ELECTROMAGNETIC PARTICLES: FORMATION OF "MATTERS" AND "ANTIMATTERS"

Abstract. Based on the analysis of the structural parts of substances , it is proposed that the constituents of their atoms are elementary and sub elementary electrical matters. These electrical matters in the course of the evolution of the Universe formed elementary **electric dipoles** and **magnetic bipoles** with the subsequent formation of "**electromagnetic particles**", which are combined into the "**core of the nucleus**". The successive combination of "**electromagnetic particles**" gives the poles of the "**core of the nucleus**" a high value of the potential difference manifested in the form of **nuclear force**. As a result of the interaction of the "**core of the nucleus**" with an electron-positron pair an equal number of protons and antiprotons should be formed, since electrically charged parts with the same modulus and opposite charges are formed equally. However, in realitythe formation of an antiproton does not occur, and therefore, the reasons for the practical absence of "antimatter" in the surrounding world is still a mysterious problem. The purpose of this work was to study the formation of "matters" and "antimatters" based on elementary and sub elementary particles of electrical nature in the nuclear-electronic structure of atoms.

Keywords. atom, nucleus, proton, antiproton, antimatter, electron, "electromagnetic particle",core of the nucleus.

INTRODUCTION

One of the fundamental questions of natural science is the knowledge of the nature of the structure of the atomic structure, which is reflected in the properties of substances. It is well known, that the same electrons, protons and neutrons, depending on the number and structural-energy correspondence form different atoms with characteristic properties [1-6]. And in [7] it is noted, that there were equal number of particles with opposite charge signs in the Universe, then there should be exactly the same amount of "**matter**" as "**antimatter**". In this case they would have annihilated and the universe would have turned into nothing. However, this kind of transformation is not observed in nature, and the reasons for the practical absence of "antimatter" in the surrounding world are still a mysterious problem. Along with this, there are data on the presence of "**antimatter**" - **antiproton**, and the formation of "**antihydrogen**" with the positron is believed [8]. This requires an antiproton and a positron, i.e., in the hydrogen atom, the electron and the positive charge of the proton created by the positron must change places. Consequently, the atomic structure from elementary and subelementary electrical matters determine the nature and properties of macroscopic formations representing "**matter**" and "**antimatter**" in the surrounding world. In this regard, when studying the structure of the nuclear-electronic system of atoms, various hypotheses and scientific theories were put forward [9-22].

Ivanenko and Heisenberg, independently of each other, put forward a hypothesis about the proton-neutron structure of the nucleus [9-10]. According to this model, there should be neutrons and positively charged protons in a very small volume, which are subjected to strong nuclear forces, which are much larger than the Coulomb's repulsion forces and act only at short distances. It should be noted that at small distances the Coulomb's force also acquires a huge value of both repulsion and attraction, which implies the need to take them into account in the atomic structure. In all papers [9 - 19] the nature of the nuclear force is not disclosed and there is no explanation about the impossibility of the formation of "antimatter". In [20] it is noted that the nucleus consists of two stable and indivisible elementary particles - protons and electrons.The nuclear forces that hold protons and electrons in the nucleus are electromagnetic in nature, and preference is given to the electrical nature of the interaction. However, the material nature and nature of the electromagnetic interaction is not indicated. The author of [21] argues that the mechanism of action of nuclear forces is based on the same principle as electromagnetic forces - on the exchange of interacting objects by virtual particles. Virtual particles in quantum theory are particles that have the same quantum numbers as the corresponding real particles, but for which the usual relationship between energy, momentum, and mass does not hold.

Thus, in all scientific works there is no explanation of the reason for the impossibility of the formation of "antimatter" and the asymmetric arrangement of the electron in the hydrogen atom. All these data testify to the complexity of the interaction in the nuclear-electronic system of substances forming atoms and structures, which requires a detailed study of the origin of the above phenomena.

The purpose of this work is to study the formation of "matters" and "antimatters " based on elementary and sub elementary particles of electrical nature in the nuclear-electronic structure of atoms.

METHODS

For writing this article the method of **induction and deduction** was used. To do this we used modern scientific-theoretical and reference data available in the scientific references. Taking into account the nuclear-electronic structure of atoms from **oppositely charged electrical matters** and the electromagnetic interaction between them, it is assumed that the formation of the atomic-molecular structure is carried out from elementary and subelementary electrical matters in the course of the evolution of Nature. Based on the universal law of conservation of matter and energy and analyzing the mass of the proton, a new formation of the "**core of nucleus**" in the nucleus from a set of series-connected electromagnetic particles is proposed. Series-connected combinations of electromagnetic particles, according to the laws of electricity additively increase the potential at the poles of the **"core**

of nucleus", which predetermines the nature of the interaction of elementary electrical matters.

