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Research Article

Mechanism of an Arc Fusion Reactor

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Abstract: Arc reactor is the design for a compact fusion reactor. In this paper, the mechanism of an arc reactor is discussed which is a multi-isotope radio-decay cell that can be created using low energy nuclear reactor technology which is a low-radiation fusion reactor. Here, palladium isotope is used as a core, and it generates a significant amount of power.

It also introduces a new portable method to generate power without generating too much heat and heavy radiation.

Keywords: *arc reactor, isotopes, nuclear, nuclear physics, nuclear power generation, nuclear and plasma sciences, nuclear reactor, palladium, tokamak*

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0 Introduction

In nuclear fusion light atoms combine to form heavier elements; in this process, a small fraction of mass is converted into a large amount of energy. Fusion reactions are called thermonuclear reactions because high temperatures are required to overcome the coulombic repulsion between the nuclei being fused.

Fusion reaction transpire when the fuel (two types, or isotopes, of hydrogen known as deuterium and tritium) syndicates to form a super-hot plasma which produces alongside helium, neutrons which have a huge amount of kinetic energy.

Cold fusion is a kind of new form of nuclear reaction that would transpire at, or near, room temperature, compared with temperatures in the millions of degrees that are required for "hot" fusion. Theoretically, arc reactor does not emit any kind of ionizing radiation (other than easily stopped alpha and beta)[1].

1 Arc reactor hypothesis

1.1 Arc reactor working principle

When an isotope is fired with several high energy lasers at it, isotope reacts on the nuclear level and starts shedding electrons and neutrons, discharging a considerable amount of electromagnetic energy in this process. Part of that energy can be used to power the laser. It can work at one atmosphere and depending on how the devices are run; it can produce low levels of heat. Arc reactor that glows so brightly is the lasers increasing intensity to excite the isotope so that the reactor generates more power[2,3].

1.2 Tokamak reactor

In Figure 1, arc reactor can be compared to a tokamak reactor. A tokamak reactor uses a magnetic field to confine the plasma in the shape of a torus. Attaining stable plasma equilibrium requires magnetic field lines that move around the torus in a helical shape.

Tokamak reactor is a doughnut designed chamber used in fusion research in which plasma is heated and confined by magnetic fields. The basic shape of tokamak actually resembles the arc reactor, and the inner toroid is plasma[9].

To produce plasma (doughnut-shaped) in the tokamak reactor, it employs the strongest currents to produce the largest magnetic fields through its toroidal coils looped perpendicularly around the doughnut ring. A current is initiated in the plasma, from high currents in the poloidal (or horizontal) coils in the middle of the doughnut shape producing its own magnetic field. The combined effect creates a helical magnetic field. To activate the current in the plasma fields, a changing current is required in the poloidal coils, therefore, producing a more pulsed plasma response. This means that the tokamak needs the power to create the fusion reaction. This is where tokamak differs from the arc reactor[4].

1.3 Arc reactor hypothetical development and analysis

In the arc reactor's torus (donut), charged particles move in a circle, contained by a magnetic field. Charged particles usually have high energy because they are moving very fast and magnetic fields curve the motion of charged particles. Curving the particle's motion into a circle keeps them in one place long enough to collide.

In fusion reactor, designs have a lot of magnetic coils on the outside of the torus whereas arc reactor has a viewing window. Plasma containment is the single biggest challenge for the hot fusion, but the arc reactor makes little easier. From this, we can conclude that a key technology in full-scale arc reactor is a method to contain the reaction in a self-sustaining ring. This line of reasoning is backed up by the toroidal field lines.

There is also one outstanding feature of an arc reactor that it does not have many cooling methods or turbines that a conventional thermal reactor has that explain arc reactor generates electricity instead of generating heat first. This statement shows that megawatt-scale reactor inside the Iron Man Suit does not burn person inside the suit. Hence, it cannot be a hot fusion reactor or conventional-fission reactor[5,10].

1.4 Palladium isotopes

Palladium is one of the elements that can be used for cold fusion because hot plasmas and containment toroid are completely eliminated. Nevertheless, palladium has some significant capture and decay properties.

