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## **Torsion Field Effect and Zero-Point Energy in Electrical Discharge Systems**

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**Abstract:** Highly localized nuclear activation in electrochemical systems and other electrical discharge processes have been observed by many laboratories in world. There is an attempt to explain such anomalous phenomena by using torsion field theory and axion model in this report. Anisotropic behaviours of radiation products, burst character, “heat after death” of excess energy release in electrical discharge systems are considered to be interpreted by the torsion coherence of vortex dynamics with the zero-point energy induced by localized intense field emission of micro-protrusion of the cathode, and the dynamic Casimir effect of transient evolution of triple region of gas, liquid solution, and electrode protrusion. Axion model and Primakoff effect are proposed for explanation of nuclear transmutation without noticeable gamma radiation. Nuclear products with high concentration, unidentified tracks with highly collimated lines of low energy nuclear reactions in the electrochemical systems were recorded by CR-39 solid detectors and photo-films, and localized spots with chemical alterations were observed at our laboratory. It is suggested to carry out intensive study of vortex dynamic for explaining the anomalous in wide area of nature and laboratories. Analysis of vortex dynamics with wide range from pitting corrosion of electrochemical system, laboratory plasma, tornado, to quasar spiral model with extremely high energy cosmic rays in the center region, leads to a conclusion for that vortex dynamics creates torsion fields responding to the anomalous effects.

**Keywords:** torsion field, zero-point energy, discharge.

### **I. INTRODUCTION**

Many laboratories in world have observed nuclear reactions and excess heat in electrochemical systems. The mechanism of such anomalous phenomena is not being well understood according to normally accepted physics.

Nuclear products with high concentration and tracks with highly collimated lines of low energy nuclear reactions in the electrochemical systems were recorded by CR-39 solid detectors and films at our laboratory [1,2]. These facts suggest that quasar model with spiral structure and extremely high energy cosmic rays in the center could be used for explanation of the mechanism. It is supposed to use the concept of torsion field to interpret

the observed phenomena, typically, the properties of axial acceleration, memory effect, and the polarized nuclear reactions with torsion effect [3].

## **II. PHENOMENA IN NATURE AND AT LABORATORIES**

The vortex and spiral structures are the archetype that appears at all levels of nature and laboratories, for example, atom structure, vortex lattice in superconductors, dense plasma focus, lightning, quasar etc.

Recent report of dark matter annihilation at the galactic center describes that the cold dark matter near the galactic center is accreted by the central black hole into a dense spike [4]. Particle dark matter annihilation makes the spike to be a compact source of photons, electrons, positrons, protons, antiprotons, and neutrinos. It remind us for that there is a similarity among pitting corrosion with electrochemical noise, laboratory plasma pinching (dense plasma focus, for example), fast laser induced ion beams[5], and quasar spiral model with high-energy cosmic rays in spiral center in spite of large dimension difference. Comparing the experimental results of electrochemical cells with excess heat and nuclear transmutation to astrophysics phenomena, it is supposed that the investigation of vortex dynamics of torsion coherence with the zero-point energy is essential for tapping the zero-point energy.

As it is predicted by quantum mechanics that the vacuum is seething with active energy, even at temperature of zero point Kelvin. This zero-point energy (ZPE) can be thought as an infinite number of virtual photons that popping out of the vacuum and going back in, but should a measurable effect en masse. To exam the origin of ZPE background, the interaction of matter with the ZPE can be treated on the basis of charged point particles interaction with a background of electromagnetic zero-point radiation with spectral-energy density.

Based on observation in the experiments, the following features are considered in order to understand the experimental results with electrical discharge systems.

### **A. ELECTROCHEMICAL DOUBLE LAYER**

In an electrolytic cell, the electrolysis with high conductivity and the electrochemical double layer with large layer-capacitance lead to a typical structure of the cathode potential distribution similar to the cathode drop of glow discharge in low gas pressure. For a compact layer the thickness of the double layer is equal to one ionic layer, across which there is a linear fall of potential. Thus, high electric field exists in some regions on the surface of the cathode.

The local enhancement of the electric field on the cathode surface with the double layer is related to the protrusions and cracks similar to the tip discharge in air or in a vacuum. The current distribution depends strongly on the surface roughness and the work function of the electron emission. A high transient current density ( $> 10^8 \text{A/cm}^2$ ) could be expected due to enhanced field.