RESULTS AND DISCUSSION

As is known, at present in the scientific literature fundamental interactions between material objects are described by two theories: the general theory of relativity and the Standard Model describing electromagnetic, weak and strong interactions. Due to the difficulties of creating a quantum theory of gravity, their unification has not yet succeeded [22].

In accordance with the strong, weak, electromagnetic and gravitational interactions, respectively, four types of elementary particles are distinguished: hadrons, which include the proton and neutron involved in all interactions; leptons, photons involved in electromagnetic interaction, and a hypothetical graviton - a carrier of gravitational interaction. Analysis of the nuclear-electronic structure of atoms and forms of energy transfer (electricity, heat, light, magnetism, etc.) allow us to believe that the material nature of the named elementary and subelementary particles are oppositely charged electrical matters.These provisions are formulated in the form of M. Faraday's thesis that regardless of the thermal, light, chemical, physiological, magnetic or mechanical energy source, they can all manifest themselves in the form of the same electricity [23]. And an interesting fact is that as a result of the interaction of electrical matters, the resulting substances have different physical and chemical characteristics, while maintaining the amount of electricity. For example, as a result of the interaction of metallic sodium with chlorine, sodium chloride is formed, which is completely different in properties from the original substances. Oxygen and hydrogen atoms form water molecules where their individual atomic properties do not appear in water [24]. This regularity of structural-energy correspondence of the constituent parts of the system reflected in their properties is an axiom and also applies to microscopic substances. Consequently, oppositely charged subelementary electrical matters created a total bipolar structure with the properties of attraction - repulsion representing magnetic bipoles. Magnetic bipoles with electric dipoles form a bidipole configuration of an "**electromagnetic particle",** which is a creation of Nature and determine the electromagnetic interaction in the atomic structure (Fig. 1)* [25]:

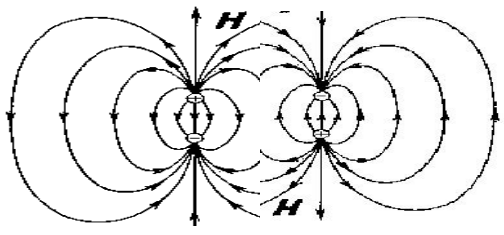

Figure 1. Conditional bidipole configuration of the "**electromagnetic particle**".
H*- magnetic bipoles.*

**In all diagrams particle sizes are conditional.*

In all processes electrically charged particles with the same modulus and opposite in sign charges form electrically neutral compounds according to the law of "unity and struggle of opposites" [26]. That is: "each object contains opposites, which are both in unity and in struggle with each other, which just causes the development of this object."

Thus, without delving into the beginning of the beginnings we accept that elementary and subelementary matters are the initial substances of the formation of the surrounding world. At the same time, electrical substances with opposite charges, although they are particles and antiparticles relative to each other, they coexist.For example, the **hydrogen atom** consists of **particles** and **antiparticle**s, i.e. of an **electron** and a **positron** in a proton. In this regard, according to the concepts of "**antimatter**" instead of a "**proton**" should be formed an "**antiproton**" and, accordingly, "**antihydrogen**". That is, the place of a positron in a proton should be occupied by an electron forming an antiproton, and the place of an electron - by a positron.

In this regard, the structure of a proton with a mass of $\mathbf{1.67262 \cdot 10^{-27}}$ **kg** consisting of a positron with a mass of $\mathbf{0.00091 \cdot 10^{-27}}$ **kg** is of scientific interest. Many scientific papers do not pay attention to this mass where the difference is:

$$\mathbf{\Delta m = (1.67262 - 0.00091) \cdot 10^{-27} = 1.67171 \cdot 10^{-27}\ kg} \quad (1)$$

In our opinion, this mass has a decisive influence on the formation ofa proton from an electron-positron pair. Otherwise, **a proton** and **an antiproton** or **neutron** should have been formed equally.

