SPIN ELECTRON CONDENSATE. SPIN NUCLIDE ELECTRON CONDENSATE

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Abstract. **Atomic electrons pair in orthobosons in a strong magnetic field. In orthoboson, the spins of the electrons are parallel S = 1, and their energies are equal. The atomic electron orthobosons form a Bose-Einstein spin electron condensate, in which the magnetic moments of electrons are directed in one direction. Such an atom is called the transatom. The magnetic moments of electrons generate a giant, directed, inhomogeneous and anisotropic magnetic field inside and outside the transatom. This field interacts with the magnetic and orbital moments of the protons and neutrons of the atomic nucleus and changes the structure of the latter and turns the atomic nucleus into a transnucleus. A transnuclear transatom is a spin nuclide electron condensate. This is a new state of matter, based on the properties of that matter we can create new technologies.**

Keywords: **quantum physics, atomic physics, nuclear physics, spin Bose–Einstein condensate, low energy nuclear reactions, spintronics, abnormal phenomena**

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Contents

1. INTRODUCTION

The concept of the spin nuclide electron condensate (SNEC) is associated with the creation of the theory of low-energy transmutation of chemical elements (transformation of some elements into others, then transmutation). Transmutation reactions occur in a weakly excited condensed medium [1-5]. Numerous and diverse, simple and complex experiments on low-energy transmutation of chemical elements demonstrate the obviousness of those processes. This article gives a brief description of the possibility of the existence of spin electron and spin nuclide electron condensates. Their properties and possible technologies based on these properties are discussed.

The main property of transmutation reactions is that “extraneous” chemical elements appear in their products, which were absent in initial material prior to beginning of said processes. In addition, in the reaction products there is an increased yield of some elements and groups of elements and a different ratio of isotopes of chemical elements that is different from the natural ratio.

The isotopes of elements obtained in transmutation reactions are non-radioactive. During the course of these reactions, γ- and β-radiation were also not detected. In special experiments with radioactive isotopes, their transformation into stable isotopes is demonstrated.

Other peculiarity of transmutation process is the registration in them of excess heat (in some experiments, electrical) energy, the value of which cannot be explained by chemical reactions.

It is noted that in transmutation reactions occurring in relatively element-light medium, along with "extraneous" light elements, heavy elements are produced that cannot be obtained in pairwise, nuclear reactions. Moreover, in some experimental methods, the yield of transmutation products reaches tens of percent of the total mass of the condensed medium, which is incomparable with the yield of products in conventional nuclear reactions. Thus, it should be assumed that in the transmutation reactions there occurs interaction of many atoms simultaneously, and, accordingly, of many nuclei. The latter means that atoms should attract each other, and the structure of atomic electron shells should automatically lead to the approach of nuclei to the distances of the nuclear forces and the beginning of the processes of nuclear transformations. In this case, the probability of nuclear reactions becomes equal to the probability of atomic transformations.

Thus, it becomes obvious that in order to carry out low-energy transmutation reactions, it is necessary that the structures of atoms and nuclei change dramatically. The simplest and most known way to change the structure of electron levels in an atom is to place the latter in a magnetic field.

2. ELECTRONIC OSCILLATIONS. FORMATION OF TRANSATOM

For clearness, the Bohr concept of elliptic motion of electrons in a plane will be used in reasoning and drawings. The internal electron orbitals of the atom, in the absence of a strong magnetic field, do not have a constant orientation in outer space, since they precess under the action of other charges and cease to lie in one plane. The electron moves around the nucleus not in a plane, but along a trajectory similar to "thread in the clew" [6]. Therefore, in spite of the fact that the orbital moments for *p, d* ... of electronic states differ from zero ($\ell \neq 0$), the medium values of orbital moments for *x, y* and *z*-components are equal to zero: $(0|\ell_x|0) = (0|\ell_y|0) = (0|\ell_z|0) = 0$. Because of this, first, the magnetic field created by orbital motion of an electron is zeroed, and, secondly, the forces of Coulomb repulsion between atomic electrons do not have a preferred direction, their medium values for the *x-, y-*, and *z*-components are equal to zero.

In a strong external magnetic field, apparently, more than 30 *T*: First, *ℓ-s* and *j-j* bonds of each electron in the whole atom are torn apart, not only on external but also on internal orbitals. **Fig. 1**a shows the splitting of energy, electronic levels in the sodium atom. The external magnetic field **B**, which has a constant orientation, rigidly aligns electron orbitals with respect to its direction in accordance with their orbital magnetic moments. The average values of the orbital moments for *x-, y-* and *z*-components cease to be zero. The orbital and orbital magnetic moments of electrons precess around the magnetic field **B**. The orbital magnetic moments create their own magnetic fields, rotating around the field **B**. Fig. 1b shows schematically two orbitals with equal orbital moments ℓ and their projections m_ℓ on the

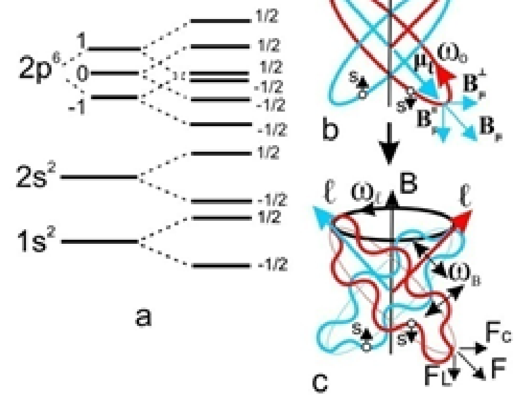

Fig. 1. *a - sodium electronic shell in strong magnetic field* **B**, *b - precession of orbitals, c - electron oscillations.*

Z axis parallel to **B**, but with different directions of electron spins $s = \pm 1/2$.

