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AN INNOVATION FOR ENERGY RELEASE OF NUCLEAR FUSION AT SHORT DISTANCE DIELECTRICS IN SEMICONDUCTOR MODEL

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Abstract

An intermediate space between dielectrics and conductors is occupied by semiconductors. The main difference between conductors is the dependence of the degree of electrical conductivity on temperature and the amount of impurities in the composition. Also, the material has the properties of both a dielectric and a conductor. With increasing temperature, the electrical conductivity of semiconductors increases, and the amount of resistance decreases. As the temperature decreases, the resistance goes to infinity. In this paper a smart innovation model was proposed to release of nuclear fusion at short distance. That is, when the temperature reaches zero, semiconductors start acting like insulators. Dielectrics differ in their characteristics and properties. For example, some dielectric materials also contain small amounts of free electric charges. Free charges arise due to thermal vibrations of electrons, viz. However, in some cases an increase in temperature induces the detachment of electrons from the nucleus, which reduces the insulating properties of the material. Some insulators are characterized by a large number of "torn" electrons, indicating poor insulating properties.

Keywords:

Dielectrics, Conductors, Semiconductors, Resistance

1. INTRODUCTION

The ideal dielectric is a complete vacuum, which is very difficult to achieve on Earth [1]. Purely purified water has high dielectric properties, but it really doesn't worth remembering that the presence of any impurities in the liquid has the properties of a conductor [2]. The main criterion for the quality of any dielectric material is the degree of compliance with the assigned functions in a particular circuit [3]. For example, if the properties of a dielectric are such that the leakage current is negligible and does not affect the operation of the circuit, then the dielectric is reliable. Dielectrics are such physical materials which do not carry electric charges at low temperatures. The composition of such substances has a neutral charge and includes only atoms of molecules [4]. The charges of the neutral atom are closely bound together, so they lose the possibility of free movement throughout the material. Gas is an excellent conductor of electricity. Other non-conductive materials include glass, ceramics, ceramics, as well as rubber, cardboard, dry wood, resins and plastics [5].

Dielectric materials are insulators whose properties mainly depend on the state of the surrounding atmosphere [6]. For example, at high humidity, some dielectric materials partially lose their properties. Conductors and dielectrics are widely used in electrical engineering to solve various problems [7]. For example, all cable and wire products are made of metals, usually copper or aluminum. The sheath of wires and cables is polymer, as well as the plugs of all electrical appliances [8]. Polymers are excellent dielectrics that do not allow charged particles to pass through. Silver, gold and platinum materials are very good conductors [9]. But their negative characteristic, which limits their use, is their very high cost. Therefore, such products are used in areas where quality is more important than price (defense industry and location) [10]. Copper and aluminum materials are also good conductors, while not too expensive. As a result, the use of copper and aluminum wires is ubiquitous [11]. Tungsten and molybdenum conductors have less good properties, so they are mainly used in incandescent lamps and high-temperature heating elements [12]. Poor electrical conductivity can significantly disrupt the operation of a circuit.

A conductor is one such material, a feature of which is that the composition consists of freely moving charged particles that are distributed throughout the material [13]. Materials that conduct electricity are metals and melts of metals, distilled water, salt solution, wet soil, human body [14]. Metal is the best conductor of electricity. Non-metals are good conductors, for example, carbon [15]. All conductors in nature are characterized by two properties: Resistance indicator; and Conductivity indicator.

Electrons, while moving, collide with atoms and ions, which is a kind of barrier and resistance arises. That is why conductors are assigned the property of electrical resistance. The reciprocal of resistance is electrical conductivity. Electrical conductivity is the property (ability) of a physical substance to conduct an electric current. Therefore, the properties of a reliable conductor are low resistance to the flow of moving electrons and, as a result, high electrical conductivity. That is, a better conductor is characterized by a larger conductivity index [16].

The rest of the paper is organized as follows: Section 2 describes the various mechanisms used by the different authors. Proposed methodology is explained in section 3. In Section 4, simulation setup is explained with results observed. Finally, summary of the work is concluded in section 5

2. RELATED WORKS

Zhu, Y. [1] et al. discussed the number of electrons and holes are the same, so a hole can capture the nearest electron. As a result, the atom becomes neutral again from the positive ion. The process of combining electrons with holes is called recombination.

