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Short Communication

Catalytic Oxidation-like Nuclear Nano-fusion; Fractal Involving of Room Temperature Magnetically Induced μ-Catalyzed Fusion

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Abstract

The nuclear fusion reaction can be catalyzed in a suitable fusion fuel by muons (heavy electrons). "For the fractal relations, ranging from DNA knots to solar neutrino flux signals", ever derived of scale-invariant properties distinguished between classical invariant theory & quantum invariant theory subfactors. Accompanying isomorphic & Connes FusionTensor Product retrieved to μ-catalyzed fusion where surroundings of room temperature fusion driven by the balance in mtDNA fusion & fission. On behalf of the nanometer dimension of the radius of heavy electrons & wavelength of UV-light, it assumed that muons can be produced by oxidation-like decay when UV-light impinging water.

More Information

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Introduction

The nuclear fusion reaction can be catalyzed in a suitable fusion fuel by muons (heavy electrons), which can temporarily form very tightly bound mu-molecules [1]. Muons can be produced by the decay of negative pions, which, in turn, have been produced by an accelerated beam of light ions impinging on a target. Muon-catalyzed fusion is appropriately called "cold fusion" because nuclear fusion also occurs at room temperature.

Ever derived of similar Hamiltonian concerns in Random Field Ising Model/RFIM in external field, for Connes Fusion Tensor Product and Photon Gluon Fusion sought "dynamic behavior driven by the balance in mitochondrial fusion & fission [Carveney, 2007] whereas between fusion and superconductors laid "electricity" as well as comprising photo/magneto chemistry. Accompanies "the energy thus produced is enormous, and because deuterium is very cheap in the form of heavy water (less than US $ 1/gm), the fuel cost for this process is very low indeed (less than 1 cent per KwH)"[2, 3].

Between CFTP & PGF

In plasma physics, plasmas which are ionized gases must meet three conditions for fusion to occur, including reaching sufficient temperature, density, and time- that is the Lawson criterion and the fusion reaction such as $1H_1 + 1H_1 \rightarrow H_2$ is algebraic.

As found in von Neumann algebra in infinite-dimensional Hilbert space, distinguished between classical invariant theory &quantum invariant theory subfactor described the subfactor theory & Witt-algebra [4], explained about Connes Fusion Tensor Product/CFTP related the Connes fusion as corresponded to the composition of homomorphism [5]:

I. Classical tensor product O-X adds the changes

II. Relative tensor product H-X preserves the changes, followed by natural isomorphism.

Photon Gluon Fusion/PGF is defined: "The photon is the gauge boson of quantum electrodynamics/QED, the simplest of all boson" devoted to a boson star at a finite temperature [6].

Quotes "the isomorphicity of these module spaces for general G "also defined Conformal Field Theory as "quantum field theory which is invariant under conformal transformation & in 2D there is infinite-dimensional algebra. Alain Connes states themselves the Connes fusion as "associative tensor operation" to be in coincidences.

There is hypnotized whereas there is no similar evidence between fusion in tensor product and nuclear reaction in hydrogen isotope.

Multifractals in Hamiltonian similarity

Fractal evidence at least occurs in exciton fusion kinetics in isotopic mixed crystals modeled by Monte Carlo random walks on random binary lattice [7].

In "Fields, Fractals & Flares..', 2009, Paul A. Conlon depicts fractal relations, ranging from DNA knots to solar neutrino flux signals. Especially to mtDNA comprise fusion &fission mechanism, "fractal characters showed through fluorapatite in gelatin-based bio-nanocomposite" [8].

Beside Macek: "Fractals &Multifractals "[9] and Tamas Tel: "Fractal, Multifractals & Thermodynamics"- [10] herewith succeed to retrieves "fractal-like relevant phase-space" [*ibid.*, 590], proposed multifractal neutrino as nominally identifies as well as "meson" for Hideki Yukawa's heavy quantum.

Of similar Hamiltonian concern in Random Field Ising Model/RFIM in the external field sought in [11]:" in an earthquake, it is an energy release and in case of a ferromagnet, it is the size of the domain flips" where one more site became unstable causes an avalanche of the spin flips.

"The multifractal structure underlying a self-similar measure stems directly from the weighted self-similar system which is used to construct the measure [Santiago, et al. 2013]. Accompanied by "fractal string", instead there were proved for instance of geometric engineering [12], whereas also obtained "Nekrasov partition functions of 5d gauge theories engineered by webs of 5 branes [13]. Nevertheless, after B. Szendroi [14] retrieved "the CHO cell line was engineered to be resistant to the antibiotic hygromycin [Hph R]" precedes by "such hybrids are established by fusion of a primary cell with a transformed cell derived from the same species & tissues"- [15] (Table 1).

[resumed from Steven Jones: Muon-catalyzed fusion revisited", CERN Courier, December 1984, h 439] [17].

