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# HIDROFOTON PROJECTS

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## 1. Bactericidal ceramic base on titanium dioxide with electronic evacuation to ground

The titanium dioxide is an excellent photocatalyst that, by its chemical properties, becomes super-hydrophilic when it gets in contact with the ultraviolet light. This means that the contact angle of water with the surface of a ceramic coated with titanium dioxide will be near to 0º, causing that water droplets may drag the atmospheric solid wastes, assisting to keep clean buildings and allowing a saving in the maintenance costs.

Furthermore, it has been shown that these photocatalysts can be used for the water decontamination, allowing the removal of bacteria and organic residues when they get in contact with ultraviolet light.

## 2. The HHO as an autonomous feeding source in internal combustion engines

The HHO, known as oxyhydrogen, is a mixture of diatomic hydrogen and oxygen in a 2:1 ratio. When this mixture is ignited, the combustion produces water and 142,35 kJ per gram of hydrogen burned.

The oxyhydrogen system located in an internal combustion engine as a power source, besides the considerably reduction of the diesel or gasoline amount (between a 10-30%), increases the engine efficiency, reduces its consumption, avoids the carbon monoxide expulsion and reduces the broadcast of carbon dioxide, only emitting water vapor as a residue.

## 3. Molecular hydrogen production

The energetic sector is undergoing an important transformation and faces a number of difficult challenges. Among them is the need to ensure an efficient and safe energy supply, given the high and increasing dependence on external energetic sources, and the need of drastically reduce the emission of greenhouse gases, meeting like this with the environmental objectives.

In general, the electricity has to be consumed immediately after its generation and, if you want to store it, you should do it in batteries, which can only store a limited amount of energy and, also, have a low efficiency and are harmful to health.

An alternative widely studied in the last years is the hydrogen, which is a heat carrier and an ecologic energetic accumulator. In addition, the natural resources reserves for the hydrogen obtainment (water) are unlimited, so probably it will gradually replace fossil fuels.

Hidrofotón offers several alternatives to get this appreciated energetic carrier:

### i. Solar cells of titanium dioxide sensitized with dye in tandem with ultraviolet titanium dioxide

The deposition techniques by PVD, allow us to greatly improve the potential of the state of the art of the titanium dioxide solar cells sensitized with dyes (DSSC). This solar cells serially connected (or in tandem) with titanium dioxide plaques, constitute photoelectrochemical systems, which, by capturing ultraviolet light, have a bandgap enough to split water into molecular hydrogen and oxygen.

### ii. Perovskite solar cells

The greatly interest in the perovskite not only lies in the high efficiencies that it offers, it also does in the new configurations that allows thanks to its unique characteristics.

This solar cells allow the sunlight capture and its conversion in an efficient way in electric energy, being able to integrate this technology in the structural elements of the buildings.

This solar cells produce enough energy as to feed an electrolyser, capable at the same time of decompose water. They can have the same potential production efficiency as two normal solar cells of silicon, at the same time that its open circuit voltage is 1.2V against silicon classical solar cells that give 0.647V.

### iii. Heterojunction solar cells

The treatment of the titanium dioxide with other semiconductor elements (with the proper bands accommodation), allows the creation of heterostructures capables of capturing sunlight and automatically decompose water.

### iv. Intermediate band solar cells

To optimize the performance of a DSSC, the relative position of the conduction band and of the valence band should be optimal in the semiconductor, so the electrons and the holes can flow through it.

When the correct position is found, it should be doped, causing the degeneration of the titanium dioxide and the delocalization of the quantum dots. When more delocalized the quantum dots are, bigger is the delocalization of the electrons which are in the energy traps and, therefore, the yields offered are better.

In general, solar cells based on titanium dioxide only can work with visible light (a 60% of the total solar light), however, if this titanium dioxide is modified with colorants or intermediate bands, it can work in the visible light range, obtaining higher yields than with the traditional solar panels (theoretically up to 52%).

### v. Eolic energy

To feed the electrolyser, until now we only have told of using solar energy, however is possible to feed it taking profit of the eolic energy through wind turbines, windmills, wind pumps or sails.

### vi. Marine energy

There are several forms of marine energy and all of them can be used to produce energy and with it produce molecular hydrogen.