Secondly, the Coulomb repulsive forces, which forced, in the absence of field **B**, the electron orbitals to freely precess, now cause the electrons to oscillate near the orbitals (Fig. 1c). Oscillation is an additional degree of freedom of the spatial motion of electron. A new degree of electron freedom generates a new quantum number for them n_b. The frequency of oscillations ω_B is related to the frequency of electron rotation on the orbital $\omega_0 = E_0/\hbar$ and the precession frequency of its orbital momentum ω_ℓ by the following relation [7, 8]:

$$\omega_B = n_b\sqrt{\omega_0^2 + \omega_\ell^2}, \quad n_b = 1, 2, 3, \ldots$$

Apparently, the value of the oscillation quantum number n_b depends on the value of the magnetic field. The greater the magnetic field, the greater n_b can be. Initially $n_b = 1$. Owing to the exchange interaction, the two electrons can form an orthoboson with oscillation quantum numbers 1 and –1. In the orthoboson, the spins of the electrons are parallel $S = 1$, and their energies are equal. Orthobosons create a spin electron condensate in an atom. An atom with such a condensate is called a transatom.

The spin μ_e and orbital μ_ℓ magnetic moments of each individual electron interact independently interact with an external magnetic field **B**. The spin magnetic moments of electrons do not precess around **B**, since they are oriented only in two ways: $m_S = -1/2$ over the field and $m_S = +1/2$ against the field. Electron states with identical orbital ℓ and magnetic moments m_ℓ are split into two levels with antiparallel electron spins $s = \pm 1/2$. The frequency of transitions between these levels $m_s = \pm 1/2$ is the same for all electron pairs $\omega = 2 \cdot \mu_e B/\hbar$ (Fig. 1a) and it does not depend on the charge of the nuclei *Z*.

The orbital magnetic moment μ_ℓ of each individual electron precesses around magnetic field **B** with frequency $\omega_\ell = \mu_\ell \cdot B/\hbar$ ($\mu_\ell = \ell \cdot \mu_e$) and it creates its own intra-atomic magnetic field with a magnetic induction vector $\mathbf{B}_\mu$, which is calculated by the formula [9]:

$$\mathbf{B}_\mu = \mu_0 \frac{3\mathbf{n}(\boldsymbol{\mu}_\ell \cdot \mathbf{n}) - \boldsymbol{\mu}_\ell}{r^3}, \quad (\mathbf{B}_S \; for \; \boldsymbol{\mu}_e), \tag{1}$$

where $\mu_0 = 1.26 \cdot 10^{-6}$ H/m is magnetic constant; $\mu_e = 9.29 \cdot 10^{-24}$ J/T $= 5.79 \cdot 10^{-5}$ eV/T, *r* is the distance from electron to the point at which the field is calculated; and **n** is a unit vector in the *r* direction. The magnetic induction vector $\mathbf{B}_\mu$ rotates with the same frequency as μ_ℓ and it can be decomposed into two components: a magnetic field $B_\mu^{\parallel}$ directed parallel to the homogeneous field **B** and a magnetic field $B_\mu^{\perp}$ directed perpendicular to the field **B** (Fig. 1b) [10]. The internal magnetic field $B_\mu^{\perp}$ stimulates transitions between the levels $m_s = 1/2 \to m_s = -1/2$. The $1/2 \to -1/2$ transitions are possible, since they occur in states with the formation of orthobosons. An interlevel transition is performed with the emission of a photon with energy $E_f = 2\mu_e \cdot B$. The photon energy amounts, with an external magnetic field in the range of 10÷100 T, to 10^{-3}÷10^{-2} eV, which corresponds to a frequency of 0.3-3 THz or a wavelength of 1-0.1 mm. Thus, in a strong magnetic field, the spin-orbit interaction of internal electrons leads to intra-atomic electron magnetic resonance (IAMR). The IAMR and photons E_f, propagating in the medium, stimulate the forced transitions with the same energy both inside the atom in which they were generated and in other surrounding atoms. Then the orthobosons transit to the low-lying levels with the emission of photons with characteristic energy for a given element. Transitions to low-lying levels will be carried out by electron orthobosons, probably, with the emission of two photons. Since transitions occur between internal electron levels of the atom, the energies of these photons depend on the charge of nucleus *Z* and lie in the range from hard ultraviolet to hard *X*-rays of 10^2-10^5 eV. Thus, orthobosons are formed in the entire atom and spin electron Bose–Einstein condensate is produced.

3. ELECTRON PAIRING INTO ORTHOBOSON

If we transfer the conditions for electron pairing to an atom, as at superconductivity in metals, then we must observe three basic requirements:

1. The Pauli principle must be fulfilled, according to which fermions cannot be in exactly equal states.
2. Electrons should be attracted by each other (Cooper condition [11]). This attraction between electrons can be arbitrarily small.
3. The sum of pulses of two electrons in a pair must be equal to zero $P_{ee} = 0$, i.e. electrons in the pair must have equal in magnitude and opposite in the direction pulses: $\mathbf{P}_{e1} = -\mathbf{P}_{e2}$.

Atomic electrons with equal quantum numbers n, ℓ and m_ℓ, but and with antiparallel spins $s = \pm 1/2$, occupy different energy states in a strong magnetic field, for them $\mathbf{P}_{e1} \neq -\mathbf{P}_{e2}$ (Fig. 1a). Therefore, electrons cannot form a boson with $S = 0$. Consequently, paired atomic electrons should be in equal energy states, which requires equal direction of their spins ↑↑ $S = 1$.