To μ-catalyzed fusion where climate-controlled surrounding of room temperature superconductors & fusion meets, sought muon produced from proton/pion and α-particle [Helium nuclei] sticking not yet understood henceforth proposed "μ-catalytic nano-fusion" as μ-catalyzed fusion of bio-nanohybrid composite materials whereas inherently not yet exploited.

We introduce muon catalytic nano-fusion because the size of "mu-atom" (e.g. a hydrogen atom in which the electron is replaced by a muon) is of the order of the Bohr radius of the muon, given by

Table 1: RFIM to μ-catalyzed nano-fusion.

Predicted	1948	Frank & Sakharov
Observed	1956	Luis Alvarez
muon formed	deuteron-triton-muon	10**-12 s
Observed	molecular formation	10**9/s
Room temperature	80 fusions/muon	Jackson, Wyoming

$a_\mu = [M_e/M_\mu]\, a_e = 2.6$ nm

a_e is the Bohr radius of an electron atom and the order of the wavelength of UV-light is of the order of 10 nm therefore found a catalytic condition to compare

$<\psi_a | H_o | \psi_a > E_1 + e^2/r + [\ldots]$

$[\ldots] = [1/R]\,[1 - exp\,(- 2\,R/\,a_o)\,[1 + (R/a_o)]]$ [18] with

$$(-)[\ldots] = [1/R]\,[1 + exp(- R/a_o)\,[1 - (R/a_o)]] \qquad (1)$$

with first-order in αZ.

The binding energies of the mu-atom are two orders of magnitude larger than the corresponding binding energies of the electronic atoms, while the radii of the Bohr orbits are two orders of magnitude smaller. For example, the radius of the 1*s* level of a "lead muon" is 4 fm (1 fm = 10^{-13} cm), which is smaller than the 7-fm nuclear radius of lead. From this example, it is evident that one has to take relativistic effects into account. In this case, the Dirac equation yields the following expression, to the first order in αZ, for the muonic energy levels:

$$E_{nj} = -m_\mu c^2 (\alpha Z)^2/2\,n^2\,[1 + (\alpha Z)^2/n^2\,\{(n/(j + ½)) - (3/4)\}]\ [1]$$

$$= -m_\mu c^2 (\alpha Z)^2/2\,n^2\,[1 + (\alpha Z)^2/n^2\,\{1 - (3(j + ½)/4n\,)\}] \qquad (2)$$

The second term of eq (2) can be seen as the expectation value of the second term in eq (1) since according to Boltzmann-Gibbs law of equilibrium, the probability P (ε) of finding a physical system or sub-system in a state with energy ε[16]

$$P\,(\varepsilon) = c\,e^{-\varepsilon/T} \qquad (3)$$

Since the expectation value of any physical variable x

$$< x > = \sum_k x_k\, e^{-\varepsilon}k/T\ /\ \sum_k e^{-\varepsilon}{}_k/T. \qquad (4)$$

They can be written as:

$$\ln \exp(-2R/ao)[1 + (R/ao)] = \ln\,(\alpha Z/n)^2\,[1 + (3(j+1/2)/4n)] \quad (5)$$

Whereas if we take Taylor expansion of ln x = (1 – (1/x)) we have

$$(-2R/ao)[1 + (R/ao)] = [1 - (n/\alpha Z)^2\,][1 + (3(j+1/2)/4n)] \quad (6)$$

After we conclude that (1/x) s convergent, through mathematical induction we see (1-(1/x)) shows fractals also occur in muon-catalyzed fusion furthermore we used FeSb as cathode & quantum material of magnetically induced muon-catalyzed fusion, not only in exciton fusion.

For Heisenberg uncertainty between energy and time

$\Delta E \sim 1/\Delta t$ we took fractality $\nabla_f = 1/\,f$.

Muons can be produced by the decay of negative pions, which, in turn, have been produced by an accelerated beam of light ions impinging on a target. It assumed that muons are produced by oxidation-like decay when UV light impinging water.

The current status of muon-catalyzed fusion is limited to demonstrations of scientific breakeven by showing that it is possible to sustain an energy balance between muon production (input) and catalyzed fusion (output). Conceptually, a muon-catalyzed fusion reactor is seen to be an energy amplifier that increases by fusion reactions the energy invested in nuclear pion-muon beams. The physical quantity that determines this balance is the number of fusion reactions each muon can catalyze before it is lost.

Conclusion

Descriptively, this can be proposed μ-catalyzed nanofusion in the growing theory of room-temperature cold fusion. Based on their nanoscale dimension, any new account of μ-catalytic nanofusion activated by UV light is taken. Ought to be studied the inherent meaning of ConnesFusionTensor Product, a fusion of a primary cell & cold fusion itself where fractals occur in exciton fusion.

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