#### ✓ Tidal power

This system converts the tides in a useful form of energy, especially in electricity. Tides are more predictable than the solar or de wind energy, so they are a good method to the energy generation. This system could perfectly be installed in the Australian Cooler Bay, where the slope of the water reaches 12 meter overnight.

#### ✓ Energy from ocean current

This kind of marine energy is obtained by taking advantage of the kinetic energy of the ocean currents, as the Gulf Stream. Currents are constants during 24 hours a day and, for this reason, the hydrogen production, from sea water, would be constant.

#### ✓ Wave energy

This energy is generated by the waves of the ocean surface and is captured to do useful work. It isn't a commercially widely used method because this technology has the problem that with bad weather waves could be very strong and can damage the sources.

Another marine energy form is the thermal, which can have an important use in tropical countries where the thermal gradient is very big.

### vii. Atomic hydrogen production from water electrolysis

During electrolysis, in a PEM electrolyser we find that water is decomposed into hydrogen and oxygen radicals. If we pass this hydrogen (before the radicals get joined giving molecular hydrogen) by a spin valve and by an atomizer, we will obtain atomic hydrogen (free radicals very unstable), which could be joined into an engine or a combustion chamber, reacting and giving molecular hydrogen and releasing energy (much more than the molecular hydrogen). The disadvantage of this hydrogen is that in cannot be stored.

Specifically, the spin valve allows to align the hydrogen electrons and separate them according to their spin. Actually, this system would have two spin valves, one for atoms with a positive spin and other for the negative ones. This hydrogen created by the spin valve offer the advantage of having a higher energy density, so it requires a smaller volume, and could be used in cars, aviation and in places with an important lack of oxygen.

## 4. Replacing natural gas by hydrogen

The natural gas consumption in the Valencian community reached in 2010 a total volume of 39,741 GWh, from which, the Castellon province consumed 21,952,754 MWh, which represents a 55,2% from the total. In a detailed studio conducted by our company, it is checked than the invoices presented by the gas company to the ceramic industries in Castellon are altered, so is invoiced 3,668 times more than what energetically can be generated by a cubic meter of natural gas burned.

This situation is repeated for the industry of Castellon and, apparently, in all Spain, since even in the population invoices the conversion factor and other parameters are higher than their actual values.

Our proposal is burn hydrogen instead of natural gas, because, in its combustion, it would be needed a lower amount of fuel to produce the same energetic quantity and, also, will be produced 772,470 tonnes of drinking water and it would be avoided an atmospheric emission of 632,500 tonnes of carbon dioxide annually.

This change of natural gas fuel by hydrogen, represents a total annual business volume of 598,301,852€.

## 5. Production of drinking water and energy from the hydrogen combustion

As mentioned in the previous section, from the combustion of hydrogen with oxygen, it is produced drinking water and energy (30,000-80,000 kcal/kg). This important reaction can solve two of the most oppressing problems than some countries have: drought and energy supply.

## 6. Cold fusion energy catalyzed by relativistic muons

The nuclear fusion of hydrogen nuclei is a natural process that provides the necessary energy in the Universe and enables its existence, including life in our planet. It is an ordinary activity that characterizes the functioning of any star, including the Sun. This process occurs spontaneously in the stars as a result of the force that causes that the nuclei of this atoms fuse together in one to form a heavier one, but of a smaller mass than the original components which created it, allowing like this the release of a huge amount of energy according to the famous formula of Einstein $E=mc^2$. This force is the gravity.

More than half a century ago the man has tried to reproduce this artificial phenomenon in the Earth in conditions designed by him, trying to replace the huge density of the matter that exists in the stars, due to gravity, by an equivalent conversion to this energy potential: by kinetic energy. This process has been called Thermonuclear Fusion. The aim of these enormous efforts has been to create a cheap source of eternal energy from which raw material is everywhere: water. Briefly, the objective is to confine a plasma in a certain device (ionized hydrogen gas, a water component) accelerated to energies corresponding with hundreds of millions of degrees until the point that hydrogen nuclei are approached to distances of $10E^{-15}$ meters and strong nuclear forces appear (gluons), fusing them in a heavier nucleus of helium, releasing the energy of the mentioned magnitude. The acceleration and confinement process of this plasma requires a large investment of energy from conventional sources. The objective is that the released energy of the successive fusions compensates and exceed the energy used to provoke them. So far, after 60 years of effort and an investment of money which is measured in hundreds of millions of dollars and that has coalesced the best minds on the planet, the purported and longed thermonuclear fusion has stood the test of time. Nowadays, it is still far achieve the objective and it is unknown if it will be achieved or not for sure. The production of energy has not reached neither the 20% of the employed energy and, in such cases, the reaction is only

sustained in fractions of a second. The nature, spontaneously, has resolved this task for no less than 13,500 million years and the reactions are there: alive and for much longer, is estimated than for others 30,0000 millions of years! The man, however, cannot sustain the phenomenon neither hundredths of a second.