### **B. ENERGY CONCENTRATION**

On the cathode surface, the high persistent electrical fields ( $>10^7 \text{V/cm}$ ) and large equivalent capacitance ( $>250 \mu\text{F/cm}^2$ ) lead to a high energy concentration in the double layer [6]. The concentrated field on the tips of the protrusions or cracks after a long-loading period with deuterium on the palladium cathode surface creates a high transient electron flux because of the large distributed capacitance and the negligible inductance in a localized discharge mini-network. The experimental data show that the reactions take

place only in some restricted areas that have specific properties. The idea of micro fusion due to the results of energy concentration and the high deuteron flux could be used to explain the nuclear transmutation.

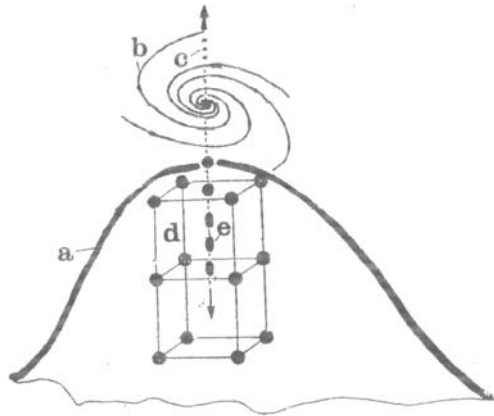
### **C. TORSION FIELD AND THEIR EXPERIMENTAL MANIFESTATIONS**

Elementary particles have the moment of quantity of motion, i.e. spin. If in any substance the spins of particle have a preferable direction, then is interpreted as spin polarization of the substance. Every substance creates a torsion-field (or called spin-field or axion field) in the space surrounding it when polarized by spins [7]. The superposition of torsion field, generated by the atomic and nuclear spins of each molecule, determines the intensity of torsion field in the space surrounding each molecule. Torsion field has strong penetration ability and does not interact with the crystal lattice of substances. The torsion field created by rotation of some sort of matter is concentrated in two opposite beams propagating along the rotation axis. The intensity of torsion-field with some lower constant value can be retained for several weeks after the rotation is stopped. Such the property of vortex matter has been observed recently in type II superconductors with magnetic flux line lattice [8]. The studies of vortex matter of type II superconductors have shown a number puzzling phenomena associated with vortex motion, including: low-frequency noise and slow voltage oscillations; a history-dependent dynamic response, and memory of the direction, amplitude duration and frequency of the previously applied current.

Some behaviors of the torsion-field effect have been observed in the experiments of electrolysis regarding to so-called cold fusion, such as the gas bubble chains come out from the protrusions of the cathode surface for long time after switching off the electrolysis potential. The more surprising thing is the heat after death, which has been recorded by many labs. This phenomenon could be explained by the persistence effect of torsion-field produced by vortex dynamics of tip effect.

