Short communication

A part II of the reports on the ongoing HMD technology research

ABSTRACT

The report continues reporting of results of an ongoing research verifying a hypothetic energy generation mechanism for reengineering of Gritskevich's Hydro Magnetic Dynamo (HMD). The HMD technology is a patented technology for electric power generation. It was invented in Russia and deployed in a semi-industrial scale (1.5 MW power unit) in Armenia in 1992. After its successful exploitation during 5 years no more units were assembled. Nowadays the technology needs verification of its physical mechanisms for its successful reengineering. The aim of the report is to present current results of an ongoing theoretical and experimental research of hypothetic physical mechanisms providing energy generation in the unit. It is written without disclosure of its construction and technical details. Thus the theory of hypothetic energy generation mechanisms is described in a general way. The reported experimental results provide only partial support for the theory. They should be independently reproduced and verified.

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

1. INTRODUCTION

The first part of the reports on the ongoing HMD technology related research has been recently published in [1]. The idea behind the experiments, which were described in the report, firstly was formulated in our paper [2]. To describe it shortly in this communication, one should avoid extensive review of available literature, but put forward the most representative references to explain the main points concerning a hypothetic energy generation mechanism, which has been formulated in [1, 2] for reengineering of HMD.

The HMD was made in result of a privately financed project by a group of physicists and engineers in Armenia in 1992. It is described in more details in [3].

As the device had 5% of heavy water in a super clean water before its further dilution by colloidal particles from the palladium electrodes, one may connect its hypothetic energy generation mechanism with so-called "cold fusion". In our theoretical research of possible energy generating mechanisms we do not consider any type of fusion, as a source of energy in the device. Instead we have formulated an energy generating mechanism, which is based on the theory of Scale Relativity [4]. The theory considers the space-time as a fractal. According to our understanding of the theory, all elementary particles, and energy behind them in general, move and interact in a geodesics having fractality as their intrinsic property. According to the theory, the fractal dimension of the geodesics changes with the scales. That gives potential possibility to interfere into this motion on some scales by intended or unintended creation of dynamically changing material structures having the same geometrical properties, as the geodesics.

Such structures may be presented by the self-similar structures of phase differences between two competing phases. For example, between two liquids with relatively low and high viscosity, one of which expunges another. The fractal properties of interface between them are considered in a famous book about fractals [5].

The close example to that is presented in this communication along with another example, which concerns fractal geometries in the solids being dynamically deformed.

Deformation of such geometries is unavoidable condition for them to come to interaction with the energy moving along highly dynamic fractal geodesics of some elementary particles. By our hypothesis, such an interaction may change the structures being formed by motion of this energy on the quantum scale of the elementary particles. As it is written in [4] with a reference to the Feynman works in quantum mechanics, the fractal dimension of geodesics on that scale is 2. It has to be bigger than that if we move to experimentation with fractal geometries on a bigger scale. Generally saying, the

feedback of a structural change on some scale has to spread through all the scales along the geodesics. It is expected in our approach that some part of this energy spreading along a fractal will be released on the geometry, which caused the above mentioned structural change on some other scale. That part has to be caught and utilized in the energy source, which uses the described possibility to interfere into a global motion of energy forming and supporting relatively steady structures on different scales.

This is our shortly described hypothetic mechanism of energy generation in such devices as HMD.

The actual applicability of this approach may be referenced using two pretty illustrative examples in the literature, which confirm possibility to interfere into the nuclear processes not only by application of accelerators or other means to apply such elementary particles as protons and neutrons for initiation of nuclear reactions.

