros E 1981 "Some Experimental Facts that Indicate the Elimination of Astigmatism in Ion Beams with Separators EXB." Journal of Applied Physics **52** 1152

[6] Leal-Quiros E, Prelas M 1990 "Focused High Intensity Proton Beam from Lithium Source by Using EXB Stigmatic Selector." Rev. Sci. Instrum **61** (1) 636

[7] Leal-Quiros E 1999 "Advanced Analyzers and Probes for Fusion-Plasma Diagnostics," Trends in International Fusion Research. Second Symposium, edited by E. Panarella, NRC Research Press, National Research Council of Canada, Ottawa, ONK1A ,0R6 Canada, pp 1-23

[8] Leal-Quiros E 2006 Solar Probe Thermal Protection System Risk Mitigation Study, submitted to APL-NASA and NASA Goddard Space Flight Center, Living With a Star Program office. Sec 4.6 pp 4-23 to 4-27 http://solarprobe.gsfc.nasa.gov/SP_RMStudy_HiRes.pdf