The second condition − presence of attraction between paired electrons, is provided by the exchange interaction [12]. It is remarkable that the exchange interaction has the character of attraction in an atom for electrons with parallel-directed spins ↑↑ only. The exchange interaction is associated with the indistinguishability of electrons (the principle of identity). It is characterized by the magnitude of exchange energy "A". The exchange energy represents an additional contribution to the total system energy. It differs from zero only in case if wave functions of electrons overlap. The more the wave functions of electrons overlap, the greater is the exchange energy. In the atom, the energy of the Coulomb repulsion of electrons "C" and the exchange energy "A" are positive. In contrast to the Coulomb electrostatic energy "C", the contribution of the exchange energy "A" to the total system energy can have different signs depending on whether the wave function of the spatial motion of two electrons is symmetric or antisymmetric, or, correspondingly, the spin part of wave function is antisymmetric or symmetric. The correction ΔE to the total system energy, connected with the interaction of electrons, is calculated in perturbation theory and, depending on whether the spatial part of the wave function is symmetric or antisymmetric, is equal to:

$$\Delta E = C + A, \qquad (2)$$

or

$$\Delta E = C - A, \qquad (3)$$

where '+' refers to the symmetric spatial wave function and the antisymmetric ↑↓ spin state S = 0, and '−' refers to the antisymmetric spatial wave function and the symmetric ↑↑ spin state S = 1.

Owing to the exchange interaction, the two electrons obtain rigidly correlated oscillations. The sum of their pulses is zero $P_{ee} = 0$, $\mathbf{P_{1B}} = -\mathbf{P_{2B}}$ (Fig. 2e). The projections of the oscillation pulse moments for each electron in a pair by the selected direction (Z axis) are not defined. However, these moments, just like the pulses themselves, are equal and opposite to each other in the direction: $n_b^1 \hbar = r_1 \cdot P_{1B} = r_2 \cdot (-P_{2B}) = -\, n_b^2 \hbar$. With an average $<r_1>$ equal to the mean $<r_2>$, this is equivalent to the equality of the modules, but with opposite signs, the quantum numbers of electron oscillations $n_b^1 = -\, n_b^2$, $n_b = 1, 2, 3, ...$ [10]. Therefore, the Pauli principle for them is satisfied.

Opposite oscillation quantum numbers of electrons make it possible to create an antisymmetric wave function of their spatial motion. Therefore, two electrons can be in the same energy state and have parallel spins $S = 1$, thereby forming an coupled pair — orthoboson. In the orthoboson, in the first order of perturbation theory, the exchange Coulomb energy of electrons is equal to the energy of their Coulomb repulsion $A = C$

[13]. Therefore, the exchange Coulomb energy of orthoboson completely compensates the energy of their Coulomb repulsion $\Delta E = 0$ (3). It turns into the quantum paradox - "The Waves extinguish the Wind".

For clearness, **Fig. 2** shows the formation of orthoboson in the helium atom. The spatial wave function of electrons of the ground state of parahelium is symmetric. The electrons are in equal energy states. The exchange energy for them is equal to the energy of their Coulomb repulsion $A = C$. These energies are added together (2) (Fig. 2a). The spatial wave function of electrons of orthohelium is antisymmetric. The electrons are in different energy states. The exchange energy for them is different from the Coulomb repulsion energy $A \neq C$. It is subtracted from the latter (3) (Fig. 2b). Due to the Pauli principle, electrons cannot be in the same energy states with parallel spins (Fig. 2c). Let's turn on a strong magnetic field. Correlated oscillations of electrons with oscillation quantum numbers 1 and –1 (n_b and $-n_b$) appear in a strong magnetic field. The spatial wave function of electrons is antisymmetric, but electrons are in the same energy states (Fig. 2d). The exchange energy for them is equal to the Coulomb repulsion energy $A = C$ and it is subtracted from the latter (3) $\rightarrow \Delta E = 0$. In Fig. 2d, for clearness, the oscillation quantum numbers of electrons $n_b = \pm 4$. For oscillation quantum numbers $n_b = \pm 1$, the energy of two electrons is $6E_a$, where $E_a = 54.4$ eV is ionization energy of the He^+ helium ion [13]. Electron oscillations in the orthobosons are carried out both in the longitudinal and in the transverse magnetic field **B** directions. Since electrons in a pair oscillate in antiphase, such a motion allows two electrons in identical energy states to be in nonintersecting spatial regions (Fig. 2e). The trajectories of two moving paired electrons can be represented as a closed double helix like screw molecule of DNA and located on the toroidal surface (Fig. 2f). Another quantum paradox emerged, while the wave functions of electrons in the orthoboson overlap to the maximum, their real, spatial clouds do not intersect.