The first example [6] was published by a group searching possibilities for a “cold fusion” type of nuclear reactions in the systems with ultrasound based cavitation containing suspensions of $LaNi_{i5}$ and $LaNi_{i5}D_x$ in D_2O. The group has found that the suspensions start to emit neutrons in a non-stationary regime after 18-20 hours of oscillations of a titanium sonotrode being partially submerged into the suspensions. After that the surface of sonotrode acquires a fractal like geometry due to the cavitation based erosion. The paper [6] has a photo of this geometry. Despite its publication, the emphasis of analysis in the paper has been made on possibilities for DD reactions in cavitation bubbles with deuterium, in TiDx film on the sonotrode surface, and in fractures on surface of $LaNi_{i5}$ and $LaNi_{i5}D_x$ particles. However, such possibilities are completely excluded in nearly the same by design experiments of a group [7] with titanium sonotrode being oscillated with ultrasound frequency in a volume with mercury. The experiments showed 100% reproducible nuclear metamorphosis of mercury after 3 minutes of sonotrode’s oscillations in the volume. We suspect that the patented design of the titanium sonotrode, which was not disclosed in the publication, has the form of its surface geometry, or geometry of its internal composition, possessing fractal characteristics functionally analogous to the characteristics of the titanium sonotrode being applied in [6]. Thus our hypothetic explanation of the referenced experimental results assumes that their main reason is in the application of materials and interfaces possessing fractal-like geometries, which are capable for interaction with the geodesics forming substances on the nuclear scale level.

To provide our hypothesis with more experimental background, we report results of experiments and measurements concerning two applications of the fractal-like geometries being dynamically formed and deformed on the interfaces between different materials and phases in the next sections.

2. MATERIAL AND METHODS

2.1 Fractal-like interfaces between gaseous and liquid substances

The first experiment was conducted in the frame of research of low temperature pyrolysis of propane-butane mixture being pumped via Pb:Sn:Bi alloy at the temperatures several degrees higher than its melting point at 138^{o}C [2]. The fractal-like structures, which are supposed to be created in such conditions are analogous to the structures between two liquids with relatively low and high viscosities expunging one another [5].

By our hypothesis, the experiments in [2] gave a side effect from dynamical creation and disappearing of the fractal-like structures on the chemical scale of structuring. It appeared in the form of such products of the low temperature pyrolysis of propane-butane mixture as carbon particles, hydrogen, and some amount of resting hydrocarbons. Upon solidification of the alloy with the carbon particles in it, one can see them as on the surface of the alloy, as in the bulk, which shows a fractal-like surface after its mechanical fracturing in the Figure 1.

Figure 1. Pb:Sn:Bi alloy with carbon particles

From methodological point of view following our hypothesis, the side effects in such experiments should also appear in the form of structural changes on the scales lower than the scale of chemical structuring. Such structural changes may also serve as a source of energy being searched in the frame of HMD related research. To test this possibility, an elemental analysis of the alloy by the Energy Dispersive Spectroscopy (EDS) method using BRUKER X-ray spectrometer of Scanning Electron Microscope (SEM) of Advanced Instrumentation Laboratory at MSE division in KTH (Department of Material Science and Engineering at Royal Institute of Technology in Stockholm) was conducted.

2.2 Fractal-like interfaces of solid colloidal particles in water

The aim of experimental setup, which is described in the first part of the reports about ongoing HMD related research in [1], is to achieve dynamic disturbances of interfaces between colloidal particles of titanium hydride and water, and of supposed fractal-like internal geometries in the particles. For that the suspension was processed by coherent impulses of crossed electric and magnetic fields. The expected side effects of such disturbances, or deformations of the fractal-like interfaces were planned to be detected by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES method). Measurements by this method of presence of 26 elements in the processed colloid could show the elements, which appeared in water in result of structural changes on the nuclear scale due to the above mentioned side effects, and due to a dissolution of various substances from the powder and from the details of experimental setup [1].
To filter out latter sources of substances in water, the subsequent EDS analysis of elemental composition of the details and the powder has been conducted.