Yu, W. [2] et al. discussed about the separation of electrons from atoms occurs with the same frequency, therefore, on average, the number of electrons and holes for a certain semiconductor is equal, which is a constant value and depends on external conditions, primarily temperature.

Roy, S. [3] et al. discussed when a voltage is applied to a semiconductor crystal, the movement of electrons is regulated, causing a current to flow through the crystal due to its electronic and hole conductivity. This conductivity is called intrinsic, which has already been mentioned a little more.

Gopi, B., [5] et al. discussed except for light nuclei, the specific binding energy is approximately constant and equal to 8 MeV/nucleon. Elements with mass numbers between 50 and 60 have the highest specific binding energy (8.6 MeV/nucleon) and the nuclei of these elements are the most stable.

Malik, J. A., [9] et al. discussed a nuclei become more heavily loaded with neutrons, the specific binding energy decreases. For elements at the end of the periodic table, this is equal to 7.6 MeV/nucleon

Kiran, P., [10] et al. discussed nuclear fission; a certain amount of energy must be expended to overcome the nuclear forces. To assemble a nucleus from individual particles, it is necessary to overcome Coulomb repulsive forces (for this, energy must be spent to accelerate these particles to a higher speed). That is, for nuclear fission or nuclear fusion to take place, some energy must be expended.

Oosterbeek, J. W [12] et al. discussed during short-range nuclear fusion, nuclear forces begin to act on the nucleons, causing them to move with acceleration. Accelerated nucleons emit gamma quanta, which have energy equal to the binding energy.

Ramesh, G., [14] et al. discussed the release of a nuclear fission reaction or fusion, energy is released. It makes sense to carry out nuclear fission or nuclear synthesis, as a result of which, i.e., The energy released as a result of fission or fusion is greater than the energy expended. the gain of energy can be obtained through the fission (fission) of heavy atoms or through the fusion of light nuclei, which is practically done

3. PROPOSED MODEL

In a conductor, free electrons move throughout the volume under the influence of electric field forces. Unlike a conductor, a dielectric (insulator) has no free charges. Insulators are composed of neutral molecules or atoms. The charges in the neutral atom are strongly bound to each other and cannot move under the influence of an electric field throughout the entire length of the dielectric. All substances present in nature differ in their electrical properties. Thus, from various types of physical materials, dielectric materials and conductors of electricity are divided into separate groups. In conductors, unlike dielectrics, there is a high concentration of free electric charges. In metals, these are free electrons that move throughout the volume of the material. Origin of Free Electrons Valence electrons in metal atoms interact very poorly with nuclei and easily lose contact with them. In a dielectric, on the contrary, the electrons are tightly bound to the atoms and cannot move freely under the influence of an electric field. Since the number of free charged carriers in dielectrics is very small, it means that they have no electrostatic induction and the electric field strength inside the dielectric does not become zero, but decreases. The tension cannot be increased indefinitely, because at a certain value, all the charges can change so much that a change in the structure of the material occurs, in other words, dielectric breakdown occurs. In this case, it will lose its insulating properties.

As the temperature rises, more energy is imparted to the electrons, their thermal vibrations gain more energy, and as a result some of the electrons move away from their atoms. These electrons become free and move in free space, creating chaotic motions in the absence of an external electric field. Atoms that have lost electrons cannot perform random motions, but oscillate slightly relative to their normal position in the crystal lattice. Such atoms that have lost electrons are called positive ions. Instead of electrons torn from their atoms, free spaces are obtained, which are commonly called holes. In general, the number of electrons and holes are the same, so a hole can capture the nearest electron. As a result, the atom becomes neutral again from the positive ion. Nuclei of atoms are tightly bound systems of large numbers of nucleons. In order to completely separate the nucleus into its components and remove them at a greater distance from each other, it is necessary to spend a certain amount of work A. Binding energy is the energy equivalent to the work required to split a nucleus into free nucleons.