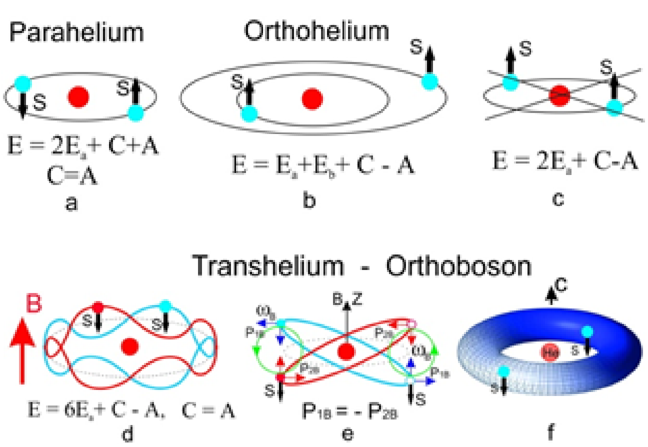

Fig. 2. *Parahelium. Orthogelium. Transhelium - Orthoboson.*

4. PROPERTIES OF ORTHOBOSONS

1. Since the magnetic moments of electrons μ_e in a Bose-condensate are directed in the same direction, they create a giant directional inhomogeneous and anisotropic magnetic field B_S 10^5–10^{10} T inside and around the transatom (1). This magnetic field and the electrostatic electric field of a spin electron condensate form inside the first electron orthobosonic orbitals with a radius R_Z an electromagnetic well with a magnetic field inhomogeneity of 10^2–10^6 T at the nucleus diameter [10]. **Fig. 3** shows, in relative units, the dependence of magnetic induction vector $\mathbf{B_s}$ on the distance to the nucleus $C(R_Z)$ along the axis C (Fig. 2f). Distance $C(R_Z)$ is normalized to R_Z. Negative values of $\mathbf{B}_S$ mean that the magnetic field in central region of the atom is directed opposite

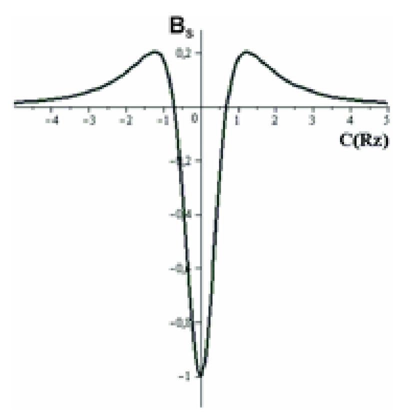

Fig. 3. *Dependence of magnetic induction vector* $\mathbf{B}_S$ *along axis* $C(R_Z)$.

to the direction of the magnetic moment of electron.

The internal magnetic field $\mathbf{B}_S$, interacting with the spin and orbital magnetic moments of protons and neutrons in the atomic nucleus, changes its structure and turns the atomic nucleus into a transnucleus. Transnucleus with transatoms represent a new state of matter: spin-nuclide-electron condensate [10].

The external ultrastrong magnetic fields and the electron Bose-condensates of transatoms allow them to attract each other, thereby creating binuclear and multinuclear molecules − transmolecules.

2. The exchange energy of paired electrons has the character of attraction and it completely compensates, in the first order of perturbation theory, the energy of their Coulomb repulsion. Oscillations of paired electrons in the transatom increase by three times their binding energy and decrease by three times the radius of their orbitals compared to the binding energy and the radius of the single electron of the multiply charged ion [13]. The radius of the orbital of such an electron is less than the radius of the K-orbital. Therefore, electrons in the Bose condensate are located on the orbital closest to atomic nucleus. The wave functions of electrons in transatoms and transmolecules significantly overlap with wave functions of transnuclei. This property of transatoms and transmolecules in low energy transmutation reactions allows to increase the probabilities of weak processes responsible for the transformation of protons into neutrons and vice versa. Thus, radioactive isotopes are not formed in transmutation reactions.

3. The exchange Coulomb energy of any two charged particles paired in orthoboson has the character of attraction and it completely compensates the energy of their Coulomb repulsion. For strongly interacting identical particles, including atomic nuclei, this fact energy compensation leads to an automatic launch of nuclear reactions without Coulomb barrier. This is due to the fact that the ultrastrong internal magnetic field $\mathbf{B}_S$ of transmolecules, consisting of identical transnuclei allows the latter, due to exchange interaction, to form an orthoboson. Since the exchange energy of identical transnuclei compensates for their Coulomb repulsion, they can enter into nuclear interactions without Coulomb barrier. Thus, the nuclear reactions occur after the formation of transmolecules automatically. This explains the possibility of low energy nuclear reactions with atomic cross sections.

Moreover, transnuclei in the transmolecule move in inhomogeneous and anisotropic space created by an ultrastrong magnetic field. Thus, motion integrals are not conserved in the interaction of the transnuclei: momentum conservation law, angular momentum (spin) conservation law, and energy conservation law are violated.

5. "CAPSULES", ORTHOHELIUM

The appearance of a strong magnetic field in a condensed medium still remains an open question. A large variety of physical experiments, in which transmutation reactions take place, suggests the existence of a characteristic object that is the same for all types of experiments. Therefore, it should be assumed that as a result of ionization of a weakly excited condensed matter, local, stable, electron-ion formations, so called “capsules” with a strong magnetic field inside appear in it [13, 14]. Experimental data show that the size of the “capsules” is estimated at $L = 10^{-8}\div10^{-5}$ m. It is known that the transmutation process is accompanied by an unknown radiation, which leaves “strange” traces in photoemulsions, on metallographic sections and which, when interacting with a substance, changes its structure and chemical composition. It is possible that those “capsules”, originating in condensed matter and moving inside and outside that matter, represent that “strange” radiation, which is recorded in many experiments. Since “capsules” are magnetic formations, an external magnetic field should be used to produce them, to effectively connect them with each other and to arrange them into long structures. That technology was applied in experiments by A.V.Vachaev and N.I. Ivanov [3], V.A.Krivitsky [15], V.A.Pankov and B.P.Kuzmin [16]. Thus, it can be said that a magnetic "nesting Russian doll" is formed in transmutation reactions (**Table 1**). The magnetic moments of protons, neutrons and nuclei are approximately three orders of magnitude less than the magnetic moment of an electron. Therefore, the magnetic fields generated by their orthobosons will be approximately the same as those of spin electron condensate (μ_p = $1.41\cdot10^{-26}$ J/T = $8.79\cdot10^{-8}$ eV/T, μ_n = $-0.97\cdot10^{-26}$ J/T = $-6.02\cdot10^{-8}$ eV/T).