The simple approaching of two simple protons at a distance of $10E^{-15}$ meters is, therefore, a very, very difficult task for man. Nature has defeated us once again. The electromagnetic repulsion forces of Coulomb make impossible a task that, at first glance, seem simple.

However, it will be possible an approach of the referred protons to the referred distance to cause their fusion if an intermediate agent that counteract their Coulomb repulsive force is used; a particle of opposite charge to that of protons, such as electrons, which, though in fact they are present in the hydrogen atoms, they are not capable of unite them. It results that this particles exist in the nature and are in any atomic nucleus taking part of another which responds to the task of holding together the repelling protons: the pion. This particle only exists for an instant of $5x10^{-24}$ seconds, enough time so it can travel from a proton to another, but not beyond the nucleus of the atom. The required energy for the existence of this particle in that short period fits the Heisenberg uncertainty principle in the Einstein version. Using these equations, the energy available during this period would be of 20 pJ (1 Joule pick of $2x10^{-11}$ J or $1,25x10^{8}$eV), the equivalent to a particle with a mass of 250 times that of the electron.

Since it was predicted the existence of this particle by the Japanese physicist Hideki Yukawa there were several attempts to detect it experimentally, but being a particle that only exists a briefest instant and using not available energy at these moments (year 1935), only thanks to the uncertainly principle, it was impossible to detect it, unless if these energy was provided in some way. And this energy was provided some years later. In 1948 experimenting with rays from the cosmos in Bolivia, Cecil Frank Powel detected the particle, which was called pion.

It turns out that the pions, after exist for a short period decays into muons and neutrinos. Muons have a relatively long life: 2,2 microseconds.

Here appears the possibility of a fusion which don't requires the creation of plasmas of such high temperatures to bring together the repellent protons. It is turn out that if we rotate negative mouns around protons with this mass 207 times higher than the electron, its wave function is so narrow that penetrates in the nuclei and does wane the Coulomb repulsion force between protons in equal magnitude, 207 times: given its negative charge. The approach of protons at distances under $1,0xE^{-15}$ M causes the melt, as already we have mentioned. This phenomenon

will be realized at moderate temperatures that can become as the environmental and the process has been called Cold Fusion.

Notwithstanding having practically the solution in our hands, there is an insurmountable difficulty: the half-life of 2,2 microseconds of a muon isn't enough long so that the necessary amount of fusion reactions can decline de balance of the critical point of invested energy/ obtained energy towards achieving an energetic extra, it is obtaining more energy of the fusion that the one used to provoke it. To clarify this point we have to take into account that the energy obtained in each fusion reaction is about 20 MeV. 10 GeV are required for the production of a muon, so to invert the balance every produced muon should cause 500 fusion reactions. We should clarify that the muon, once has provoked the fusion is separated from the merged nuclei and can produce this reaction continuously until its death in 2.2 microseconds. The best estimates give a harvest of fusion reactions of 250 fusions by muon; in practice only have been achieved 150 reactions, which leaves us far from the minimum required to break even. Therefore, the process is not profitable. To solve the problems raised there is a number of projects to do, which we detail below:

a) Produce more fusion reactions by reactant muon;
b) Produce muons with less energy for their creation;
c) Extend muons life to prevent their fall in 2.2 microseconds;
d) Find somewhere a cheap energy and, better yet, free to produce the muons that we will use in our Cold Fusion.

The a) solution can be found by decreasing the frequency with which the muons are lost in the chain of reactions. The solution lies in increasing the deuterium and tritium density in the gas to merging, first. Also in this appendix we have to reduce the frequency of the muon adhesion to the created alpha particles, produced during the fusion, which would increase the number of fusions when the adherence time of the muon is reduced. A mechanism that facilitates this task is the introduction of a magnetic field which acts on the muon capture decreasing this time.