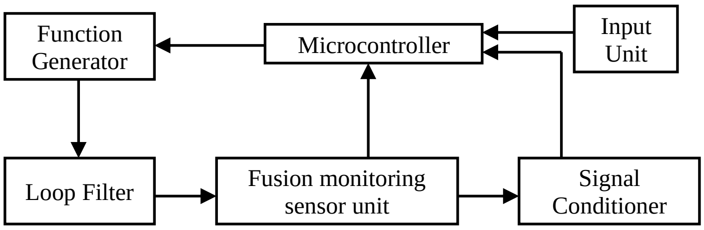

Fig.1. Proposed model

According to the conservation law, the binding energy is equal to the energy released when a nucleus is formed from individual free nucleons simultaneously.

$$\text{Electrical bonds} = -A \tag{1}$$

The process of combining electrons with holes is called recombination. Separation of electrons from atoms occurs with the same frequency, therefore, on average, the number of electrons and holes for a certain semiconductor is equal, which is a constant value and depends on external conditions, primarily temperature. When a voltage is applied to a semiconductor crystal, the movement of electrons is regulated, causing a current to flow through the crystal due to its electronic and hole conductivity. This conductivity is called intrinsic, which has already been mentioned a little more. But semiconductors in their pure form with electronic and hole conductivity are not suitable for the production of diodes, transistors and other components, since the basis of these devices is the p-n junction.

3.1 NUCLEUS BINDING ENERGY CALCULATION

The nucleons in the nucleus are held firmly together by nuclear forces. To remove a nucleon from the nucleus, a lot of work must be done, that is, significant energy must be imparted to the nucleus. The binding energy of a nucleus characterizes the intensity of interaction between nucleons in the nucleus and is equal to the maximum energy that must be expended to separate the nucleus into separate non-interacting nucleons without imparting kinetic energy to the nucleus. Each nucleus has its own binding energy. The higher this energy, the more stable the nucleus. Accurate measurements of nuclear masses show that the rest mass of the nucleus is always less than the sum of the rest masses of its constituent protons and neutrons. This mass difference is called mass deficiency. To obtain such a transition, two types of semiconductors are needed, two types of conductivity (p - positive - positive, hole) and (n - negative - negative, electronic). These types of semiconductors are obtained by doping, adding impurities to pure germanium or silicon crystals. Although the amount of impurities is very small, their presence changes the properties of the semiconductor to a large extent, which makes it possible to obtain semiconductors with different conductivities. Specific binding energy BE pulses - binding energy of nucleus per 1 nucleon:

$$BE_a = ME_c/A \tag{2}$$

Here the ME_c denoted the molecule energy and the A represents the cross sectional area. This part of the mass is lost when the binding energy is released. Applying the law of the relationship between mass and energy, we get because most nuclei are stable, there is a special inter nuclear (strong) interaction between nucleons - gravity, which repels such charged protons, ensures the stability of nuclei.

3.2 BINDING ENERGY CALCULATION

The binding energy of a nucleus is a physical quantity equal to the work that must be done to break the nucleus into its constituent nucleons without imparting kinetic energy. It follows from the law of conservation of energy that the same amount of energy must be released when the nucleus is formed that must be expended in splitting the nucleus into its component nucleons. The binding energy of a nucleus is the difference between the energies of all the nucleons in the nucleus and their energies in the Free State. To compute the mass related to binding energy:

$$\nabla Q = ME_c/A^2 = Ed_a + (S\text{-}R)d_b - d_r \tag{3}$$

10 ^ 10 (ten billion) atoms have no more than two free electrons, so germanium is a poor conductor, or, as they say, a semiconductor. It should be noted that one gram of germanium contains only 10 ^ 22 (ten thousand billion) atoms, which allows it to "get" about two thousand billion free electrons. It seems that it is enough to pass a large current. To overcome this problem, it is enough to remember what a current of 1 A is. A current of 1 A will cause 1 coulomb or 6*10 ^ 18 (six billion) electrons to pass through the conductor per second. Against this background, two thousand billion free electrons, moreover, scattered over a large crystal, cannot ensure the passage of large currents. However, due to thermal conductivity, germanium has a small conductivity. This is called intrinsic conductivity. Energetically Favorable:

1) Splitting heavy nuclei into light ones;
2) Fusion of light nuclei with each other into heavy ones.

Both processes release enormous amounts of energy; these processes are currently implemented in practice; nuclear fission reactions and nuclear fusion reactions. Nucleons are firmly bound in the nucleus by nuclear forces. To break this bond, that is, to separate the nucleons completely, a certain amount of energy must be expended.