Separate attention should be paid to the chemical element helium, namely, orthohelium, which has a strong magnetic field. In orthohelium, the magnetic moments of electrons are parallel. The calculation (1) shows that the magnetic field at the center of the atom is ~ 410 T, and at the orthohelium radius R_2 = $8.76\cdot10^{-11}$ m, the magnetic field is ~ 70 T. As experiments have shown, the magnitude of such a field is sufficient to trigger transmutation reactions.

When two orthohelium atoms interact, they form a nuclear transmolecule of "beryllium-8" (**Fig. 4**a). Two transhelium nuclei form a nuclear orthoboson in that transmolecule. The "Be-8" transmolecule is stable, because the two transhelium nuclei cannot merge at reaction energy Q < 0. The radius of transmolecule "^{8}Be" will be R_{Be} = $4.4\cdot10^{-12}$ m, and the magnetic fields will be: in the center B_s^0 (Be) = $5.4\cdot10^5$

Table 1

Magnetic "nesting Russian dolls"

"Nesting Russian dolls"	Size, m	Magnetic field, T
External field	0.01 ÷ 0.1	0.1 ÷ 10
"Capsules"	10^{-9} ÷ 10^{-5}	> 20
Electron orthobosons	~10^{-12}	10^5 ÷ 10^{10}
Nuclear orthobosons	<10^{-13}	>10^7
Proton and neutron orthobosons	<10^{-14}	>10^{10}

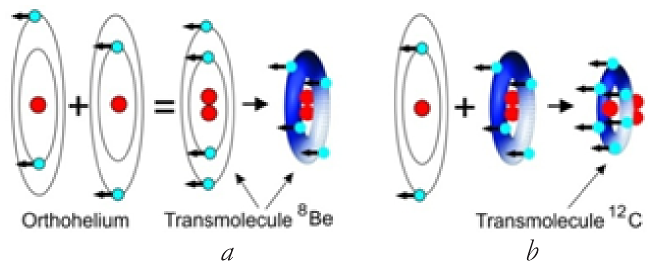

Fig. 4. *Formation of transmolecules ^{8}Be and ^{12}C.*

and at a distance of $1.2\cdot R_{Be}$ from the center B_s^R (Be) = $1.1\cdot10^5$ T. The transmolecule "Be-8" attaches another atom of orthohelium to itself, forming the transmolecule "carbon-12". The transmolecule "^{12}C" is also stable because it consists of three ^{4}He nuclei: two paired transhelium nuclei and one unpaired ^{4}He (Fig. 4b). The radius of the transmolecule "^{12}C" is R_C = $3.0\cdot10^{-12}$ m, and the magnetic fields are: in the center B_s^0 (C) = $2.6\cdot10^6$ T and at a distance of $1.2\cdot R_C$ from the center B_s^R (C) = $5.2\cdot10^5$ T. Subsequently, the transmolecules "^{8}Be" and "^{12}C" due to their own ultrastrong magnetic fields, are attracted to each other and enter into exchange interaction with their electronic Bose condensates. As a result, multinuclear transmolecules $n\cdot{}^4_2He$ with a helium Bose condensate are formed. The creation of such transmolecules causes multinuclear reactions, with the emission of protons, neutrons, alpha-particles and heavy fragments [17]:

$$n\cdot{}^4_2He \to {}^{4n-1}_{2n-1}A + p + Q,$$

$$n\cdot{}^4_2He \to {}^{4n-1}_{2n}B + n + Q,$$

$$n\cdot{}^4_2He \to {}^{4(n-1)}_{2(n-1)}C + {}^4_2He + Q,$$

$$n\cdot{}^4_2He \to A + B + C + ... + Q,$$

where Q is the energy released by the reaction.

Atoms of other chemical elements in ultrastrong fields of the "^{8}Be", "^{12}C" transmolecules can also transform into transatoms and enter into low-energy transmutation reactions. So the hydrogen atom in a strong and ultrastrong magnetic fields, due to electron oscillation, is converted into the hydrogen transatom "H". In this case, a photon with an energy of 2·13.6 = 27.2 eV [13] is emitted. Energy 13.6 eV is the

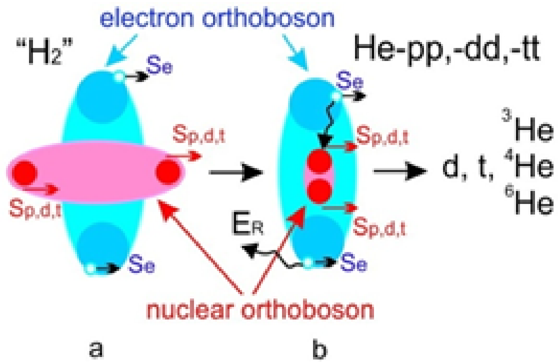

Fig. 5. *Transformation of hydrogen transmolecule into "helium" transmolecule.*

ionization energy of the hydrogen atom. In the case of recombination of an electron with the H^+ ion, a photon with an energy of 3·13.6 = 40.8 eV is emitted, and when the electron recombines with a molecular hydrogen ion H_2^+ with formation of two hydrogen transatoms 2"*H*", two photons with energies of 32.7 eV are emitted. In a strong magnetic field, the hydrogen molecule H_2, two hydrogen atoms 2*H*, and two hydrogen transatoms 2"*H*" form a hydrogen transmolecule "H_2"with an energy level of 102.7 eV (**Fig. 5**a, **Fig. 6**). This transmolecule transforms into a helium-*pp* transmolecule with an electron energy level of $3E_a$ = 163.2 eV (Fig. 5b, Fig. 6). The hydrogen molecule H_2 and two hydrogen atoms 2*H* can turn into a helium-*pp* transmolecule directly, bypassing the "H_2" stage. In an ultrastrong magnetic field, the electron levels in the hydrogen atom and in the molecular ion of

