

# A Report on the HMD Technology Related Research

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**Abstract:** A short report about the ongoing experimental research to prove a hypothetic mechanism of energy generation in the Gritskevich's Hydro Magnetic Dynamo (HMD) is presented. The experiments are conducted using titanium hydride water colloids being processed by short electromagnetic impulses. The concentrations of 26 elements are measured in colloids before and after processing. Their changes are presented and discussed in this report.

**Keywords:** Scale Relativity, fracturing of nanoparticles, low energy nuclear reactions

## 1. INTRODUCTION

If one takes a look on such sustainability related service, as [1], one may conclude together with authors of the service, that "The world's greatest challenge is whether we can make the transition to a sustainable lifestyle fast enough to avoid environmental catastrophe". Except the social and political measures, which might be undertaken to avoid the catastrophe, the engineers, scientists and innovators may contribute significantly for that. A breakthrough in the energy production may save ecology of the planet from fossil and nuclear emissions and pollutions. To achieve this, a new prospective trend in the science and engineering actively develops. This trend assumes application of the Low Energy Nuclear Reactions (LENR) for power generation. As one could see from [2], the whole thematic issue of Current Science Journal was devoted to this subject in the year 2015. Despite the fact that the issue published 33 papers, the only 3 LENR applications were mentioned as near to commercialization. Up to know, however, the LENR based energy sources are still absent on the market.

We wouldn't consider various obstacles for development in this area, which exist in the science itself, in the politics, etc. From the point of view of an innovator, the most prospective way to achieve motion forward with a breakthrough innovation in the energy sector is to provide any possible help for such Small Research Enterprises (SME), as Estonian Sintos Systems OÜ.

This SME had applied to a European Union (EU) program Future and Emerging Technologies (FET) with the project being financed nearly 5 years to the date of

the application. However, lack of basic support for communication with such institutions, as EU and FET, resulted a decline of the application. And this is despite the fact that the project's aim was just to reengineer the LENR based energy source, which was already developed and exploited in Armenia during nearly 5 years (from 1992 to 1997). The description and history of Gritskevich's HMD is presented in [3], and in some other Internet resources.

Authors of this report would like to note, that during nearly seven years of research and engineering, a substantial progress was made both in theoretical understanding of physics in HMD, and in engineering approaches to reengineer it. We describe shortly the theoretical background in the next section. It also explains essence of our approach to the experiments being described in this report.

## 2. THEORETICAL BACKGROUND

A general description of the theory behind our experimental approach is presented in our publication [4]. It is based on the theory of Scale Relativity [5]. It has been developed by French astrophysicist Laurent Nottale. It considers the whole space-time as a fractal. To avoid repetition of description of our way to apply the theory, we would like to make a short philosophic note, which allows simple explanation of essence of our approach. This note is based on a general cosmological concept of a Universe being limited in space and time. Such a Universe has to have something conceptually opposite to it. We wouldn't go deeply into the theological description of this conceptual opposition. We shall mention only two important aspects, which might be useful for our experiments. The first aspect is a conceptual necessity to place a source of motion for all the elements in the Universe out of its borders. The second aspect is necessity for energy of this motion to pass through all the scale limits of a Universe. These limits have to include the biggest and the smallest scales of all existing structures in the Universe, which are dynamically created and supported in the global motion from the source out of the borders of Universe to its depth, and back. The purpose of this motion is to provide a dynamic creation, support, and destruction of all existing things. If one reminds the theory [5], one may put this motion to a correspondence with motion

along a fractal. An important aspect here is that this motion has to come to every single elementary particle. And become influenced on the ways to the particle and back to the source by all the other motions, which create, support, and destroy all the other things and particles. One may logically conclude that due to this mutual influence we obtain the uncertainty principle of quantum mechanics, and all its phenomena, which are described in the nuclear and other branches of physics.

The important addition, which follows from the theory of Scale Relativity, and from our more general picture, that the elementary particles, and the energy behind them, move in fractal trajectories. Acceptance of this hypothesis makes possible conscious interference into the global motion using intentionally created fractals, which may partially coincide with some parts of these global fractal trajectories.

That is essence of our general approach [4] for the development of new energy sources. This approach allows general explanation of nuclear transmutations and neutron emissions, which, for example, were reported in the papers [6] and [7], and in book [8]. In all the cases we find the reason for all observed in these researches phenomena in the processes of dynamic fracturing and deformation of internal fractal geometries in solid materials. These are the titanium and palladium solids, whose fracturing and spreading of a fractal like structures of internal defects is promoted by diffusion of deuterium (see [6] and [7]).

In this respect, these materials may be considered as smart materials, because in the frame of our hypothesis they are considered as capable for interference into the most basic natural processes, which create, support, and destroy substances.

In the phenomena being described in the book [8] one finds additional support to the note, that if surfaces of the fractures and structures of defects in the solids, obtain fractal geometries, their dynamical deformation yields such prospective side effects, as discussed in [4]. The rocks and other large scale geological structures [8] possess fractal geometries of much bigger scales, than ones, that could be created in the titanium chips [6] and palladium wires [7].