According to the theory of quantum chromodynamics the mass of a proton can be attributed to the sum of the masses of quarks and gluons [19–20]. However, there are mutually exclusive statements here: gluons are inherently massless and most of the mass of a hadron (proton, neutron) comes from gluons. An absurdity arises, where masses of hadrons are formed from massless gluons. In addition, gluons and quarks are hypothetical particles whose material nature remains undiscovered, and therefore, this issue requires a different approach to solving the problem.

In our opinion, the variety of manifestations at the microlevel reflecting the macroscopic properties of substances is due to the electrical nature of the particles. This thesis is also not denied by quantum chromodynamics. We believe that the mass of $\mathbf{1.67171 \cdot 10^{-27}}$ **kg** is a set of serial connections of "**electromagnetic particles**", and represents a **new structure** in the nucleus called the "**core of nucleus**" and conditionally looks like below(Fig. 2) *:

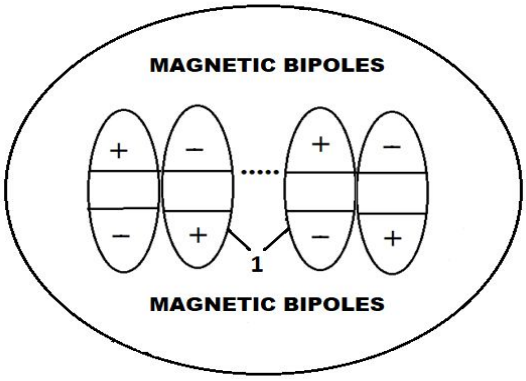

Figure 2. Conditional **structure** of the "***core of nucleus"***a set of "***electromagnetic particles***" **(**1).

The arrangement of "**electromagnetic particles**" as "batteries connected in series" causes a high potential value at the poles of the dipoles of this combination. To calculate the value of the potential at the poles of this combination, we determine the charge of the pole of the "electromagnetic particle". It's generally known, an electron charge **$1.60 \cdot 10^{-19}$ C** and its a mass of **$9.1 \cdot 10^{-31}$kg** is taken as a unit of elementary charge. Considering that the electric charge is an inherent property of matter manifested through its masses we determine the specific charge **(q_{sp})** of an electron:

$q_{sp} = 1.60 \cdot 10^{-19} : 9.1 \cdot 10^{-31} = 0.176 \cdot 10^{12}$ C/kg(2)

This value (2) is used to determine the charge of the "**electromagnetic particle".** In [27], we calculated the average mass of the elementary carrier of thermal energy "theplotron" - a kind of "**electromagnetic particle**", which is **$2.4 \cdot 10^{-36}$ kg**. Using this value we determine the number of "electromagnetic particles" in the "structure" of mass **$1.67171 \cdot 10^{-27}$ kg**:

$1.67171 \cdot 10^{-27} : 2.4 \cdot 10^{-36} = 6.96 \cdot 10^{8}$particles (3)

For an "electromagnetic particle", we calculate the charge **(q)** using the generally accepted standard value of the specific charge of an electron:

$$q = 0.176 \cdot 10^{12} \cdot 2.4 \cdot 10^{-36} = 0.42 \cdot 10^{-24} \text{C} \quad (4)$$

where **$0.176 \cdot 10^{12}$ C/kg** is the specific charge of an electron;

$2.4 \cdot 10^{-36}$kg - the mass of the "**electromagnetic particle**" (theplotron).

Therefore, each pole (positive and negative) of the "electromagnetic particle" dipole corresponds to an electric charge:

$0.42 \cdot 10^{-24} : 2 = 0.21 \cdot 10^{-24}$C (5)

According to [28-29], electric charge is a physical scalar quantity characterizing the ability of bodies or particles to electromagnetic interactions, i.e. must have an electrical potential. For a spherical pole with radius **R**, charge **q** and uniformly distributed over the surface, we calculate the potential φ using the formula [30]:

$$\varphi = q / 4\pi\varepsilon_0\varepsilon R \quad (6)$$

where $\varepsilon_0$is the electrical constant in the SI system;
ε - relative permittivity.