3.3 ENERGY CONSERVATION

According to the law of conservation of energy, the energy of the nucleons bound in a nucleus must be less than the energy of the nucleons separated by the value of the binding energy of the nucleus 8. On the other hand, according to the law of proportionality, the mass and energy of a system, A change in energy is accompanied by a proportional change in the mass of the system. For example, let's calculate the binding energy of the nucleus of a helium atom. It consists of two protons and two neutrons. The mass of the proton is the mass of the neutron hence, the mass of the nucleons that make up the nucleus is the mass of the nucleus of a helium atom hence, the defect of the helium nucleus. Then the binding energy of a helium atom the general formula for calculating the binding energy of any atom in joules from its mass defect obviously has the form. If these nucleons combine to form two new nuclei with mass numbers 119, the energy released is equal to the sum of the binding energies of the new nuclei.

As a result of the fission reaction of a uranium nucleus, nuclear energy is released in an amount equal to the difference between the binding energy of the new nuclei and the binding energy of the uranium nucleus. The release of nuclear energy occurs during different types of nuclear reactions - when several light nuclei (clusters) combine into a single nucleus. In fact, for example, the fusion of two sodium nuclei into a nucleus with the same mass number takes place. If these nucleons combine to form a new nucleus (with mass number 46), an energy equal to the binding energy of the new nucleus is released. Consequently, the reaction of the synthesis of sodium nuclei is accompanied by the release of nuclear energy equal to the difference between the binding energy of the aggregated nucleus and the binding energy of the sodium nuclei. The release of nuclear energy occurs in fission reactions of heavy atoms and fusion reactions of light nuclei. The amount of nuclear energy released by each reacted nucleus is equal to the difference between the binding energy 8 2 of the reactant and the binding energy 81 of the original nuclear substance. This arrangement is very important as the industrial methods of obtaining nuclear energy are based on it. The most favorable in terms of energy yield is the reaction of fusion of hydrogen or deuterium atoms. The difference in the binding energies of the synthesized nuclei and initial nuclei can be large.

4. RESULTS AND DISCUSSION

The proposed short distance dielectrics in semiconductor model (SDDSM) was compared with the existing surface dielectric barrier discharge (SDBD), multiport filtering power divider (MFPD), photovoltaic self-charging energy storage (PSES) and charge transfer magnetic field model (CTMFM).

4.1 CONDUCTOR MEASUREMENTS

A body containing a large number of free charges moving throughout the volume of this body. The following Fig.2 shows, there are conductors with electronic and ionic conductivity. The former includes all metals and alloys. Second - electrolytes, i.e. aqueous solutions of salts, alkalis, acids etc.

4.2 DIELECTRIC MEASUREMENTS

A body without free charges. A dielectric is composed of neutral atoms or molecules. These include glass, resins, varnish etc.

The following Fig.3 shown in a neutral atom, all charged particles are closely connected to each other, as a result, even under the influence of an electric field, they cannot move throughout the entire volume of the body. Therefore, dielectrics practically do not conduct electricity and have very low electrical conductivity.