One of the palladium isotopes Pd-103 which yields Rh-103 (rhodium) through electron capture process; this shows that an inner electron that is involved in the nucleus assimilation with a proton to generate a neutron and an energetic photon which is a gamma ray.

Another isotope of the palladium Pd-107 which yields Ag-107 (silver) through beta decay process, discharging an electron when a neutron changes into a proton. (This process is completely opposite as from the previous one). In real physics electrons equilibriums, the resulting nuclei-silver and rhodium that have dissimilar numbers of protons from palladium and electrons that are produced and or consumed balance out the proton amount, so there is no flow of current.

In this specific case, we could use beta decay of Pd-107 ions as an electron origin for the electron seizure of Pd-103 thereby producing an electric circuit between two different radioactive isotopes. Palladium isotope, i.e., Pd-103 is pretty radioactive which has almost 17 day half-life when compared to palladium isotope Pd-107 which is almost 6½ million years half-life. Due to the difference in the decay properties, there need to be heavier isotope to re-compensate the difference.

The core of the device which is palladium would be isotope Pd-107 which generates high-energy electrons as it decays into Argentum (Silver). Since Pd-107 is a stable isotope, we can expect to be existent in the normal (non-separated) palladium.

We know that the device uses charged particles moving within the circle of electromagnets, to achieve that, a small amount of Pd-103 gets ionized by an electric arc (thus the name called arc reactor and start-up power requirement) which then Pd-103+ to be dispersed at high velocity within the outer core of the device. The ionization phenomenon acts to slow down the electron capture procedure until atom comes across a free electron and high kinetic energy; since velocity intensifies the odds of electron capture occurring once the electron is encountered. As a result of the radioactive decay of Pd-103 can be started, stopped and controlled by the device simply by controlling the ionization and circulation of the palladium isotope Pd-103.

The device's structure and electromagnetic fields direct the high-energy electrons from Pd-107 core toward the outer circle. There the electrons are seized by high-energy Pd-103 ions. The electron capture method discharges gamma rays which are refracted inward to catalyze the beta decay of Pd-107. There is one good reason to support the statement for the gamma-ray emission because suit's chest portion unibeam weapon of an Iron Man Suit is obviously a discharge of a large number of high-energy photons directly from the device (arc reactor). Usually, the gamma rays are focused inward to catalyze device's operation, but they can be focused in a unidirectional energy beam.

To review: Electrons move outward from the inner core and gamma rays move inward from the outer core. Subsequently, the electron/photon drift increases shortage of electrons (comparative to protons) in the device core, huge electrostatic potential is developed, and the palladium core draws lower-energy electrons from the internal suit's wiring. The expulsion of electrons from the palladium core toward the frame of the device generates an electrical cell that is capable of creating huge voltage and current[6,7].

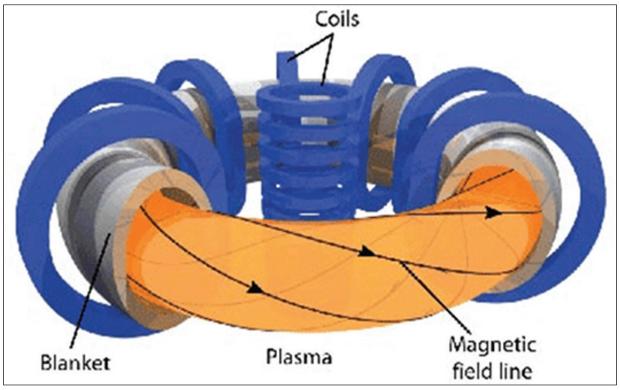

Figure 1. Working principle of tokamak reactor[9]

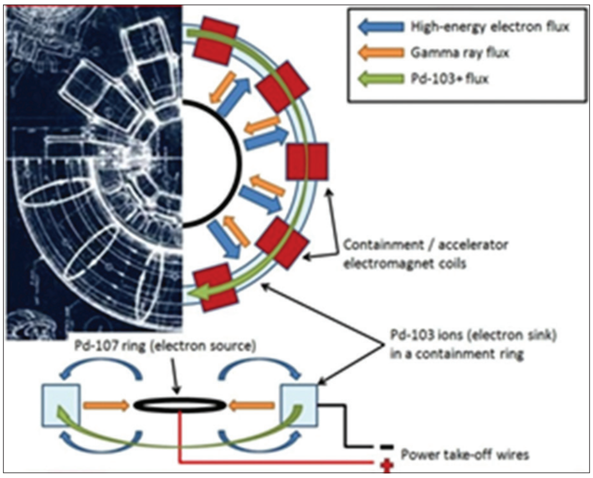

Figure 2. Depicts possible construction and working principle of an arc reactor[15]