The b) solution passes by trying to get muons by non-classical methods which require significantly less energies in the creation of these particles than the employed by the classic methods of the bombardment of materials of targets with dense nuclei, as is the case of the current method that consist in directing an ion beam, from a particle acceleration, to a carbon or lithium target from which the resulting muons beam is introduced in a recipient of deuterium and tritium and begin to catalyze the fusion reactions. The produced helium by the reactions is extracted with a purifier, while neutrons pass through the chamber walls and arrive to a lithium

cover, where they deposit their energy and also produce tritium. Tritium is conducted to the container again to be used in the following reactions, as it is one of its fuels. The generated heat in the cover is removed with a heat exchanger and is used to drive turbines and power generators. Part of this electricity is used to power the ions accelerators and the other parts of the reactor and the rest is send to the external electric network to its distribution to the population. We propose a more economical variant to this scheme and is the introduction of the ions of the primary beam directly into the reaction chamber, where pions will be generated and will be confined in a magnetic mirror with their posterior disintegration in muons, which obviates the passage of transport from the accelerator to the container. Muons at the same time could be magnetically confined reducing like this their losses and specially the creation energy by muon. This would suggest the tilt of the balance to our favor by reducing the employed energy to provoke the fusion.

A possible variant, of extreme importance will be the muon production from the relativization of particles of smaller masses, stable in the ground state.

The solution c) foresee the muonic acceleration to relativistic speeds that increase the lifetime of the muon when are approached to the light speed and with this would be possible the consequent increase of the amount of fusion reactions, when the life of the catalyst element of these reactions is increased. Also may be considered in parallel the corresponding acceleration and ionization of deuterium and tritium atoms which are merge to reduce the losses by inelastic collisions with these nuclei by part of the muons which are paired, reducing the effective section of the collisions.

In the solution d) will participate a source of constant energy which every day gives us nature, the Universe, specifically: the Cosmos.

To the Earth, at sea level, arrive constantly muons as cosmic secondary rays in an amount of 10,000 muons by square meter. These muons arrive at sea level with energies of 4 GeV and, due to their relativistic speeds (v=0.994C), their life is lengthened until 40 microseconds. If we were able to use this times of life, the fusion reactions by muon would be of 3,000, which would release a total energy of 60 GeV with which create at the same time 6 muons of second generation. This would cause the inclination of the balance widely in our favor. The incorporation of this step of the project to the solutions that we have detailed before could be crucial to achieve, with absolute security and definitely, the longed and sought for decades by man Eternal Energy.

## 7. Energetic teleportation by quantum entanglement

This project is based on one of the most rarest and counterintuitive phenomena of the quantum physics: the Quantum Entanglement, baptized by the most privileged minds of all the times, Albert Einstein, as “Ghostly Action in Distance”. In this characterization he shown his complete disagreement with the colossal indeterministic phenomenon. But for how hard it is to accept, the reality is imposed and for the physicists only remains the difficult task of investigate why. This phenomena can be briefly explained as follows

A pair of subatomic particles, among which we can mention electrons, protons or photons, after being in narrow quantum interaction by a determinate time, can arise to manifest the quantum entanglement state, which consists in that if these particles become separated after an interaction time a distance of arbitrary magnitude, whatever it was, their connexion state or entanglement would remain invariable resulting that the action from the outside on one of them would cause an instantaneous effect on its partner, without any delay in time. This phenomenon, which seems to be in direct contradiction with the universal principle of the relativity, where it is accepted that the light speed is unsurpassed by any physical body, has been well demonstrated and nowadays is being intensively worked in its application in quantum computing, giving encouraging positive results. The transfer rates of information and the binary data may be infinite.

In electrons, for example, this action means that if you make change the rotation spin of one of them by the reverse direction, the other electron could respond changing at the same time its spin in the opposite direction. We repeat, whatever the distance. Can an electron be found here in Spain and the other, at this moment, in the Andromeda Galaxy. The change of state would be manifest in a unison way.

Our project, which is entirely new in the use of this phenomenon has been testified by jurat and has therefore the priority date. Its application is based on the energy field. It is, moreover, based in a phenomenon which we have experienced in other of the projects that concern us in the field of the hydrogen energy: the related with the use of atomic hydrogen, as an energy carrier.