Basing on results of these experimental investigations, and on results of others, which are not referenced here, we accept as a basis for our experiments the hypothesis about influence of the fracturing, and fractal geometries' deforming processes in the solids, on the nuclear processes inside and around them.

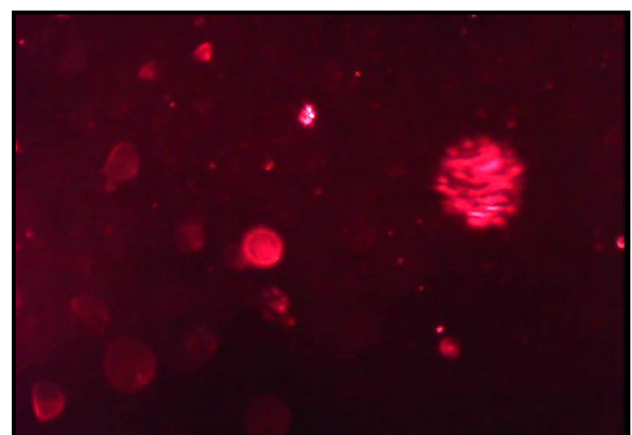
The surfaces and internal structures of solid nanoparticles in colloids may be fractal because of ways to produce them. The experiments with such colloids aim partial replication of the conditions, which were existent in working HMD, where palladium

electrodes emitted a lot of palladium particles to a super clean water (with 5% dilution by heavy water) during the high voltage and high power discharges. After that the palladium particles were subjected to a line of different factors aiming their deformation and gradual fragmentation with a simultaneous release of excess energy accompanying such processing. As it was observed, the release of excess energy in HMD was free from emissions of any ionizing radiation. It looks close to results of the experiments in [7], where nuclear transmutations took place in the palladium wire without emission of any ionizing radiation.

### 3. EXPERIMENTAL METHODOLOGY AND SETUP

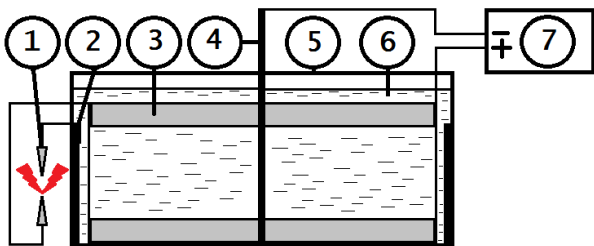
For our experiments with colloids in water we replace the palladium particles with the particles of titanium hydride, and partially subject them for fracturing, or deforming types of processing, which were applied in HMD. Then analyses on concentrations of 26 elements are conducted for the processed and unprocessed colloids using inductively coupled plasma - optical emission spectrometry (ICP-OES).

For the source of colloidal particles the -325 mesh powder of mechanically crashed hydride of titanium sponge was purchased from one of its traders in China. Some amount of the powder is put directly to deionized water (1  $\mu$ S conductivity). The smallest powder particles constitute persistent colloid after a week of their sedimentation. Presence and motion of these particles is observed due to a scattering on them of a red light of a 5 mW laser beam passing through a plastic cuvette under optic microscope with a sample of the colloid. One may see a typical picture of this scattering at Figure 1.



**Figure 1:** Scattering of a laser beam in  $TiH_2$  colloid

This colloid is put to a control sample volume for ICP-OES analysis, and to a plastic volume for electro-mechanic processing. Two flat Tesla coils are installed in the volume along with two titanium electrodes accordingly to the Figure 2.



**Figure 2.** Experimental setup to process colloids: 1 - electrodes for discharges in the air; 2 - a broken ring shaped titanium electrode; 3 - flat Tesla coils; 4 - central titanium electrode; 5 - round plastic volume; 6 - titanium hydride colloid; 7 - high voltage discharge source.

The electrodes are installed so, that negative potential from the high voltage discharge source is spread from the center of a volume to another titanium electrode in it, which is installed near its walls as a ring shaped tape with a gap. It's possible to observe colloid and regulate a distance between the flat Tesla coils while watching through the gap. The flat Tesla coils are insulated from the colloid. They connect a positive contact of the high voltage discharger with a discharge electrode. The continuously running pulsed discharges of maximally 15 kV amplitude take place near external border of the volume.

As it can be seen from the Figure 2, the magnetic and electric fields have mutually perpendicular directions. They also have impulse character due to the continuously running discharges. Such arrangement makes possible for colloidal particles to gain an excess negative charge, and abruptly varyate their polarization. Due to a synchronization of polarization currents with variating magnetic field from the coils, the particles are forced by Lorentz force to turn and stretch the dipoles of water molecules in the double electrical layers around them. Thus the conditions for deformation and fragmentation of the particles, which also are stretched by electrolytic dissociation forces in water, are created.

Upon several hours of such processing of the colloid, its sample is taken for inspection under optical microscope. If the scattering in the sample becomes evidently lighter and more diffuse than scattering in a control sample, the experiment is finished. 160 mL of the colloid are put to the sample volumes and sent for a standard Metal Packet water analysis, which is conducted by LMI Sweden AB.

