ABSTRACT
A Hydrogen ThermoCell that generates heat energy through the disassociation and recombination of hydrogen and or the reaction between atomic hydrogen and metal powder and or the reaction between atomic hydrogen, one or more metal powders and or one or more catalysis to accelerate an exothermic reaction. The Hydrogen ThermoCell uses pressure and heat to initiate, operate, sustain and or control the Hydrogen ThermoCell reaction. The heat from said device can be applied to a wide variety of applications including the production of heat, electricity, steam, electrolysis, and other applications derived from a heat source.
Figure 1

Hydrogen Disassociated Atom

Recombined Hydrogen Atoms
Figure 2

Hydrogen Atoms

Ceramic Insulator

Cooling Water Jacket

Housing 201

Nickel 210

Heater

Tungsten Mesh Heater/Container

H2 In

Out

Hydrogen Atom

Hydrogen Disassociated Atom

Nickel Atom

Hydrogen Atoms
SELF-REGULATED HYDROGEN THERMOCOLL AND APPLICATIONS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from prior provisional application 61/851,809 filed on Mar. 13, 2013. The entire collective teachings thereof being herein incorporated by reference.

FIELD OF THE INVENTION

[0002] A Hydrogen ThermoCell that generates heat energy through the disassociation and recombination of hydrogen and or the reaction between disassociated hydrogen, and a composite of one or more metallic powders. The hydrogen ThermoCell uses pressure and heat to initiate, operate, sustain and or control the Hydrogen ThermoCell reaction. The heat from said device can be applied to a wide variety of applications including the production of heat, electricity, steam, electrolysis, and other applications derived from a heat source.

DESCRIPTION OF RELATED ART

[0003] There have been successful experiments using metal and hydrogen to create an exothermal reaction. These experimental devices have either generated very low power or have not proven a sustained and safe operational condition of self-regulation. These previous devices have not been viable for commercial application.

[0004] The interaction of hydrogen and nickel with applied heat and pressure to create an exothermal reaction has been studied for some time. The National Air and Space Administration has reportedly worked in this field as far back as twenty years ago. More recent activities include the work performed Dr. Andrea Rossi and Sergio Focardi where they report a performing apparatus. These previous works have not enabled a commercial system and do not provide an explanation of the underlying physical mechanism.

[0005] Therefore a need exists to overcome the problems with the prior art as discussed above and enable a device that can be applied to commercial products.

SUMMARY OF THE INVENTION

[0006] The present invention, the Hydrogen ThermoCell, uses the disassociation of hydrogen and the recombination of hydrogen in the presence of heat and pressure to create an exothermal heat reaction. Metal powders or porous metal plates can be used to interact with the hydrogen and or disassociated hydrogen to increase the heat reaction and resulting heat energy. The Hydrogen ThermoCell is an energy multiplier using both hydrogen and nickel as fuel.

[0007] In the Hydrogen ThermoCell, Aluminum and Nickel can be combined to form an alloy known as Raney Nickel. The nickel-aluminum alloy Raney nickel can be used to create an exothermal reaction in the Hydrogen ThermoCell.

[0008] The Hydrogen ThermoCell energy is self-regulated by maintaining a threshold of heat and pressure and restricting hydrogen fuel, pressure and reducing heat when the reactor reaches the threshold. The reactor is maintained in a safe operational range of heat and pressure while the reactor is operational.

[0009] An example of a Hydrogen ThermoCell utilizes a raney nickel powder as a catalyst to cause the disassociated hydrogen gas to react with the nickel creating an exothermal reaction. The nickel powder and atomic hydrogen interact and combine to form a composite material or a form of copper. The interaction results in an exothermal reaction.

[0010] In another embodiment, the metal powder is formed in a rough exterior to maximize surface area. The metal powder can be formed into porous membranes of a variety of shapes and held inside the pressure chamber with the hydrogen.

[0011] In another embodiment the tungsten grid is placed close to the metal powder to cause the hydrogen to be broken into atomic hydrogen to accelerate the interaction between the hydrogen and metal powder.

[0012] In another embodiment a tungsten grid and high heat is used to break apart the hydrogen into atomic hydrogen and then recombine into hydrogen and repeat the cycle continuously. The result is heat energy from the Hydrogen ThermoCell.

[0013] The exothermal reaction of the current invention is both sustained with the application of hydrogen fuel, nickel, heat and pressure. The current invention is self-regulating maintaining a consistent energy level enabling a commercial system for power generation.

[0014] The mechanics of the Hydrogen ThermoCell with nickel catalyst to create an exothermal reaction are describe as an interaction between the nickel lattice vibration states and the hydrogen atom.