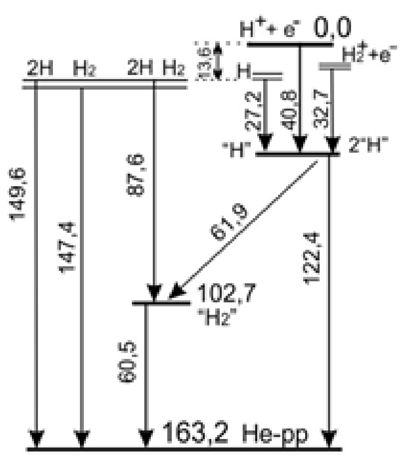

Fig. 6. *Scheme of electron transitions in the hydrogen-helium transmolecule in He + H_2 plasma.*

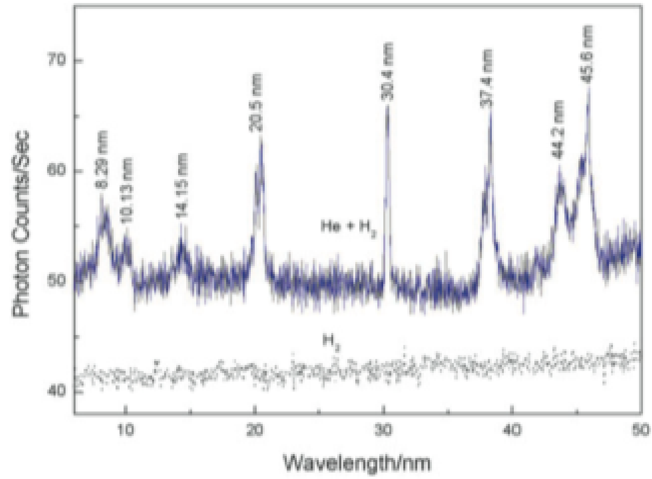

Fig. 7. *Short-wave spectrum in He + H_2 and H_2 plasmas* **[18].**

Table 2

Wave lengths and energy of lines in spectrum He + H_2.

λ, nm	8.29	10.13	14.15	20.5	30.4	37.4	44.2	45.6
E, eV	149.6	122.4	87.6	60.5	40.8	33.16	28.05	27.2

hydrogen H_2^+ are split, so lines with energies of 28.05 eV and 33.16 eV appear in the spectrum (**Table 2**). Fig. 6 shows a supposed transition scheme. The same transitions and transformations will occur with deuterium and with tritium in a strong magnetic field. Helium-*dd* and helium-*tt* transmolecules are formed in those cases. In the work of R.Mills and P.Ray on extreme ultraviolet spectroscopy of helium-hydrogen plasma [18], these emission lines were observed (**Fig. 7**, Table 2). Those lines were registered at microwave discharge in a helium mixture with 2% of hydrogen at room temperature and at pressures from 20 to 1 torr. They appear in a mixture of helium and hydrogen only, but are absent in pure helium or hydrogen and in mixtures of hydrogen with other noble gases.

6. NUCLEAR ORTHOBOSONS. TRANSMUTATION REACTIONS

The helium-*pp*, helium-*dd*, and helium-*tt* transmolecules are nuclear orthobosons. They enter non-Coulomb nuclear transmutation reactions with the formation of protons, neutrons, deuterons, tritons, ^{3}He, ^{4}He, ^{6}He nuclei (Fig. 5) [13]. Transmutation reactions can occur with the participation of electron orthobosons $+2e^-$:

$p + p + 2e^- \rightarrow d + \nu_e + e^- + 1.44$ MeV
$d + d \rightarrow t + p + 4.03$ MeV
$d + d \rightarrow {}^3He + n + 3.26$ MeV
$d + d + 2e^- \rightarrow {}^4He + 2e^- + 23.85$ MeV
$t + t \rightarrow {}^4He + 2n + 11.3$ MeV
$t + t + 2e^- \rightarrow 2e^- + 12.3$ MeV $+ {}^6He$ (β-, $T_{1/2}$ = 0.8c) $\rightarrow {}^6Li + e^- + \tilde{\nu}_e + 3.5$ MeV.

Thus, orthohelium with its own strong magnetic field is a catalytic element that creates, in a mixture with hydrogen, conditions for formation of hydrogen-"helium" transmolecule and for realization of nuclear fusion reaction of two protons and an electron orthoboson. Other inert gases do not create strong magnetic fields.

Nuclear levels, in a strong magnetic field due to its interaction with magnetic moments of protons and neutrons, split $\Delta E(p, n) = \pm \mu(p, n) \cdot B_s^0$. That is why all even-even nuclei with a spin equal to zero ($I = 0$) obtain a mechanical moment $I \neq 0$ [13]. For example, the spin of the nucleus ${}^{12}_{6}C$ is $I = 0$, but the mechanical moment of the transatom "${}^{12}_{6}C$" is $I \neq 0$. The identical transnuclei will also enter into non-Coulomb transmutation reactions [$I({}^6_3Li) = 1$]:

${}^6Li + {}^6Li + 2e^- \rightarrow 2e^- + {}^{12}C + 28.17$ MэB,
${}^{12}C + {}^{12}C + 2e^- \rightarrow 2e^- + {}^{24}Mg + 13.93$ MэB.