Taking the distance electromagnetic interaction between two charges approximately $\mathbf{1\cdot10^{-10}m}$ (**R**), we determine the potential of the pole of the "**electromagnetic particle":**

$$\varphi = 0.21\cdot10^{-24} / (4\cdot3.14\cdot8.85\cdot10^{-12}\cdot1\cdot1\cdot10^{-10}) = 1.89\cdot10^{-5}\ V \quad (7)$$

With serial connections of the poles of "electromagnetic particles" the total value of the potential of $\mathbf{6.96\cdot10^{8}}$particles is:

$$\Sigma\varphi = 1.89\cdot10^{-5}\cdot6.96\cdot10^{8} = 13.15\cdot10^{3}V \quad (8)$$

The huge value of the potential $\mathbf{13.15\cdot10^{3}V}$ has a strong electromagnetic interaction and determines the nature of the direction of the process and the structural-energy correspondence of the formed "**matter**" and "**anti-matter**" in the atomic structure. As a result of the interaction of the "**core of nucleus**" with each other (Fig. 3), as well as with an electron-positron pair by means of "**electromagnetic particles",** the **nuclei of other atoms** of substances are synthesized [24] (the topic of a separate article). That is, the nature of "**matter**" (metals, dielectrics, etc.) and "**antimatter**" is formed in the nuclear - electronic structures of atoms.

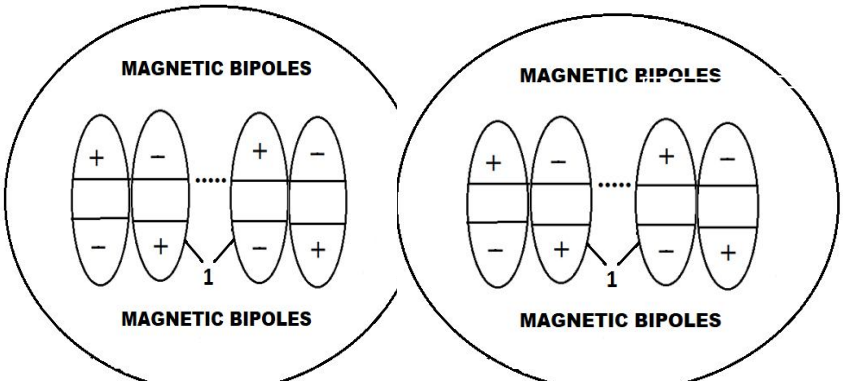

Figure 3. The conditional connection of two structures of the "**core of nucleus**", of "electromagnetic particles" (1).

During collisions of the "**core of nucleus**" with an **electron-positron pair,** at first glance it seems, that the formation of a **proton** and an **antiproton** should occur equally. The formation of an **antiproton** and the corresponding **antihydrogen** would be the initial substances for the formation of **antimatter**. However, the nature of the electromagnetic interaction of the "**core of nucleus**" with an **electron-positron pair** does not allow the formation of an **antiproton**, although they can be obtained in special scientific experiments. It is the impossibility of the formation of **antimatter** that is connected with the impossibility of the formation of an **antiproton.**

The magnetic bipoles of the "**core of nucleus**" with the positron perform synchronous binding and the positron is located in the sphere of the "**core of nucleus**" forming a proton. And the magnetic bipoles of the electron are repelled by them and the possibility of the location of the electron in the sphere of the "**core of nucleus**" and the formation of an **antiproton** is excluded. In the future, the proton binds to the electron outside the sphere of the "**core of nucleus**", by means of "electromagnetic particles" forming a **proton-electronic asymmetry**, i.e., a hydrogen atom is formed (Fig. 4).

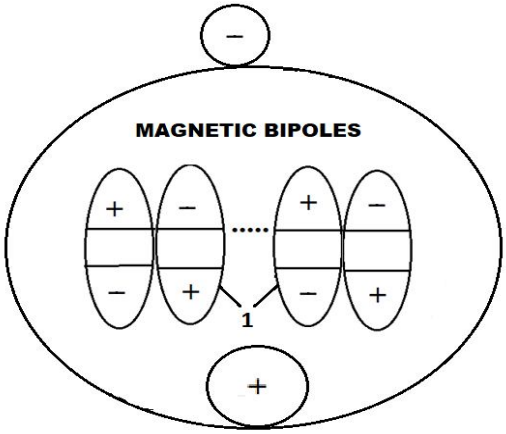

Figure 4. Conventional scheme of ***the hydrogen atom***:

1- "*electromagnetic particles*"; *«+» positron; « - » electron.*

To determine the magnitude of the potential energy created by the poles of electric dipoles of "electromagnetic particles" we use the well-known equation:

Volt = Joule/Coulomb (9)

