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Angle of Electron Winding

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Abstract— *It is demonstrated that corpuscular interactions flow along the potential gradient (principle of adding reciprocals of energies), and wave processes – against the potential gradient (principle of algebraic addition of energies).*

Keywords— potential gradient, quantum transitions, corpuscular-wave dualism.

I. INTRODUCTION

The paper [1] shows:

1. In the systems in which the interactions proceed along the potential gradient (positive performance) the resulting potential energy is found based on the principle of adding reciprocals of the corresponding energies of subsystems [2]. Similarly, the reduced mass for the relative motion of two-particle system is calculated.
2. In the systems in which the interactions proceed against the potential gradient (negative performance) the algebraic addition of their masses as well as the corresponding energies of subsystems is performed (by the analogy with Hamiltonian).

From the equation (10) it is seen that the resulting energy characteristic of the system of two material points interaction is found based on the principle of adding reciprocals of initial energies of interacting subsystems.

"Electron with the mass m moving near the proton with the mass M is equivalent to the particle with the mass: $\mu = \frac{mM}{m+M}$" [3].

Therefore when modifying the equation (10), we can assume that the energy of atom valence orbitals (responsible for interatomic interactions) can be calculated [4] by the principle of adding reciprocals of some initial energy components based on the following equations:

$$\frac{1}{q^2/r_i} + \frac{1}{W_i n_i} = \frac{1}{P_E} \quad \text{or} \quad \frac{1}{P_0} = \frac{1}{q^2} + \frac{1}{(Wrn)_i};$$

$$P_E = P_0/r_i \qquad (11),(12),(13)$$

Here: W_i – electron orbital energy [5]; r_i – orbital radius of i–orbital [6]; $q=Z^*/n^*$ [7], n_i – number of electrons of the given orbital, Z^* and n^* – nucleus effective charge and effective main quantum number, r – bond dimensional characteristics.

For a free electron $P=P_e=Wr$, where W = 0,510034 MeV = 0,81872 J.

As the dimensional characteristic, we used the value of electron classic radius $r = 2{,}81794\cdot10^{-15}$m and, therefore, $P_e = 2{,}30712\cdot10^{-28}$ J·m.

II. ACT OF QUANTUM ACTION

The formalism of equations (10,11,12) is not principally new. Already in 1924 the following equation was obtained based on Compton's effect:

$$\frac{1}{h\nu'} = \frac{1}{h\nu} + \frac{1-cos\theta}{mc^2} \qquad (14)$$

Here: hν' – energy of scattered photon, hν – energy of incident photon, mc^2 – own energy of electron, Θ – scattering angle. At the same time, the energy of photons decreases by the value additionally obtained by the electron. In this way the act of quantum action takes place, resulting in the energy redistribution between the corpuscular and wave properties of the interacting systems.

It is even easier, if the action proceeds during the interaction of the pair of similar particles. During the interaction along the potential gradient (corpuscular mechanism) the resultant energy $W_k = \frac{W}{2}$. If this process goes against the gradient (wave movement), the total energy $W_w = 2W$. The ratio between them $\frac{W_w}{W_k} = 4$.

Electric current is the motion of electrons along the potential gradient. If we assume that the magnetic field generated by them is the wave process, the ratio between the electric and magnetic constants needs to contain this digit 4, which is confirmed in the following empirical equation:

$$h = \left(\frac{4+2\alpha}{2\pi}\right)^2 P_e \frac{\varepsilon}{\mu} \qquad (15)$$

Her: ε – electric constant, μ – magnetic constant, h – Plank's constant, α – fine structure constant – parameter characterizing the interactions of quantum electron-positron and electromagnetic fields. Number π is determined by the ratio between the rotational motion (circle perimeter) and translational motion (length of diameter).

The percentage error of calculations in this equation is about 0.06%.

The proportionality coefficient in the equation (15) has the velocity dimensionality (m/sec) for the ratio (F/Hn),

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i.e. in such way the rate of energy redistribution in the system "particle-wave" is characterized.

Therefore, the act of quantum action expressed via Plank's constant is narrowed to the energy equilibrium-exchange redistribution between the corpuscular and wave processes.

Generalizing the formalism of equations (10,15) onto all other interactions flowing along the potential gradient, we can make the conclusion that corpuscular processes take place in these cases, and wave dualism corresponds to the interactions against the potential gradient.

III. ANGLE OF ELECTRON WINDING

It is known that a particle can have three main motions: translational, rotational and oscillatory. But quantum mechanics does not consider the issue of electron trajectory as we can speak only of the possibility of its location in the given point in space.