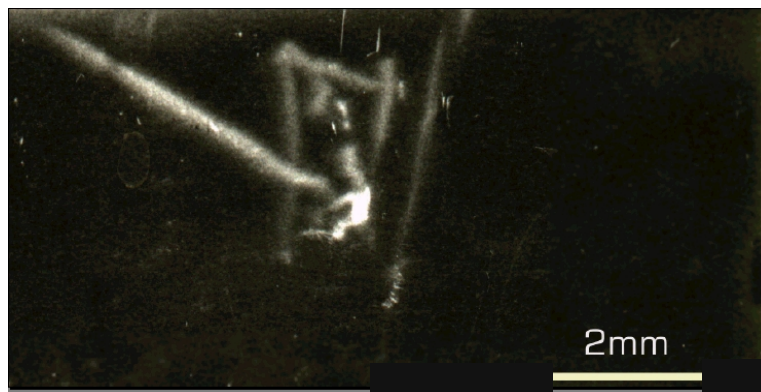
### **D. EXPERIMENTAL RESULTS IN THE ELECTROCHEMICAL CELL**

CR-39 plastic films possessing with a high degree of optical clarity and isotope in track response, and been sensitive to neutron, proton, tritium, alpha, and other charged particles, were used to detect the products of nuclear reactions. The films of CR-39 were immersed in the NaOH electrolyte of heavy water and placed adjacent to the tips of the cathode [9]. After 110 hours, electrolysis experiment with the applied voltage 1 V and current 2 ma, the solid detector was etched by 6.25 N NaOH solution in 70° C for 11 hours. The photomicrograph shows the cluster of tracks with a cycle crater of 100 $\mu$ m in diameter and 25 $\mu$ m in depth. According to the etching condition, the energies of the most of the particles, P, T,  $\alpha$  are estimated roughly to be in the range of 1-4 MeV. On the backside of same region of the CR-39 film detector, one can clearly see a few of tracks in the circle area or nearby. Such tracks are believed to be created by recoil-protons of forward incident neutrons. Highly concentration of the cluster of nuclear tracks could be explained by the quasar spiral model and by the crystal channeling effect (figure 1). The experimental results of the generation of tritium with single crystal metal of Pd show that none of the generation of tritium has been revealed by using non-single crystal electrodes [10]. The important of the crystal channeling effect for nuclear reactions in the electrochemical systems can be inferred.



**Figure 1.** Schematic presentation of a micropinch spiral by tip effect in the electrolysis cell: a) tip of the electrode; b) spiral structure of micropinch; c) electron beam; d) crystal channel; e) ion beam.

To determine the spatial distribution of radiation active sites (RAS), Black-white 135 films of 27 DIN have been used to image the position of the RAS. After 1.5 year-deposition in glass tube of finishing electrolysis experiments with light water electrolyte for more than 200 hours running, the patterns of RSA have been clearly formed on the films after exposure of 100 hours [2]. The bright spots corresponding to the tips of palladium cathode edges can be seen due to the tip effect. The effect of magnetic field on the traces of the charged particles has been observed while the Pd samples exposing to the films, which were folding and wrapping up the sample, were inserted between a couple magnets. The tracks stretching along the film surfaces confirm that the tracks were created by charged particles, electrons for example, with low energy about some keVs. Highly oriented tracks can be observed by autoradiography by using normal films locally (Figure 2).



**Figure 2.** Autoradiography of charged particles tracks of beta delay isotopes on the surface palladium cathode. Some tracks of beta particles are paralleling the cathode surface.

#### **E. SONOLUMINESCENCE AND “BUBBLE NUCLEAR FUSION”**

Some scientists of Oak Ridge National Laboratory in America reported their articles of bubbles experiments in Science. Experimental results show that the radiation lights of

sonoluminescence possess three characters: short duration with picoseconds; wide continual spectrum; highly oriented thin beams. Based on those characters, vortex dynamics with axial acceleration of bubble collapse could be inferred. Nuclear reaction with abnormal gamma radiation was observed [11]. Dr. Claudia Eberlein describes her conclusion on sonoluminescence that only the ZPE spectrum matches the light emission spectrum, which must be a ZPE phenomena [12]. The effect of torsion field on nuclear reactions along the axis of vortex should be taken into consideration for the low ratio of the nuclear products of  $n/T$  due to spin polarization of reaction particles.

The axion model and Primakoff effect are proposed for explanation of nuclear transmutation without noticeable gamma radiation. Many laboratories in world have been engaged in several experiments to search for axions, light neutral pseudoscalar particles yet to be discovered. The axion would be produced in the solar core through the Primakoff effect if its mass is a few electronvolts and could be detected in the laboratory

### III. CONCLUSION

Researchers of new energy study of “cold fusion” type should pay great attention to the general processes of electrolysis to find the key points, which could play major role in the transit form the electrochemical processes to processes of torsion and the nuclear processes. From the authors’ point of view, the evolution of double layers is of importance to understand the anomalous effect, typically on the protrusions of cathode. The change of space-time near the tips due to torsion field generated is expected to delivery the zero-point energy, and dynamic Casimir effect for the evolution of gas bubbles on the tips are expected to generate photons and excess heat [1]. The yields of transmutation products are related to the current distribution on the cathode surface. The cathodes of thin wire were benefit to the generation of nuclear reactions and excess heat for electrochemical systems. Careful examination of the evolution of electrochemical double layer will lead to a good understanding of pitting corrosion with electrochemical noise, and further to recognize the anomalous excess heat and nuclear reactions.

Heat after death was observed in many laboratories. It is believed that the persistence behaviors of torsion field could be used to explain such anomalous phenomena. The contact between beads coated with a thin metallic layer or multilayered film and palladium black particles could be regarded as point-contact similar to the tip-effect [13]. We may say that, it is expected to reveal the puzzles of the mechanisms of high- $T_c$  superconductivity with pinning vortices by torsion field theory [14,15].

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