The value of the potential energy corresponding to $\mathbf{0.21\cdot 10^{-24}\ C}$ of electricity and the electric potential of $\mathbf{1.89\cdot 10^{-5}\ V}$:

$$\mathbf{1.89\cdot 10^{-5} V = \varepsilon / 0.21\cdot 10^{-24} C}$$

$$\mathbf{\varepsilon = 1.89\cdot 10^{-5}\cdot 0.21\cdot 10^{-24} = 3.97\cdot 10^{-30} J.}\ (10)$$

Using the equation $\mathbf{\varepsilon = mc^2}$, we determine the mass of electrical matter that creates energy $\mathbf{3.97\cdot 10^{-27} J}$:

$$\mathbf{m = \varepsilon / c^2 = 3.97\cdot 10\text{-}30 / 9\cdot 10^{16} = 4.4\cdot 10^{-47} kg}.(11)$$

The calculated mass is close in magnitude to the mass of magnetic matter that creates the effect of the "Bohr's magneton", which is equal to $\mathbf{2.06 \cdot 10^{-47} kg}$ [25]. The close coincidence of the properties and masses of $\mathbf{4.4 \cdot 10^{-47} kg}$ and $\mathbf{2.06 \cdot 10^{-47} kg}$of physical quantities means that they are identical in nature. Therefore, magnetism is a form of transmission of electrical energy through magnetic bipoles from subelemental electrical matters that exhibit attraction and repulsion.

To determine the number of "**electromagnetic particles**"(EMP) connecting the electron with the proton, we determine the difference between the sum of the masses of the proton and the electron from the mass of the hydrogen atom ($\mathbf{1.676 \cdot 10^{-27} kg}$):

$$\mathbf{m(}\text{EMP}\mathbf{) = [1.67600 - (1.67262 + 0.00091)] \cdot 10^{-27} = 0.00247 \cdot 10^{-27} kg} \quad (12)$$

or

$$\mathbf{2.47 \cdot 10^{-30} : 2.4\ 10^{-36} = 10.3 \cdot 10^{5}}\text{particles}$$

We determine the charge $\mathbf{2.47 \cdot 10^{-30} kg}$ of a set of "**electromagnetic particles**" based on the specific charge of an electron:

$$\mathbf{q = 0.176 \cdot 10^{12} \cdot 2.47 \cdot 10^{-30} = 4.34 \cdot 10^{-19} C} \quad (13)$$

In terms of one "**electromagnetic particle**" the charge is:

$$\mathbf{4.34 \cdot 10^{-19} : 10.3 \cdot 10^{5} = 0.42 \cdot 10^{-24} C} \quad (14)$$

or on one pole:

$$\mathbf{0.42 \cdot 10^{-24} : 2 = 0.21 \cdot 10^{-24}\ C} \quad (15)$$

The exact coincidence of the value of the charge of the poles of the "**electromagnetic particle**" $\mathbf{0.21 \cdot 10^{-24} C}$ calculated for a proton and a hydrogen atom under different conditions means the reliability of the calculation when determining physical quantities.

For $\mathbf{10.3 \cdot 10^{5}}$particles with serial connections, the total value of the potential at the poles are:

$$\mathbf{\Sigma\, \varphi = 1.89 \cdot 10^{-5} \cdot 10.3 \cdot 10^{5} = 19.46 V} \quad (16)$$

A small value of the potential of the poles of "**electromagnetic particles**" (**19.46 V**) allows the electron to easily detach from the proton in the hydrogen atom. Consequently, the proton - electron asymmetry should be reflected in the strength of the bond between the electron and positron with the "**core of nucleus**" in the hydrogen atom. To confirm this assumption, we use the data of [29-31]. Taking the electric radius of the proton $\mathbf{0.841 \cdot 10^{-15}\ m}$ as the distance between the negative charge of the "**core of nucleus**" and the **positron**, we calculate the Coulomb's interaction ($\mathbf{F_p}$):

$$\mathbf{F_p = q_1 \cdot q_2 / r^2 = q_1 \cdot q_2 / (0{,}841 \cdot 10^{-15})^2 = 1.41 \cdot 10^{30}\ q_1 \cdot q_2} \quad (17)$$

where $\mathbf{q_1}$ is the positive charge of the proton $\mathbf{1.66 \cdot 10^{-19}\ C}$ (positron);

$\mathbf{q_2}$is the negative charge of the “core of the nucleus”.