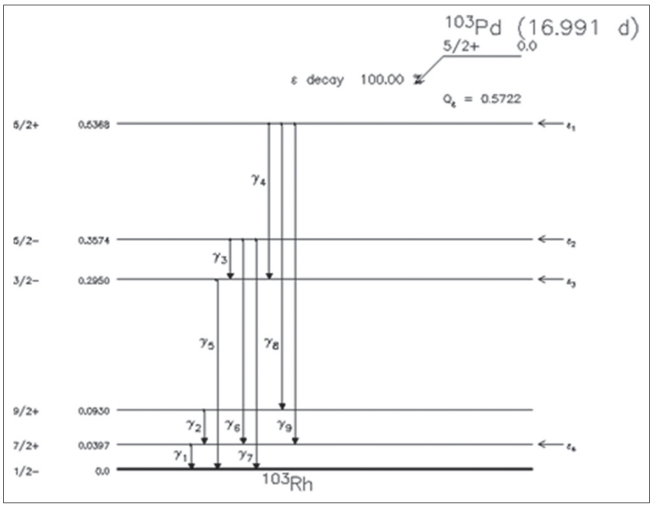

Figure 3. The graph of decay of palladium isotope (Pd 103) producing Rh 103 (rhodium) through electron capture[13]

1.5 Arc reactor startup process

Utilizing outward power Pd-103 is ionized by an electric arc and accelerated to high velocity in the outer ring. There can also be some externally-powered gamma-ray production to jump-start the inner core.

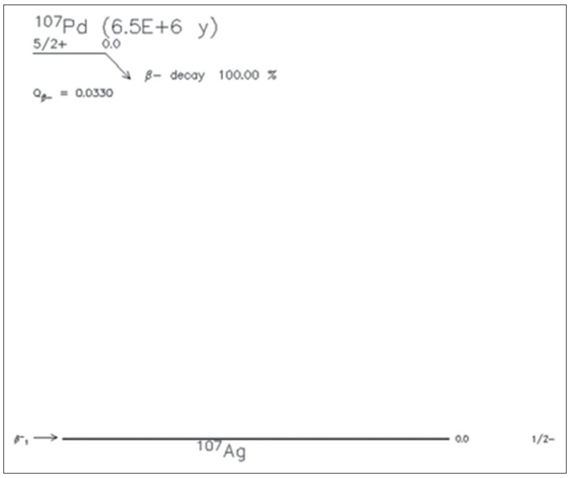

Figure 4. The graph of decay of palladium isotope (Pd 107) producing Ag 107 (Silver) through the decay process[14]

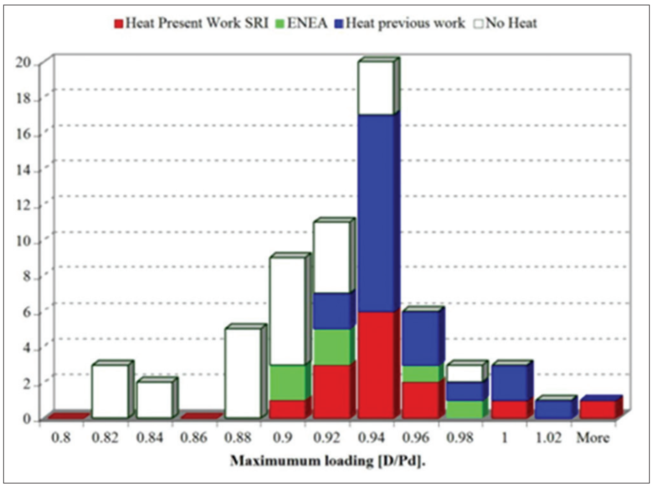

Figure 5. This graph (Excess Power versus Maximum Loading) shows that heat appears at loading above 0.94 and it never appears below 0.90[12]