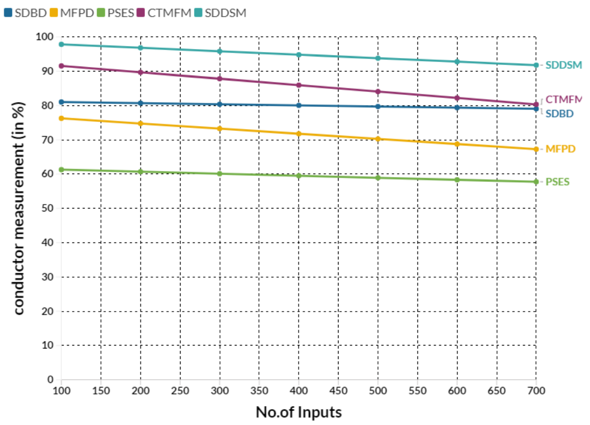

Fig.2. Comparison of conductor Measurement

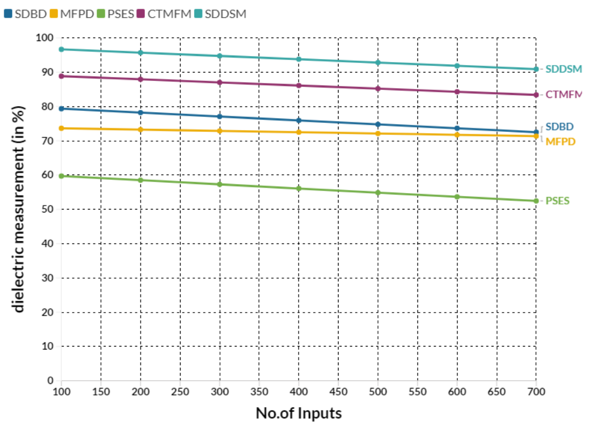

Fig.3. Comparison of dielectric Measurement

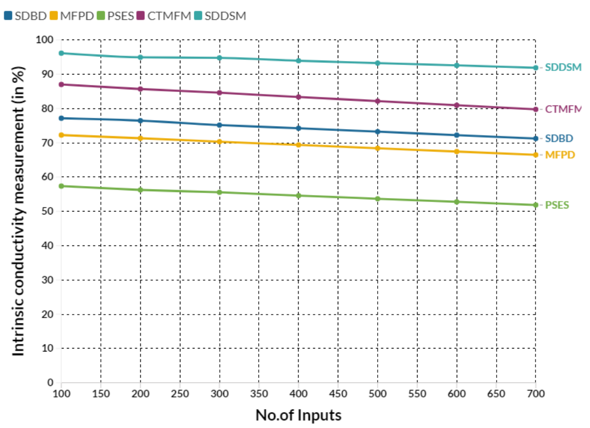

Fig.4. Comparison of Intrinsic conductivity Measurement

4.3 INTRINSIC CONDUCTIVITY MEASUREMENTS

The fact is that under the influence of temperature, some electrons still break away from their atoms and free themselves from the bond with the nucleus for a while. In Fig.4 shows the germanium crystal has a limited number of free electrons due to which it is possible to conduct electricity.

4.4 VALENCE OF ATOMS MEASUREMENTS

Atoms with 6 or 7 electrons in their outermost orbital's tend to gain 1 or 2 electrons. Such atoms are said to be mono valent or divalent. But if an atom has 1, 2 or 3 electrons in its outer orbit, such an atom tends to give them up. In this case, the atom is assumed to be one, two, or three valent.

The Fig.5 shows, If an atom has 4 electrons in its outer orbit, such an atom prefers to combine with the same one having 4 electrons. This is how the germanium and silicon atoms used in making transistors are joined together. In this case, the atoms are called tetravalent.

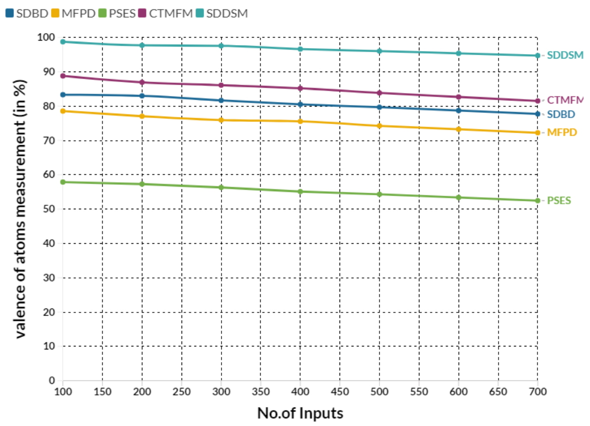

Fig.5. Comparison of valence of atoms Measurement

4.5 STRUCTURE OF SEMICONDUCTORS

Germanium and silicon atoms in the periodic table are in the same group as carbon (the chemical formula of diamond is C, which is large crystals of carbon obtained under certain conditions), and therefore, when combined, they are diamond-like.