In a strong magnetic field, an atom, from an "amorphous state", is transformed into an ordered, magnetic "crystal". The same happens with the nucleus, but already in the ultrastrong magnetic field of the spin electron condensate. A transnucleus is an ordered, nuclear magnetic "crystal". Nucleons in the nucleus, as well as electrons in an atom, can form nucleon orthobosons: proton-proton and neutron-neutron orthobosons (Table 1). Apparently, intra-nuclear nucleon magnetic resonance is also possible in the nucleus. Apparently, intra-nuclear reactions with two neutrons can occur in neutron-rich transnuclei: $n + n + A_1 \rightarrow d + e^- + \tilde{\nu}_e + A_2 + Q$ (3.04 MeV) with subsequent reactions $d + d + B \rightarrow {}^4He + B + Q$ (23.85 MeV), where $A_{1,2}$ and B are parts of the nucleus in which intra-nuclear reactions occur. The energy Q released in the intra-nuclear reaction must take into account the changed energy balance in the entire nucleus. The energy released in the reaction, if it proceeded outside the nucleus, is given in brackets The assumption of such types of reactions follows from experiments on electron explosion of metallic targets [19]. In these experiments with targets made of Cu, Ag, Ta and Pb, the appearance of multiple track clusters with a well-pronounced expansion center and with a number of tracks > 100 is noted. The clusters include α-particles, lithium nuclei, and probably heavier nuclei with energies of the order of several MeV/nucleon, i.e. nuclei, in which the number of neutrons is approximately equal to the number of protons. In target nuclei, the number of neutrons is 1.3÷1.5 times more than the number of protons.

Nuclear transformations of radioactive isotopes into stable isotopes and heavy nuclei dissotiations, like fission, but with the formation of stable fragments occur in transnuclei. Such dissociations are discussed by V.A.Krivitsky. in the book [15]. Obviously, it should be assumed that as a result of fusion of transatoms into a general formation, but with non-identical transnuclei, the latter also enter into transmutation reactions

7. TECHNOLOGIES

Not all atomic electrons, but only a part of them can, in the process of forced transitions, be transformed into orthobosons. Thus, each atomic nucleus Z can have $Z/2$ "chemical" transelements or "transatomic chimeras". A part of "transatomic chimera" will be represented by electrons in a paired boson state, the other part will be represented by electrons, which fill the "chimera" orbitals. Here, "chimera" orbitals should be understood as "traditional" orbitals with corrections due to magnetic and electric field influence created by transatomic paired electrons of the transatom on its unpaired electrons. Thus, many other transelements are added to the existing chemical elements in Mendeleev Periodic Table.

Since not all atomic electrons can pass into the orthoboson state, there are three possibilities for the existence of chimeric transatoms.

The first case. When converting an atom into transatom, a situation may arise in which the number of orthobosons will be Ob = 1 or Ob = 2. In this case, the energy of magnetic attraction between Chemical TransAtoms (ChTA) is less than the energy of thermal motion [5]. Then the ChTA cannot connect between each other due to their magnetic attraction. However, for such transatoms, the formation of chemical molecules with both ChTA and ordinary atoms on the basis of chemical bonds is not excluded..

The second case. The energy of the interacting Magnetic TransAtoms (MTA) is enough to form a complex of transatoms based on their magnetic attraction, but it is not enough to overcome the Coulomb barrier of repulsive, atomic electrons, i.e. to form a nuclear transmolecule.

And the third case. There is a formation of nuclear transmolecule from the Nuclide TransAtoms (NTA) followed by the launch of transmutation reaction.

For MTA and NTA transatoms, the formation of chemical molecules with ordinary atoms on the basis of chemical bonds is also not excluded.

Based on the properties of transatoms and transmolecules discussed above, it is possible to implement the following obvious technologies:

- The release of nuclear energy in the process of transmutation allows to create new type energy generators: powerful, compact, non-radiative. Such generators can be used in home conditions.
- The possibility of transforming one element into another allows to obtain rare elements and their isotopes from cheap elements, including to obtain superheavy elements and, possibly, supercharged nuclei.
- A method to eliminate radioactive waste by converting radioactive isotopes into stable isotopes has appeared.
- Spin and magnetic transatoms can be used in computing technology, for example, in quantum computer technologies as qudites with $D = 3$ and $D = 5$ [20]. Since ChTA with Ob = 1 has S = 1, and therefore, it has three states -1, 0, +1, and ChTA with Ob = 2, S = 2 already has five states -2, -1, 0, +1, +2.
- It is possible to create various devices based on materials with low density, but with huge magnetic, both constant and variable, fields.
- It is possible to create materials with record strength characteristics, with magnetic transatoms in their composition, since the binding energy between them is much greater than the energy of any chemical bonds.
- To the chemical elements present in the Periodic Mendeleev table, a great lot of other "chemical" trans-elements are added. So, if one confines himself to nuclei with Z charge from 2 to 100, then the number of transelements without Lorentz sub-shells, will be ~ 2500. This opens up huge prospects in chemistry, materials science, industry, etc.

8. SPIN MATTER

Let us briefly consider possible and non-trivial technologies that use the "spin" matter - spin electron condensate as basis.

- After experimental confirmation of the Einstein-Podolsky-Rosen (EPR) paradox, it became obvious that entangled pairs could be used for information communication between objects. If two matrices are created on the basis of spin electron orthobosons, the orthobosons of which are pairwise entangled, then when the orthoboson state changes in one of the matrices, the orthoboson states in the other matrix will also change. Thus, information will be transmitted almost instantaneously and at any distance, since the EPR paradox does not depend on speed or distance. In the EPR paradox, the wave functions of the partners in an entangled pair overlap maximally, but they themselves can be maximally far from each other. − “Spooky action at a distance”.