[0015] The normal oscillations of the nickel crystal lattice of the nickel promote an interaction with the small disassociated hydrogen atom.

[0016] The disassociated hydrogen atoms work through the nickel lattice and are trapped by the Nickel nuclei allowing interaction with the nickel atoms (lattice) resulting in thermal energy.

[0017] The atomic hydrogen and raney nickel interaction produces one or more copper isotopes including to Cu-59, Cu-61, Cu-62, Cu-63 and Cu-65. Only Cu-63 and Cu-65 are stable and not radioactive. The other isotopes Cu-59, Cu-61, Cu-62 are radioactive and convert back to nickel with an average life expectancy between 18 seconds and a few hours.

[0018] Additional catalysts may be applied to Hydrogen ThermoCell to accelerate the hydrogen and raney nickel reaction.

[0019] Applications for the Hydrogen ThermoCell includes the powering of appliances such as a hot water heater, heating systems for buildings, portable heating systems, fixed and portable electrical generators in addition to electrolysis and water splitting systems for hydrogen production and steam operated devices.

[0020] One method of reducing dependency on fossil fuels is to reduce the demand of electricity from the electric grid. Local devices applied to reduce the need for electric grid consumption also enable a distributed architecture for electricity. The distributed architecture limits the impacts of natural disasters and enables rapid recovery of the electrical power after the disaster.

[0021] One embodiment of the invention applies the Hydrogen ThermoCell in a hot water heater appliance. In this case, the water is heated by the exothermal reaction of the Hydrogen ThermoCell instead of electrical or gas heating elements.

[0022] Another embodiment of the invention applies the Hydrogen ThermoCell as a heater for stove or oven.
[0023] One embodiment of the invention applies the Hydrogen Thermocell as a heater for a residence or building. In this case, the heating system uses the heat from the Hydrogen Thermocell instead of electrical or gas heating elements.

[0024] Another embodiment applies the heat from the Hydrogen Thermocell to create steam which is separated by low power applied across the electrodes to separate hydrogen and oxygen.

[0025] Another embodiment applies the heat from the Hydrogen Thermocell to create steam which is used to drive a steam based generator or a sterling engine and or electrical generator.

[0026] Another embodiment applies the heat from the Hydrogen Thermocell to create steam which is applied to a turbine to generate electricity.

[0027] Another embodiment applies the heat from the Hydrogen Thermocell to convert water into steam, split the steam into hydrogen and oxygen to create fuel for a water propulsion system.

[0028] The Hydrogen Thermocell heat can be applied to a hydrogen production process that may include but is not limited to thermochemical hydrogen production and high temperature hydrogen production.

[0029] The Hydrogen Thermocell heat can be applied to a hydrogen production method to produce on-demand hydrogen for hydrogen combustion engines.

[0030] The Hydrogen Thermocell can be applied with an electrical generator in a compact package to support small portable electronics devices.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] FIG. 1 Hydrogen Thermocell with hydrogen dissociation

[0032] FIG. 2 Hydrogen Thermocell with metal catalyst interaction

DETAILED DESCRIPTION OF THE INVENTION

[0033] The present invention relates to a hydrogen thermo-cell that creates heat through an exothermal as a result of the dissociation of hydrogen atoms, the recombination of hydrogen atoms and or the reaction of atomic hydrogen with one or more metal powders. The heat from said device can be applied to a wide variety of applications including the production of heat, electricity, steam, electrolysis, and other applications derived from a heat source.

[0034] In one embodiment Raney Nickel is used as the metal powder. Raney Nickel is composed mostly of nickel derived from a nickel-aluminum alloy. The Raney Nickel is prepared in a powder form and acts as both a hydrogen catalyst to atomic hydrogen and an exothermal reaction when the atomic hydrogen joins with nickel.

[0035] The Hydrogen Thermocell is self-regulated by maintaining establishing a threshold of heat and pressure and restricting hydrogen fuel, pressure and reducing heat when the reactor reaches the threshold. The Hydrogen Thermocell is maintained in a safe operational range of heat and pressure while the reactor is operational.

[0036] A key aspect is the assurance that radiological emanations from the device are minimal and shielded to ensure a safe environment and enable a reliable, safe and controllable reactor to support a wide variety of applications.

[0037] According to one aspect of the present invention, hydrogen gas is fed into a chamber where powdered nickel-aluminum is present. Pressure and heat are applied where the nickel aluminum act as a catalyst to generate atomic hydrogen. The atomic hydrogen reacts with the nickel creating an exothermal reaction and heat.

[0038] Temperatures for the catalytic conversion of hydrogen to atomic hydrogen and the reaction of the atomic hydrogen with the nickel to create the exothermal reaction range between 100°C and 1,000°C. Pressure for the operation ranges between 2 to 25 bars.

