Innovative Approach

ENERGY GENERATION PROCESSES AND COLD NUCLEAR FUSION IN TERMS OF SCHRODINGER EQUATION

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Abstract:Proceeding from the complete Schrodinger equation at small energyes the classic variable charge particle motion equation has been obtained, the later providing a good explanation for CNF and the excessive energy.

In earlier works [1,2] an approximate motion equation for an individual oscillating charge particle was proposed. It adequately explains both the cold nuclear fusion phenomena [13,14] and the anomalous excessive energy [12] occurrences of a mysterious origin being observed in experiments of a number of researchers. Yet, the said equation has resulted from purely heuristic reasoning, not in rigorous terms, when determining the electric charge value and the fine structure constant [9,10] on the basis of the Unitary Quantum Theory (UQT). This invited right criticism of many research workers and caused personal deep dissatisfaction. Further it will be shown that the above equation may follow directly from the Schrodinger's equation for small energies.

Let us consider the entire Schrodinger's equation:

$$\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\Psi(x,t) + i\hbar\frac{\partial}{\partial t}\Psi(x,t) = \mathrm{U}(x)\Psi(x,t) \; ; \qquad (1)$$

Its solution is to be expressed in wave function terms:

$$\Psi(x,t) = \cos(kx)\int \exp[i\,\mathrm{tg}(\phi)]dt \; ; \qquad (2)$$

where
$$\phi = \frac{mt}{2\hbar}\left(\frac{d\,\mathrm{x}(t)}{dt}\right)^2 - \frac{m\,\mathrm{x}(t)}{\hbar}\frac{d\,\mathrm{x}(t)}{dt} + \phi_0 \; ; \qquad (3)$$

where ϕ_0 is an initial phase, x is an independent variable, and x(t) represents a non-related to x as yet unknown function which, as will be shown below, turns out to be a time-dependent coordinate. By substituting the latter into the Schrodinger's equation we arrive at:

$$i\hbar^2k^2\int \exp[i\,\mathrm{tg}(\phi)]dt + 2im\mathrm{U}(x)\int \exp[i\,\mathrm{tg}(\phi)]dt + 2\hbar m \exp[i\,\mathrm{tg}(\phi)] = 0 \qquad (4)$$

At small energies the value $\hbar^2k^2 \ll 2m\mathrm{U}(x)$, the first integral being neglected. Having differentiated the resulting equation with respect to time and having reduced the common exponential factor we come to:

$$2\,U(x)\cos^2(\phi)+2mt\frac{d\,x(t)}{dt}\frac{d^2\,x(t)}{dt^2}-m\left(\frac{d\,x(t)}{dt}\right)^2-2mx(t)\frac{d^2\,x(t)}{dt^2}=0 \qquad (5)$$

It is evident that for short time stretches (or for small energies at elastic interactions when the velocity changes are small) the member $x(t) \approx t\,\frac{d\,x(t)}{dt}$. Then the second and third terms are reduced and we obtain the following:

$$U(x)\cos^2(\phi) = \frac{m}{2}\left(\frac{d\,x(t)}{dt}\right)^2 \qquad (6)$$

It is clearly seen that the left term is the potential energy oscillating according to the harmonics law, whereas the right one represents the conventional kinetic energy. Yet, the potential energy doesn't transform into the kinetic one as is the common case in the conservative systems of conventional mechanics. If one relates the potential energy oscillations to those of the electric charge existent in the Unitary Quantum Theory [3-11], as the potential energy always stands in direct proportion to the electric charge value, then one arrives at the oscillating charge equation of conventional mechanics. But in this case one's reasoning would naturally proceed from the necessary assumption on substitution of the independent variable x for the function $x(t)$

Proceeding from this equation, by way of differentiation, one can readily come to the same oscillating charge equation of motion, the latter having been obtained [1,2] heuristically within the Unitary Quantum Theory based on quite different reasons.

$$m\frac{d^2}{dt^2}\mathbf{r} = Q\,\mathbf{GRAD}(U)\cos^2\varphi\,; \quad \text{where} \quad \varphi=\frac{mt}{2\hbar}\left(\frac{d\mathbf{r}}{dt}\right)^2-\frac{m\mathbf{r}}{\hbar}\left(\frac{d\mathbf{r}}{dt}\right)+\phi_0 .$$

Let us clear up the validity of the resulting 1- st order equation (6). At first, we shall consider the motion within the plane condenser field. Let us insert the potential $U(x) = G\,x(t)$:

$$G\,x(t)\cos^2(\phi)+\frac{m}{2}\left(\frac{d}{dt}x(t)\right)^2 = 0 \qquad (7)$$

We shall look for a particular solution in the form of $x(t)=at^2$. Having substituted this solution into the equation (7) we arrive at:

$$at^2\left(G\cos^2\phi_0+2am\right)=0 \qquad (8)$$

One can see clearly that the acceleration may be chosen to satisfy the equation. The motion will take place with the acceleration value of:

$$a = -\frac{G\cos^2\phi_0}{2m}$$

An interesting fact is discovered: the acceleration generated in one and the same field is dependent upon ... the initial phase ϕ_0.

Let us consider now the diffusion motion within the dipole field $U(x) = -G/x(t)^2$, for which there is also a well-known analytical solution.

The substitution of the particular solution $x(t) = r\sqrt{t}$ will result in:

$$\frac{1}{8tr^2}\left\{-8G\cos^2\left(\frac{3mr^2-8\hbar\phi_0}{8\hbar}\right)+mr^4\right\}=0$$

This transcendental equation will have a non-analytical decision, as the 4-th degree parabola will always intersect with the cosine squared. And again, the velocity of the resulting motion will depend upon the initial phase ϕ_0.

Unfortunately, at this point the possibility to solve these equations analytically seems to be exhausted.