But an electron also moves if this translational motion goes along the potential gradient, then it correspond to corpuscular process, and rotational motion – to wave one. The correlation of these energy redistribution acts depends on the values of initial energy criteria of the subsystems. During quantum transitions these can be orbital bond energies of the corresponding levels.

Thus, the main parameters of quantum transitions are as follows:

1. Energy of electromagnetic wave of quantum transition following Plank's equation $E = h\nu$, where ν – electromagnetic wave frequency. In such way the oscillatory motion demonstrates itself in quantum transitions, since the electromagnetic wave itself is the process of distribution of the corresponding oscillations.
2. Difference of bond energies of electrons on different energy level of transition: $\Delta W = W_2 - W_1$.
3. Resultant energy of their corpuscular interaction:

$$\frac{1}{W_k} = \frac{1}{W_1} + \frac{1}{W_2} \qquad (16)$$

Let us consider some macroprocesses important in this case. The silkworm winds the natural (organic) silk thread only at a definite rotation angle. In cosmonautics the cellulose-viscose thread is wound around the metal cylinder of the spaceship following the special technology, and, what is important, at the same winding angle as the silkworm. The spaceship becomes most durable, more technologically high-quality and lighter [4]. We can also speak of other examples of such phenomenon.

This angle (mainly as applicable to organic systems) was called the geodesic angle: $\varphi_g = 54.73^o = 54^o44'$.

In a general case, the winding angle (Θ) is the angle between the geodesic line and vector of rotational motion. The geodesic line is the shortest distance between two points in a geometric figure of rotation. Besides, planets are also rotating around the sun along the geodesic line. For five primary planets the angle between the axis of rotation and orbit equals from 62^o up to 66.5^o. The earth Θ, apparently taking into account also the moon influence, is $66^o33'$. The sun has the same value Θ. In astronomic terms: obliquity of the sum ecliptic and obliquity of the earth equator to the orbit are numerically the same and equal $22^o27'$. Isn't it the reason of special efficiency of solar action on the earth biophysical processes?

Nitrogen, oxygen, hydrogen and, most important, carbon are the main elements of organic materials. Carbon is a specific element, capable of easier hybridization of atomic orbitals with the quantum transition 2s-2p. Therefore, when temperature and pressure rise, the conditions for such hybridization of carbon atoms are formed in organic materials, and this, apparently, takes place in the winding technique in spaceships. And in the silkworm, the same way as in many other natural processes, the corresponding fermentative reactions take place, on which we are still learning how to work.

To calculate Θ and φ_g we use the formalism of Compton equation (14), modifying it as applicable to quantum transitions:

$$\frac{1}{h\nu} - \frac{1}{W_K K} = \frac{1-\cos\theta}{\Delta W} \qquad (17)$$

By this equation the difference of energies of wave and corpuscular processes numerically equals the difference of bond energies of electrons on the corresponding orbitals, but when implementing the addition principles (in this case – deduction) of reciprocals of these parameters and taking into account the quantum geometry of transitions. In accordance with the law of energy conservation, this is the process of its redistribution during the quantum action. Angle Θ is the angular vector of electron movement, which is quantized by integer number (K) via the square tangent of this angle: $tg^2\varphi_g = 2$; $tg^260^o = 3$; $tg^245^o = 1$.

The calculations by the equation (17) are given in Tables 2 and 3. At the same time, the values of the angle Θ are mainly correlated with the value $\varphi = \frac{h\nu}{W_k}$ in compliance with Table 3.

The notions of breaking stress in the process of plastics stretching by its winding pitch are used in papers [8,9,10]: σ_α – axial, σ_β – circumferential stress, which are replaced by the value N_α – axial "effort" and N_β – circumferential

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"effort" proportional to them. At the same time, the following equation is fulfilled:

$$\frac{\sigma_\beta}{\sigma_\alpha} = \frac{N_\beta}{N_\alpha} = tg^2\varphi_g = 2 \quad (18)$$

Table.2: Energies of quantum transitions

Atom	Transition	W_1 (eV)	W_2 (eV)	ΔW (J)	W_k (J)	λ (A^0) by [13]	$h\nu$ (J)
C (IV)	2s-2p	19.201	11.792	11.871	11.705	1549	12.824
N (V)	2s-2p	25.724	15.445	16.469	15.462	1238	16.046
O (VI)	2s-2p	33.859	17.195	26.699	18.267	1031	19.267
Al (III)	3s-3p	10.706	5.7130	7.9997	5.9886	1854	10.7145
Si (IV)	3s-3p	14.690	8.0848	10.583	8.3554	1393	14.260
C (III)	$2s^2$-2s2p	19.201·2	19.201+11.792	11.871	27.480	977	20.332
N (IV)	$2s^2$-2s2p	25.724·2	25.724+15.445	16.469	36.638	765	25.967
Si (III)	$3s^2$-3s3p	14.690·2	14.690+8.0848	10.583	20.557	1206	16.4715
Al (II)	$3s^2$-3s3p	10.706·2	10.706+5.7130	7.9997	14.889	1670	11.895