[0039] The atomic hydrogen deposits electrons into the conductivity band of the metal. Based on the atomic hydrogen’s reduced volume, compared to that of their atom, the hydrogen nuclei can diffuse into the crystalline structure of nickel. The combination of the hydrogen and nickel transforms the Ni58 nucleus into several isotopes including Cu59, an isotope that is short lived (18 seconds). Most of the copper isotopes decay back into nickel. And some of the nickel fuel is consumed in the process.

[0040] The exothermal reaction provides heat to generate electricity and heat that can be used to separate hydrogen and oxygen through high temperature electrolysis. The hydrogen produced can be returned as fuel for the Hydrogen Thermocell to extend operation.

[0041] The Hydrogen Thermocell is dependent on a fuel source of nickel and hydrogen.

[0042] In FIG. 1, the Hydrogen Thermocell™ may be formed in a variety of shapes and is shown here as a cylinder type housing (101). A water jacket or tube is applied outside of the cylinder to allow water to flow into the water jacket (102) and hot water or steam to flow out of the water jacket. An insulator (103) is applied around the cylinder to address the high temperatures. The example insulator is ceramic (103). A hydrogen input (104) is provided to apply hydrogen at the desired pressure. A heater (105) is also provided to heat the inside of the Hydrogen Thermocell. In this example a tungsten mesh (105) is used as the heating element. Sensors may be applied to detect the heat inside and out of the Hydrogen Thermocell and the temperature of the water. In addition, a pressure sensor may be applied to evaluate the pressure inside the Hydrogen Thermocell.

[0043] The illustration shown below the Hydrogen Thermocell shows hydrogen being dissociated and recombining as an example of what is occurring within the Hydrogen Thermocell.

[0044] The Hydrogen Thermocell can be controlled in a variety of ways which can be used independently or in combination. The Hydrogen Thermocell heat can be reduced by applying water through the water jacket. The Hydrogen Thermocell can be controlled by raising or lowering the hydrogen pressure and or by cutting off or turning on the hydrogen supply. The Hydrogen Thermocell can be controlled by raising or lowering the heat.

[0045] In FIG. 2, the Hydrogen Thermocell may be formed in a variety of shapes and is shown here as a cylinder (201). A water jacket (202) or tube is applied outside of the cylinder to allow water to flow into the water jacket and hot water or steam to flow out of the water jacket. An insulator (203) is applied around the cylinder to address the high temperatures. The example insulator is ceramic (203). A hydrogen input (204) is provided to apply hydrogen at the desired pressure. Nickel (210) is applied inside the Hydrogen Thermocell. Additional catalysts may also be applied. A heater (205) is also provided to heat the inside of the Hydrogen Thermocell. In this example a tungsten mesh is used as the
heating element. Sensors may be applied to detect the heat inside and out of the Hydrogen ThermoCell and the temperature of the water. In addition, a pressure sensor may be applied to evaluate the pressure inside the Hydrogen ThermoCell.

[0046] In FIG. 2, the illustration shows hydrogen being dissociated and recombining with nickel to form copper isotopes as an example of what is occurring within the Hydrogen ThermoCell. The copper isotopes decay into nickel and can repeat the process.

[0047] The Hydrogen ThermoCell can be controlled in a variety of ways which can be used independently or in combination. The Hydrogen ThermoCell heat can be reduced by applying water through the water jacket. The Hydrogen ThermoCell can be controlled by raising or lowering the hydrogen pressure and or by cutting off or turning on the hydrogen supply. The Hydrogen ThermoCell can be controlled by raising or lowering the heat.

[0048] The Hydrogen ThermoCell can be used as a building heater. The heat from the Hydrogen ThermoCell can create steam or a hot liquid or air that is applied through a radiator or air handler to heat a building. Other methods include but are not limited to heat from the Hydrogen ThermoCell applied to an air handler that blows hot air through the building.

[0049] Figure four shows how the Hydrogen ThermoCell can be used as a hot water heater where the Hydrogen ThermoCell heats the water that is held in a hot water reservoir. Other appliances can include but are not limited to flush water heaters where a water reservoir is not applied, ovens for cooking and electrical generation to operate a wide variety of appliances such as a refrigerator or building air conditioner.

[0050] The Hydrogen ThermoCell can be used to generate hydrogen. High volumes of hydrogen can be created through high temperature electrolysis or thermochemical processes. High temperature electrolysis significantly reduces the electrical potential applied to separate hydrogen and oxygen in water. Temperatures of 2,500 F can separate water without electricity applied.