Taking into account the diameter of the hydrogen atom $\mathbf{1\cdot10^{-10}}$ **m**, we assume the distance between the electron and the positive part of the charge of the “**core of nucleus**” $\mathbf{0.5\cdot10^{-10}}$ **m**, we determine the forces of Coulomb attraction ($\mathbf{F_e}$):

$$\mathbf{F_e = q_1\cdot q_2 / (0.5\cdot10^{-10})^2 = 4.0\cdot10^{20}\, q_1\cdot q_2} \quad (18)$$

where $\mathbf{q_1}$is the charge of an electron in a hydrogen atom, $\mathbf{1.66\cdot10^{-19}}$ **C;**
$\mathbf{q_2}$ is the positive charge of the “core of the nucleus”

We determine the relative strength of the Coulomb forces of interaction of the positron with the "core of nucleus" in comparison with the electron in the hydrogen atom:

$$\mathbf{F_p / F_e = (1.41\cdot10^{30}\, q_1\cdot q_2) / (4.0\cdot10^{20}\, q_1\cdot q_2) = 3.5\cdot 10^{9}} \quad (19)$$

This number shows that the positron is attracted to the “**core of nucleus**” $\mathbf{3.5\cdot10^{9}}$times stronger than the electron. That is, the electromagnetic interaction of “**electromagnetic particles**” with a positron practically excludes the formation of an **“antiproton”** and, accordingly, “**antihydrogen**”, which is the material of “**antimatters**”. Indeed, in all chemical reactions, the redistribution of electrons and chemical elements over chemical bonds occurs, and the positive charge of the positron remains with the proton. Similarly, in the processes of β-decay occurring with the natural radioactivity of nuclei, the electron ($\boldsymbol{e^-}$) is easily released from the neutron ***(n)*** forming a proton (***p***) and a neutrino (***ν***) [32-35].

$$\boldsymbol{n \rightarrow p + e^- + \nu} \quad (20)$$

As the calculations show, the probability of a positive charge being released from the composition of atomic hydrogen or from a proton is practically zero. Therefore, the reaction equation for the transformation of a nuclear proton into a neutron with the formation of a positron and a neutrino during $\boldsymbol{\beta^+}$ decay in [36] is incorrect:

$$\boldsymbol{p \rightarrow n + e^+ + \nu} \quad (21)$$

In addition, in equation (21), the universal law of conservation of mass is clearly violated, and in the natural processes of radioactive transformation of nuclei, only α and β decays take place. It is noted in [36] that the reaction is possible if energy is supplied from outside. However, matter never turns into energy, since energy is a "conceptual expression" that characterizes the state of matter in motion or at rest. In the transfer and transformation of energy, only the form of the movement of elementary material energy carriers in the form of light, heat, electricity, magnetism changes, and in mechanical influences their structural - energy set as a whole.

Taking into account the formation of a neutron from a proton and an electron, it is possible to allow the release of a positron ($\mathbf{e^+}$) from the composition of the neutron according to equation (22), with the transformation into an **antiproton** (p*):

$$n \rightarrow p^* + e^+ + \text{"electromagnetic particles"} \quad (22)$$

However, in practice, only **β** is realized - the decay of a neutron (**n**) into a proton (**p**) and an electron (**e**-) with the release of "electromagnetic particles" (EMP):

$$n \rightarrow p + e^- + \text{"electromagnetic particles"} \quad (23)$$

That is, the formation of "**antihydrogen"**from an "**antiproton"** and a **positron** under natural conditions is almost improbable due to the presence of a "**core of nucleus**" in the atomic structure of substances.

CONCLUSION

Elementary and subelementary particles of electrical nature formed, respectively, "electric dipoles" and "magnetic bipoles" with the subsequent formation of "**electromagnetic particles**" causing electromagnetic interaction in the atomic-molecular structure.

Consistently combined "**electromagnetic particles**" formed **a new structure** in the atom - "**core of nucleus**" with a huge value of the potential representing the **nuclear force**. The "**core of nucleus**" has a strong electromagnetic interaction and determines the nature of the direction of the process and the structural-energy correspondence of the formed ""**matter"** and "**antimatter"**.The magnetic bipoles of the "**core of nucleus**" determine the nature of the electromagnetic interaction with the electron-positron pair, which excludes the formation of an "**antiproton"** and, accordingly, "**antimatters"**.

The calculation of the force of the Coulomb's interaction of the "**core of nucleus"** with the positron is $\mathbf{3.5 \cdot 10^9}$times greater than the force of interaction compared to the electron, which practically excludes the formation of an "**antiproton**", and therefore, "**antimatter**".

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