**3. RESULTS AND DISCUSSION**

Upon time of this report four samples of colloids were sent for analyses using ICP-OES method. Total duration of continuously running air discharges in each of two experiments was approximately 12 hours. The Tesla

coils were switched to produce a mutually opposite directions of magnetic field in the second experiment. Frequency of discharges were notably decreased for the second experiment. The sedimentation time for the colloids in the second experiment was four weeks longer than the same for the first experiment.

Results of analyses of unprocessed and processed colloids of two experiments are presented in Table 1.

The concentrations in unprocessed and processed colloids in the first experiment are designated as 1 and 1' respectively. The same results for the second experiment are designated as 2 and 2'. The concentration values, which were close to a sensitivity limit of the method, but possible to determine, are designated by the symbol \*. The sign < shows, that concentration of an element is below the sensitivity limit of the method for this element.

**Table 1.** Results of ICP-OES analyses

Element	Unprocessed colloids (mg/L)		Processed colloids (mg/L)	
	1	2	1'	2'
Al	< 0.0089	*0.025	< 0.0089	*0.026
As	< 0.01	< 0.01	< 0.01	< 0.01
B	*0.18	*0.011	0.19	0.079
Bi	< 0.02	< 0.02	< 0.02	< 0.02
Ca	*0.086	*0.017	3.7	0.90
Cd	< 0.0014	< 0.0014	*0.0017	< 0.0014
Co	0.0051	< 0.003	0.0084	< 0.003
Cr	< 0.003	< 0.003	< 0.003	< 0.003
Cu	< 0.005	< 0.005	*0.0070	0,022
Fe	< 0.0017	< 0.0017	< 0.0017	< 0.0017
Hg	< 0.006	< 0.006	< 0.006	< 0.006
K	*0.20	< 0.024	0.31	< 0.024
Mg	0.036	< 0.016	0.20	0.13
Mn	*0.0010	< 0.0003	*0.0021	< 0.0003
Mo	*0.0043	< 0.002	*0.0052	< 0.002
Na	0.13	*0.025	0.30	0.50
Ni	< 0.005	< 0.005	< 0.005	< 0.005
P	*0.022	*0.019	*0.028	< 0.016
Pb	< 0.016	< 0.016	< 0.016	< 0.016
S	< 0.012	< 0.012	0.043	0.015
Se	< 0.042	< 0.042	< 0.042	< 0.042
Sr	0.014	< 0.0001	0.025	0.0074
Ti	0.0033	0.0036	0.0027	0.0018
V	< 0.10	< 0.10	< 0.10	< 0.10
W	< 0.10	< 0.10	0.20	< 0.10
Zn	*0.0076	*0.0032	*0.016	*0.0045

It's possible to note that in both experiments the concentrations of a main constituent of the colloid – titanium, decreased in results of processing. This may be explained by deformation and fragmentation of titanium hydride particles, and by transmutation of their constituents and substances around them in result of deformation and fragmentation processes with their side effects.

This also may explain appearance of previously undetectable elements of W, S, Cu.

The concentration of such elements as Zn, Sr, Na, Mg, B were increased in both experiments.

The concentration of P was close to its sensitivity limit, but increased in result of experiment applying collinear vectors of magnetic fields from the Tesla coils, and decreased in result of another experiment, where these vectors were opposite. This factor along with decreased frequency of discharges may be responsible for the differences in detection of concentration changes of such elements as Co, Cd, K and Mo in the first experiment, while concentrations of these elements were below the sensitivity limits in the second experiment.

The biggest change of concentrations in both experiments belongs to Ca. This fact, however, might be explained by a gradual release of CaCO<sub>3</sub> to the colloids from the plastic insulation of Tesla coils. This substance could be applied as a softening addition to the insulation. The copper wire for the coils was purchased from a Biltema store. A chemical composition of its plastic insulation is unknown for us up to now.

From the other point of view, accordingly to the report [9] of Dr. A. Parkhomov about the 7 months continuously running hydrogen fed reactor having Ni powder as a fuel, big amounts of Ca and other elements were created on surfaces of some reactor elements due to an unknown mechanism of nuclear transmutations.

Another research [10], which indirectly supports our approach to achieve cold nuclear transmutation, describes possibility for small nanoparticles of Ag (25 atoms) to exchange their isotopes with other such particles having another isotopic composition. The particles are separated by special chemical substances (ligands). Such possibility for nanoparticles of Ag indirectly confirms possibility for easy deformation and fragmentation of TiH<sub>2</sub> nanoparticles in our experiments.

#### 4. CONCLUSIONS

To confirm the hypothetical mechanism of nuclear transmutations one needs to conduct more such experiments as described in this report. We encourage the readers to replicate these experiments, and to design their own experiments with materials, which possess, or are capable for dynamical creation and deformation of their internal fractal geometries. These experiments have to be conducted without such ambiguity as ours with Ca, which could appear in the

colloids not because of transmutation, but because of chemical composition of materials in the colloids.

To build a new clean energy source running on LENR, one should invest to more researches devoted to physical mechanisms of work of Gritskevich's HMD.

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