Table.3: Quantization of the geometry of structural transitions

Atom	Transition	$\varphi = \frac{h\nu}{W_k}$	<φ>	K	Θ°	<Θ>	$<\frac{4}{3}\Theta°>$	Functions of square tangent (k)
C (IV)	2s-2p	1.0956	60.9°	2	54.45°	60.02°	-	$tg^2\varphi_r = 2$
N (V)	2s-2p	1.0377		2	59.67°			
O (VI)	2s-2p	1.0547		2	65.93°			
Al (III)	3s-3p	1.7951	$\varphi_r° + 45.47°$ =100.2°	3 = 2+1	45.45°	46.2°	61.6°	$tg^260° = 3$
Si (IV)	3s-3p	1.7067		3 = 2+1	47.02°			
C (III)	$2s^2$-2s2p	0.7399	43.1°	1	31.97°	31.7°	42.27°	$tg^245° = 1$
N (IV)	$2s^2$-2s2p	0.7087		1	35.38°			
Si (III)	$3s^2$-3s3p	0.8013		1	29.27°			
Al (II)	$3s^2$-3s3p	0.7589		1	30.17°			

"This condition allows obtaining the equally tensioned system of threads with the minimal item weight" [9].

The quantum functions of square tangent k = 1, 2, 3 numerically determine the ratios of two triangle legs, whose values characterize energy dependencies via axial and circumferential stresses in the system with quantum and wave processes.

From Table 3 it is seen that quantum transitions of 2s-2p type for carbon atom, as distinguished from all other elements, are not accompanied with the changes in geodesic angle and coefficient k. Obviously, this property predetermines the unique features of the winding geodesic angle influence on the biosystems stability. Besides, in all transitions (except for 2s-2p) the correlation $\varphi \approx \frac{4}{3}\Theta$ is fulfilled, which proves that such coefficient mainly compensates structural features of more complex transitions.

Some difference between the values of the angles φ and Θ or φ and $\frac{4}{3}\Theta$ is obviously determined by the effect of particle scattering around the main coordinate axes. Similarly, at the conformation of cellular structures the particles are statistically concentrated along the coordinate axes of hexagons with the deviations by 2.6°; 4.4° and 7.9° (Fig. 1 [11]).

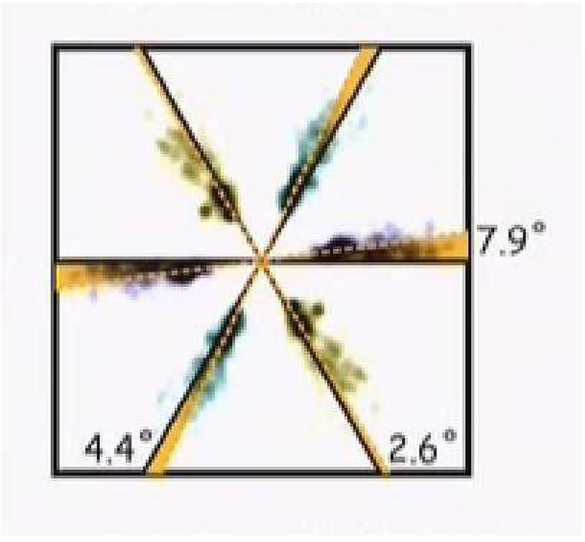

Fig.1: Statistic distribution of the cell number along the coordinate axes [11]

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The average number of such deviations equaled to 4.97 approximately corresponds to the difference $60^o - \varphi_g{}^o = 5.27^o$.

The dynamics of hexagonal formation of cellular systems is in compliance with the established [12] condition of approximate equilibrium of spatial-energy characteristics of the subsystems by all bond lines. This is also facilitated by the fact that biosystems with elements of the second period in their structure produce the winding angular vector (Ѳ) of 60^o.

IV. CONCLUSIONS

1. Two principles of adding energy characteristics of structural interactions can be transformed onto the processes of corpuscular-wave dualism.
2. It is assumed that in the process of rotational-translation motion of the electron the energies redistribute in the system "particle-wave", which is demonstrated via the angular vector of such motion (winding angle).

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