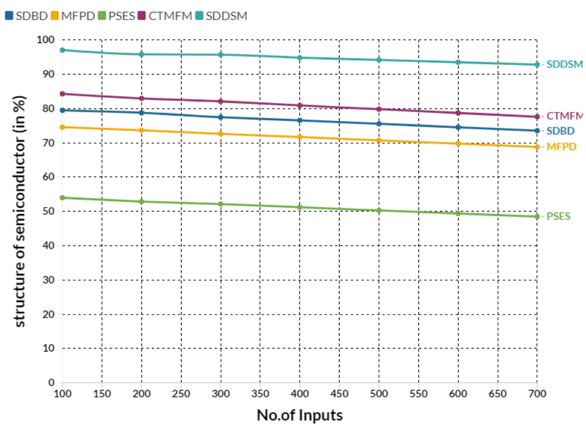

Fig.6. Comparison of structure of semiconductor

In Fig.6, A germanium atom is in the center of the cube, and 4 atoms are located at the corners. The atom depicted in the center of the cube is bonded to its nearest neighbors by its valence electrons

Thus, the outer orbitals are completed for eight electrons. Of course, the crystal lattice is not cubic, as shown in the figure, so that the mutual, dimensional arrangement of the atoms is clear. During nuclear fission the mass of the nucleus is always less than the sum of the rest masses of the free particles formed in Nucleus Synthesis. Studies have shown that nuclei are stable shapes. This means that there is a specific interaction between the nucleons in the nucleus. The study of this connection may be carried out without obtaining information about the nature and properties of nuclear energy, but on the basis of the law of conservation of energy. The physical quantity equal to the work done to remove the nucleon with binding energy from the nucleus without imparting kinetic energy to the nucleus is called the physical quantity.

The total critical binding energy is determined by the work done to separate the atoms into their constituent nucleons without imparting kinetic energy to them. It follows from the law of conservation of energy that when a nucleus is formed, energy equal to the binding energy of the nucleus must be released from its constituent nucleons. Obviously, the binding energy of a nucleus is equal to the difference between the total energy of the free nucleons forming a given nucleus and their energy within the nucleus. From the theory of relativity, it is known that there is a relationship between energy and mass.

Note that in a conductor, the energy levels from the valence band to the conduction band are connected as a continuous graph. The conduction band and the valence band overlap each other, which is called the overlap band. Depending on the presence of electric field (voltage), temperature and other factors, the number of electrons can vary. Thanks to the above, electrons can move in conductors, even if you give them minimal energy. A semiconductor has a specific band gap between the valence band and the conduction band. The band gap describes how much energy must be supplied to a semiconductor in order for current to flow. For dielectrics, the diagram is similar to the diagram describing semiconductors, but the difference is only in the band gap - which is several times larger here. The differences are due to internal structure and material

1) If we discard lighter nuclei, the specific binding energy is constant and equal to approximately 8 MeV, roughly, say zero approximation. Nucleon. The approximate independence of the specific binding energy from the number of nucleons indicates the saturation property of nuclear forces. This property means that each nucleon can only interact with a few neighboring nucleons.
2) Specific binding energy is not strictly constant, but maximum (~8.7 MeV/nucleon) but= 56, i.e. The iron core falls in the area, and on both edges. The maximum of the curve corresponds to the most stable nuclei. The fusion of lighter nuclei is energetic, releasing thermonuclear energy. For heavier nuclei, in contrast, fission into fragments is beneficial, which proceeds with the release of energy known as nuclear energy.

We have reviewed the three main types of materials and provided their examples and features. Their main difference is their ability to conduct current. Therefore, each of them has found its own purpose: conductors are used to transmit electricity. Various types of materials are used in electronic devices. The main components used for these devices are conductor and semiconductor products. To use them most effectively, you need to know exactly how conductors differ from semiconductors. The properties of each element, used in combination, allow you to create devices with unique qualities and characteristics

5. CONCLUSION

In this paper, Measurements of the masses of nuclei show that the mass of the nucleus (Mn) is always less than the sum of the rest masses of free neutrons and protons. The mass of the formed nucleus is always less than the sum of the remaining masses of the free particles that formed it. The mass defect is a measure of the binding energy of a nucleus. The mass defect is equal to the difference between the total mass of all the nucleons of the nucleus in the Free State and the mass of the nucleus. The nuclear binding energy is equal to the work required to split the nucleus into individual nucleons or the energy released from the nucleons during the assembly of nuclei. A measure of nuclear binding energy is the mass defect. If there is a system of particles with mass, a change in the energy of this system leads to a change in its mass.

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