[0051] The generation of high volume hydrogen can be applied to automobiles to support hydrogen combustion engines. To further support the hydrogen combustion engine, the hydrogen applied to the combustion chamber of the engine could be dissociated in the fuel injector to increase the hydrogen combustion power and reduce the amount of hydrogen required in the combustion chamber of the combustion engine.

[0052] The hydrogen ThermoCell can be used to supply heat energy for a steam operated thrust system to power a boat.

What is claimed is:

1. The present invention is a self-regulating Hydrogen ThermoCell where:
   Hydrogen is applied under pressure and heat to a closed cell where the hydrogen is broken down into atomic hydrogen and interacts with a nickel compound to form one or more copper isotopes where one or more of said copper isotopes decay into hydrogen in one or more cycles, and
   Where the atomic hydrogen (dissociated hydrogen) interaction with the one or more nickel compounds and the copper isotope decay process and or the recombination of hydrogen atoms result in an exothermal heat reaction, and
   Where a threshold is established for heat and pressure in the reaction process, and
   Where the hydrogen fuel, pressure and heat are monitored and controlled to maintain an established temperature and pressure.

2. The Hydrogen ThermoCell of claim 1 wherein, a nickel and aluminum compound is used as the metal as a powder or formed for insertion into the Hydrogen ThermoCell.

3. The Hydrogen ThermoCell of claim 1 wherein, a nickel and or a nickel compound fuel membrane is formed for use in the Hydrogen ThermoCell.

4. The Hydrogen ThermoCell of claim 1 wherein, high temperatures from the Hydrogen ThermoCell are used in high temperature electrolysis and may be assisted by electrical charge to separate hydrogen and oxygen from water and apply the hydrogen as a fuel source for the Hydrogen ThermoCell.

5. The Hydrogen ThermoCell of claim 1 wherein, the exothermal reaction is the result of a nickel compound nickel interacting with dissociated hydrogen to form one or more isotopes and or copper isotopes (Cu-59, Cu-61, Cu-62, Cu-63 and Cu-65) where the decay coupled with the nickel lattice creates an exothermal radiant heat with minimized radiation emissions.

6. The Hydrogen ThermoCell of claim 1 wherein, nickel is combined with one or catalysts such as tellurium, zirconium, gadolinium and aluminum to form a Hydrogen ThermoCell fuel compound.

7. The Hydrogen ThermoCell of claim 1 wherein, the metal powder is a micro or nano particle powder.

8. The Hydrogen ThermoCell of claim 1 wherein, the Hydrogen ThermoCell is used to heat the water in a hot water heater appliance, provide heat for a stove or an oven.

9. The Hydrogen ThermoCell of claim 1 wherein, the Hydrogen ThermoCell is used as a heater for a residence or building or power for air cooling devices.

10. The Hydrogen ThermoCell of claim 1 wherein, the Hydrogen ThermoCell is used to create steam which is separated by low power applied across the electrodes to separate hydrogen and oxygen.

11. The Hydrogen ThermoCell of claim 1 wherein, the Hydrogen ThermoCell is used to create steam which is used to drive a steam based generator or a sterling engine and or electrical generator.

12. The Hydrogen ThermoCell of claim 1 wherein, the heat from the Hydrogen ThermoCell is used to drive a sterling engine.

13. The Hydrogen ThermoCell of claim 1 wherein, the metal powder is enriched in one or more naturally occurring isotopes.

14. The Hydrogen ThermoCell of claim 1 wherein, the heat is applied to a hydrogen production process that may include but is not limited to thermochemical hydrogen production and high temperature hydrogen production.

15. The Hydrogen ThermoCell of claim 1 wherein, a hydrogen production method of claim 14 is applied produce hydrogen for the Hydrogen ThermoCell fuel supply.

16. The Hydrogen ThermoCell of claim 1 wherein, a hydrogen production method of claim 14 is applied produce on-demand hydrogen for hydrogen combustion engines.

17. The Hydrogen ThermoCell of claim 1 wherein, shielding material is applied around the Hydrogen ThermoCell contains any radioactive emissions.

18. The Hydrogen ThermoCell of claim 1 wherein, the Hydrogen ThermoCell is used to power an air cooling system for building air-conditioning.
17. The Hydrogen ThermoCell of claim 1 wherein, the Hydrogen ThermoCell is applied with an electrical generator in a compact package to support small portable electronics devices.

19. The Hydrogen ThermoCell of claim 1 wherein, the Hydrogen ThermoCell is used to power a steam and hydrogen based propulsion system for boats.

20. The Hydrogen ThermoCell of claim 1 wherein, the Hydrogen ThermoCell is used to create purified water.