3. RESULTS AND DISCUSSION

The experiments using both experimental setups showed presence of substances with unidentified sources. The EDS analysis of the alloy after pumping of gaseous hydrocarbons through it showed an atomic presence of 6.8-11.24% of Tc (Technetium). Unfortunately, it appeared not possible at the time of measurements of the alloy to compare its elemental composition with the unprocessed alloy. We assume that the elemental composition of the alloy being sold at the site of its producers [8] for modelling is not diluted by Tc, but plan to make EDS measurements on the same instrument with the unprocessed alloy too.
The elemental analysis of materials of volume for colloid, of titanium hydride powder, of Tesla coil insulation and titanium tape being applied in the experimental setup [1] showed the expected sources of dilution by such elements as Ca, K, Al, Zn and S from the details and the powder. The sources of B, Cu and W were not found. The sources of Cd, Co, Mg, Mn, Mo, Na, P and Sr, whose concentrations in the colloid were increased in result of processing, also were not identified.
We may suppose that these elements were present in the deionized water due to its imperfect deionization. However, the reason of increase of their concentrations in result of electromagnetic processing is not known.
One may argue, that these elements are impurities of the powder, whose dissolution to the colloid was intensified by the electromagnetic processing. As opposite argument to that we may note that concentrations of Ti in the colloid, which were decreased in result of processing, are in the same range as concentrations of those elements, or even by orders of magnitude lower. We refer readers to the results of ICP-OES measurements in [1]. Thus the colloidal particles of titanium hydride could not dissolve such amounts of impurities from them.
In addition to that, we may cite the report of Advanced Instrumentation Laboratory in KTH with results of EDS measurements, which gave the following normalized atomic composition of the powder (excluding hydrogen): Ti – 99.44%, Al – 0.24%, Si -0.22%, Cl – 0.09%.
With respect to discussion of these experimental results, and supporting results in the literature, we may note the following.
From the point of view of the theory [4], every physical potential driving some transfer process creates an opposite generalized quantum potential [9]. We assume that its appearance in spatial areas with presence of the fractal-like geometries being dynamically created and deformed by a physical transfer process causes structural changes at least in those spatial areas, where this quantum potential acts.
If one considers our first experiment with the heat and mass transfer of hydrocarbons through the liquid alloy [2], results of this experiment are right in the frame of our assumption. We may additionally note, that accordingly to the paper [10], the alloy may form dendritic fractal-like structures in it due to its super-cooling. Here we have both fractal-like material structures and physical potentials driving transfer processes not only in the form of pressure expunging one substance by another [5], but also in the form of the temperature difference as a potential driving heat transfer [9].
These conditions are generally analogous to the conditions of experiments in [11], where abnormal heat liberation was observed from the palladium wire in a deuterium atmosphere upon reaching of a triggering magnitude of current through the wire. The diffusion of deuterium into the wire caused its embrittlement and appearance of a lot of micro-fractures with a fractal-like geometry on a surface of the wire. A wide spectrum of new substances appeared in these fractures without detection of any accompanying radiation.

Here we observe three physical transfer processes – diffusion of deuterium, electrical current, and heat release from the wire. The effect of opposing generalized quantum potentials acting along the fractal geometries appeared in the form of substances, which were absent in the wire before the experiment analogously to the Technetium in our first experiment.
Our second experiment receives its support in our interpretation of experimental results of already mentioned group [6] searching possibilities for DD fusion in solids. They detected emission of neutrons accompanying ball milling of titanium chips in a deuterium containing media [12], and the same emission from fracturing of LiD crystals being destroyed by a mechanical impact [13]. We may note that material structures of the first experiment had fractality at least on two scales: on the surface of titanium chips, and in their bulk due to a diffusion of deuterium in it. This situation is analogous to the situation with the fractal-like geometries in our titanium hydride powder, which was obtained by a ball milling of titanium sponge with hydrogen in it. One may assume that deuterium is more efficient than hydrogen in respect to creation of the fractal-like geometries in the solids along with their development due to a mechanical fracturing in [13]. Yet we may argue that presence of water could add more fractals to the deformed ones in the colloid particles. Accordingly to the paper [14], the water itself may form dynamic fractal clusters of different sizes. Thus the dipole nature of its molecules allowed a dynamic deformation of the whole set of the fractal geometries as in water itself, as in its colloidal particles using coherent impulses of crossed electric and magnetic fields. Because of that we may argue that the substances, which were detected in water by ICP-OES method, could appear in it due to the above mentioned side effects from such a deformation.

4. CONCLUSION

Up to the current stage of the HMD related research its main idea about physical mechanism of energy generation in HMD has found experimental support in results of conducted experiments. The results, however, need to be reproduced with special emphasis on comprehensive analysis of all possible sources for the substances to be detected in the similar or close by idea experiments.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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