The explanation is as follows: the hydrogen molecule $H_2$ is the stable form of hydrogen in nature. It is formed by two matched atoms that share two electrons from the s orbital and whereby it remains strongly united. To separate this two atoms it has to be applied an equivalent energy of 50,000 kCal/kg of $H_2$. This energy is truly great; it can be compared with the energy released in the combustion of the best gasoline; it is of 8,100 kCal/kg. The electrons in the molecule are liked because the spin direction of one is exactly the opposite of the other. Otherwise by the

Pauli Exclusion Principle it was not allowed the union of these two atoms in one molecule. If both atoms have their respective spins in the same direction, they would be inevitably separated and wouldn't be a force able to hold them together. Now, we suppose that the stable gas of hydrogen in the chamber, where it is stored, suddenly experiment, in a half of the electrons that make up its molecular structure, a change of direction in its atomic spins. This gas would do that the atoms become separated forming atomic or hydrogen radicals throughout its volume, increasing the pressure inside. Suddenly an external force makes that this half of the atoms change the direction of their spins by the contrary. The gas would suddenly pass, back to the molecular state, releasing the referred energy of 50,000 kCal/kg, which could be used to do the work, for example make the explosion touch of an internal combustion engine in a car. The process could be repeated indefinitely, simply by changing the direction of spins from the parallel state to the antiparallel and vice versa. Like this the engine could run until the pins stop their operating and remain in the antiparallel state to be stored, so to speak, in the form of the stable initial molecular state.

If the appearance of the antiparallel state of the atomic spins in the hydrogen gas provokes its combustion or exotermic energy release, the forced separation to the atomic gas state corresponding to parallel spins requires overcoming the repulsive forces of a corresponding magnitude of 50,000 kCal/kg. From where do you get this colossal energy?

We suppose that the half of the spins which change their spin belong to a gas that is entangled with other, which we will call twin, and that this latter is distant in a place, where the energy is cheap and affordable: this places are abundant in Earth and, if it is wanted and is technologically possible, it could be anywhere in the cosmos where surely the energy does not lack. This gas, which we will call Motive for being the one which governs the other, which we will call Driven (it is like in a gearbox to make it more familiar recognize terms), will feature with the necessary energetic manipulation to change intentionally the direction of the motive spins. The Driven gas distant, will feel instantly the order to change its state by the opposite and here will be produced the separation of atoms of the molecular gas, being stored momentarily in the atomic state until it receives the new order of change. Thus, by repeating of the process the time desired, the engine will run without interruption. And, if we are able to seal off well the work chamber of the engine, this would not require of the uncomfortable refuelling's and the money spending that entails; unless, for example, a monthly rental by the provided service by the energy supply company!

The energy teleportation requires overcoming an undesirable phenomenon, the quantum decoherence. It turns out that if our entangled gases feel the action of a classical external agent, as in the case of energetic manipulation force that may be present to alter the spin direction of the Motive gas, they lose their entanglement property and the phenomenon disappears. In order that the entanglement endure indefinitely, the entangled particles must be completely isolated and cannot be operated by external agents.

Fortunately this phenomenon could be shielded if the quantum system in question becomes immune to these external destructive attacks. This is accomplished by converting the quantum system in a topological system, which will allow any kind of changes in its configuration, without affecting the robustness of the entangled system. This is possible through the employment of topological insulators, which would be the handlers of the entangled particles and that can be deposited by physic evaporation techniques onto substrates, in which we are specialists with years of experience.

So, as example given, we may form a fleet of vehicles with incorporated fuel that would not have to replenish, and which would be directed from a power station at the moment and for the time required by a consumer and that would never be affected by the distances that he travels, bringing it close or separated to the energy source.

## 8. Summary

To summarize, we can say that all the projects that in one or other way have been made arrive to you, have the common denominator of energy and the use of hydrogen as the universal carrier of this and are closely linked, being able to get the development of one to the achievement of another: we can say that they are “Physically Intertwined”.

Of these, we believe that the two latest, the one of the Cold Fusion and the one of energetic teleportation, are the most important in all the fields and can be used in the immeasurable plans and dreams that humanity has to stock up on energy which, in addition of powerful, is clean, safe and environmentally friendly, regardless where it is used and in the desired magnitude.

In conclusion, we have to argue that our specialist have extensive experience in the design and construction of reactors for applied physics, as well as the support and collaboration of the Polytechnic University of Catalonia in the jobs of possible certifications and laboratory manipulation, both in physics and in chemistry disciplines.