In all the solutions the coordinate, velocity or acceleration is always dependent upon the initial phase value ϕ_0. As illustrated by the given examples, at some phase values the motion equations are in conformity with the energy conservation laws and are the same as within conventional mechanics, whereas at other phase values the motion will be different and, consequently, there is violation of the energy conservation law: the particle may gain or lose energy. The same phenomenon is true for the harmonic oscillator, which has been revealed at first numerically in [1,2], and both the cold nuclear fusion and the energy generation mechanisms in their considered approximation follow directly from the Schrodinger's equation. It is well-known, that the energy conservation laws are non-existent if the potential function is time-dependent. It should be noted that even in the conventional quantum mechanics the energy conservation laws are observed within the accuracy of uncertainty correlation. Previously it was shown numerically [1,2,13] that if one sums up the energy or momentum for an assembly of particles throughout all the phases, the resulting energy and momentum will be preserved which is the case in quantum mechanics, because it always regards particles in assemblies.

The energy conservation laws hold true only in selection of the initial phase particular value, which proceeds clearly from the equation's translational properties. Thus, the given examples prove the soundness of the earlier used approach and the validity of the oscillating charge motion equation, having been previously obtained heuristically on the basis of absolutely different assumptions.

We shall regard now the problem of the cold nuclear fusion. Let us express the equation of motion for two nuclei with charges Q and q. Let the heavy nucleus possessing the charge q be at rest, and let the other nucleus move in its direction with the velocity V from the point at the distance A. Then the equation of motion for the head-on collision may be expressed in the following way:

$$m\mathrm{x}(t)^2\frac{d^2}{dt^2}\mathrm{x}(t)=Qq\cos^2\varphi \quad \text{where} \quad \varphi=\frac{mt}{2\hbar}\left(\frac{d\mathrm{x}(t)}{dt}\right)^2-\frac{m}{\hbar}\mathrm{x}(t)+\frac{d\mathrm{x}(t)}{dt}+\phi_0; \qquad (9)$$

The accurate analytical solution for the above equation is hardly possible, yet, one may obtain a 4-th order series expansion of its solution:

$$\mathrm{x}(t)=A+Vt+\frac{Qq\cos^2\delta}{2mA^2}t^2-\frac{QqW\cos\delta}{6A^3m\hbar}t^3+\mathrm{O}(t^4)$$

where $W=\hbar V\cos\delta-mAV^2\sin\delta+2\hbar mAV^2\sin\delta+2Qq\hbar\cos^2\delta\sin\delta$;

$$\delta=\frac{mVA}{\hbar}-\phi_0.$$

Restricting our consideration by the first three terms of the obtained solution, we can find out that minimum $\mathrm{x}(t)$ occurs at:

$$t = -\frac{mVA^2}{Qq\cos^2\delta}$$

Then the minimal distance for which the nuclei will approach each other will be equal to:

$$x_{\min} = A - \frac{mV^2A^2}{2Qq\cos^2(\frac{mVA}{\hbar} - \phi_0)}$$

It is evident that by choosing the initial phase value at no matter how small energies and at any nuclei charge values, the minimal distance between the nuclei may be made no matter how small. This was shown numerically for the first time in [1,2]. Consideration of the next (cubic) component would not entail any principal changes in the solution and, therefore, is not cited here in because of its being too cumbersome. Such nuclei transmutations have been frequently observed. It is clear now that cold nuclear reactions may take place at any nuclei charge values. Naturally, the phase precipice width [13] will diminish in direct proportion to the charge value increase.

Full of mystery is a well-known energy shortage problem being observed in a number of bio-chemical reactions with enzymic participation. For instance, the well-studied polysaccharides breakdown reaction in the presence of a lysozyme involves the following: the polysaccharide molecule gets caught into a special cavern within the big lysozyme molecule, the remains of the former being thrown away after some time. In so doing the polysaccharide ties break energy is of the order of 5 eV, whereas the heat movement energy does not exceed 0.025 eV. Where the lysozyme takes energy for breaking the polysaccharide is still unclear. No satisfactory mechanism to explain this type of reactions (which are rather numerous) had been proposed and all these phenomena, as the physicists say, have been "swept under the carpet". Most intriguing is the fact that in all these cases (CETI elements, proton-conducting ceramics, cavitation devices of the Griggs-Potapov type, sonoluminescence, electric motors with new magnetic ceramics, etc.) the energy generation can be explained neither by chemical reactions nor by phase transitions. Sometimes these phenomena are accompanied by nuclear reactions (which is, in fact, impossible), but even the latter can be responsible only for a hundredth portion of the generated heat energy. Doubtless, all these phenomena belong to new physics, because their explanation is impossible in terms of rigorous science.

The energy generation processes may possibly help to explain the anomalous excess heat production phenomena occuring in proton-conducting ceramics, CETI elements, nickel electrolysis in light water, cavitation bubbles, hydrated metals, fermentative chemical reactions, etc. In such systems the proton (or some other particle), being incorporated into some kind of a cavity (potential well), will each time be reflected from its wall with the velocity greater than that of falling and take energy from the vacuum (the "maternity home" solution) [12].

It is most curiouse that if the magnetic momentum oscillates alongside with the electric charge (which, of course, must take place in UQT), then the solution of the problem of their orientation is reduced to similar equations and thus it makes possible to obtain energy from vacuum with the help of permanent magnets. There is an impression that these phenomena are observed in experiments. If Nature is actually designed so that there are no energy conservation laws for an individual particle, but there is one for an assembly of particles, then the generation of pollution free energy may be viewed as a relatively simple task both from theoretical and technical viewpoint as compared to hot nuclear fusion. Thus the mankind will be saved from energy shortages forever. Look for the detailed discussion of energy conservation problem in earlier publications [12].

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