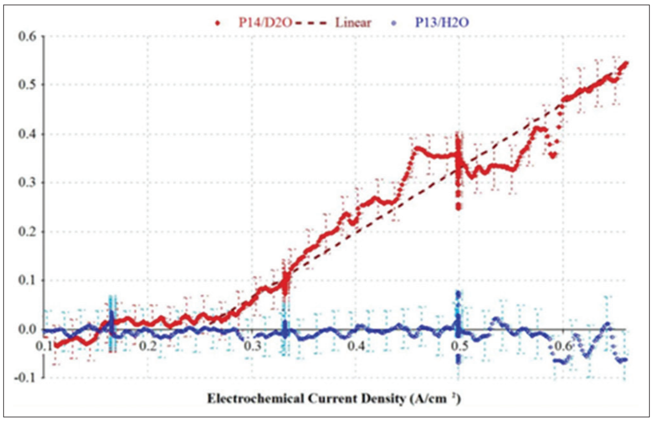

Figure 6. This graph (Excess Power versus Current Density) shows that when current density is raised, the heat responds proportionally[12]

When Pd-107 decays to Ag-107, the inner core starts to produce high-energy electrons, the electrons seep the core and are focused by the magnetic fields into the outer core. Deficiency of electrons generates a net positive charge in the core which reduces further emission (avoiding run-away decay) until the electrons can be outwardly refilled.

In the outer core, high-energy free electrons run into with high-energy Pd-103+ ions. This roots instantaneous electron capture and gamma-ray generation. The gamma rays are refracted inward near the core, therefore, catalyzing further electron emission and generating a self-sustaining reaction. Note that the reaction is very slow when the reactor is idle but also self-sustaining.

The potential difference is generated by the flow of electrons from the inner core to the outer core. Current is created when electrical loads are applied when the outer core has an excess of electrons and inner core has a shortage of electrons.

The electrical current through an external load releases electrostatic charge accumulations that originally slowed the reactions. Hence, less power load draws, the slower the device produces radioactive decay and more the power the load draws, the faster the reactions are catalyzed. In this, one of the method, output power can be regulated accordingly.

Palladium gradually converts to Rh-103 and Ag-107, and the reactor runs out of power when palladium is completely used.

There are other elements that can also be used such as next-generation arc reactor that can replace the palladium isotope with a "new element" hypothetical Thorium isotopes that can also undergo gamma-ray-mediated beta decay but less toxic and more output style[8].

There are other statements of evidence that also supports this type of nuclear decay/electron flux reaction can be a mechanism for an arc reactor.

The statements that stated above that an arc reactor depends on Pd-103/Pd-107 radio-isotope decay cell to produce power.

Figure 2, illustrates possible construction and working principle of an arc reactor which uses Pd-103/Pd-107 (electron sink) in a containment ring.

1.6 Graphs of an isotope of palladium

Figure 3, graph shows the decay of palladium Isotope that produces Rh 103 (rhodium) through electron capture. It depicts the graphical representation of palladium decay.

In Figure 4, shows the decay of Palladium Isotope (Pd 107) producing silver through decay process which is not harmful compared to other metals.

In Figure 5, depicts heat produced in the process of the generating power for palladium; white bock represents no heat or less heat compared to fusion reactor.

In Figure 6 shows Excess Power versus current Density when current density is raised, heat is also increased proportionally; it is very low comparatively with traditional fusion reactor.

1.7 Arc reactor toxicity

Arc reactor toxicity can be caused by the ionization of the arc.

Another aspect of the original model palladium arc reactor called "Palladium toxicity." Its very possible that palladium is simply can be ejected from the device into the skin, by all the high-energy collisions going on. Rhodium composites can also cause stain skin and are greatly toxic. As a matter of fact, because most people have essentially zero exposure to rhodium, the toxicity of rhodium is very poorly understood[11,12].

2 Conclusion

Based on the hypothesis and illustrations explained, arc reactor can be built using palladium isotopes or next generation thorium isotopes.

It is also a portable method to generate power such as power required for cooling/heating, displays, and other devices that require power.

3 Acknowledgment

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