- Experiments on cold nuclear fusion (cold fusion - *CF*) conducted by I.S. Filimonenko in the sixties of the last century, led to the creation of a research program, one item of which reads - the implementation of “thrust without mass removal”. Apparently, this point did not appear by chance, and it is associated with the *CF* phenomenon and the low-energy transmutation phenomenon.

In the 30s of the last century, the French mathematician E.Cartan hypothesized that the proper rotation of material objects creates a torsion of space around them, just as the gravitational mass of material objects creates a curvature of space around them.

In the theory of physical vacuum by G.I.Shipov [21], “all particles are field microgyroscopes consisting of Riemann curvature and Ricci torsion, which generate their spins. Therefore, permanent magnets, which magnetic field is generated by electron spin, detect right and left static Ricci torsion fields around themselves. Apparently, under certain conditions and properties of a material object, the torsion of space caused by it can compensate for the inherent curvature of space. Thus, the rotation will extinguish gravity - “Waves extinguish the Wind”. As a result, it can be assumed that the rotating inertial mass reduces or fully compensates for the gravitational mass, and it either decreases or disappears. In addition, the torsion field or, in other words, the field of inertia can cause the body to move without a mass drop.

The English scientist John Searl created, from rotating, self-moving magnets, generators, which not only convert the energy of their rotation into electrical energy, but also lose weight. The loss in weight was expressed in the fact that the rotating magnetic disks rose above the ground and were lost in the sky. In the end, John Searl learned to control the disks in flight.

The experiments of J. Searl were repeated in Russia, the USA and Taiwan. In Russia, a device similar to the Searl generator was created by V.V. Roshchin. and S.M.Godin [22]. That device allowed to generate electric power up to 7 kW and it would lose or gain in weight up to 50%, depending on the direction of rotation.

Summarizing what has been said in this paragraph, it can be assumed that a solid body that has, in its composition, a macroscopic rotating ensemble of unidirectional electron orthobosons, “loses its weight”, and moves without inertia and without mass dropping in the direction corresponding to direction of rotation and orientation of magnetic moments of orthobosons relative to that rotation. The impression appears that the magnetic field created by the magnetic moments of electrons increases the thrust of the whole body. The rotation of the ensemble of electron orthobosons along the circumference can be, obviously, self-moving, like in case of disks in experiments of J. Searl. But it is possible to organize the movement of orthobosons along the circumference in the form of electron current without resistance.

- Indeed, unlike electrons in superconductors, which are paired into a Cooper pair with $S = 0$, electrons in a transatom are paired into orthodoson with $S = 1$. It is possible to realize superconductivity using electron orthobosons. Superconductivity with the help of Cooper pairs is ensured by a low temperature. At present, a number of mercury-containing superconductors have the highest critical temperature ~–138°*C*. Orthoboson superconductivity is provided by a strong magnetic field. Thus, the orthobosons superconductivity does not depend on temperature (up to temperature destruction of the conductor) and can be realized at room temperature and above it. The orthobosons themselves, which create a magnetic field, can provide a strong magnetic field in the conductor. It is possible that superconductivity at room temperature registered in palladium by dissolving deuterium in it with the concentration of atoms of the latter more than two per palladium atom in cold nuclear fusion reactions, is realized by orthobosons.

By and large, the requirement of magnetic field presence is not necessary, since for the existence of an orthoboson it is necessary that electrons in the orthoboson are in the same energy state and that their wave spatial function is antisymmetric. And since the trajectories of electrons in orthoboson represent double helix, the conductor through which the orthobosonic current flows should probably consist of two twisted micro-, and possibly nano-filaments. The double-filament structure of the conductor and exchange interaction between electrons make the motion of electrons strictly correlated, and their spatial wave function - antisymmetric. Organic molecules like DNA molecules must probably be used as conductors. In organic molecules, superconductivity can be organized on the basis of the hydrogen, namely the proton orthoboson.

- The proposal to use organic molecules as superconductors seems to be quite acceptable, as known are successful works [23-25] on low energy transmutation of elements in microbiological cultures, including the transmutation of radioactive isotopes into stable isotopes. Transmutation of isotopes in biocultures occurs in rapidly growing biological systems, in which RNA molecules and proteins are synthesized on DNA matrix. The DNA provides storage and transmission of information through a genetic program on the development and functioning of living organisms. In essence, biological systems are dynamic information systems that correct their activities as a result of data exchange both between the elements-structures that make up a biological system, and between the biological system itself and external surrounding systems. If we assume that the information exchange between DNA molecules, RNA and proteins involves electron and proton orthobosons, and if we project the properties of orthobosons formulated in this chapter onto biological systems, then a physical basis appears for explaining such fantastic phenomena as exchange of information between biological objects separated by large distances, telepathy, levitation.

9. CONCLUSION

The phenomenon of low energy nuclear reactions led to the creation of a theory of spin nuclide electron condensate. Thus, the taming and "domestication" of nuclear energy occurred. Thanks to the SNEC theory, spintronics is expanding its research not only on collective states of spin electron matter, but also on states of spin protons and spin nuclear matter. Spintronics of biological objects, animals and humans appears. A new front of scientific research, and associated creation of advanced technologies passes through such areas as: inertial field, low energy nuclear reactions, orthoboson superconductivity at high temperatures, inertia-free and non-gravitational motion of bodies without mass rejection, instantaneous transfer of information over any distances, creation of new materials, biospintronics.

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