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Differences in semiconductors

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ABSTRACT: The periodic table contains 14 semiconductor elements, including silicon, germanium, selenium, cadmium, aluminum, gallium, boron, indium, and carbon. Semiconductors are crystalline solids with moderate electrical conductivity, so they can be used both as conductors and insulators. This article discusses this.

Key Words: Semiconductors, silicon, germanium, selenium, cadmium, aluminum, gallium, boron, indium, Valence electrons, External semiconductors, Internal semiconductors, P-type semiconductor, N-type semiconductor.

1. INTRODUCTION

If they are used as conductors, under certain conditions they allow the circulation of electric current, but only in one direction. They also do not have as high conductivity as conductive metals. Semiconductors are used in electronic applications, especially for the manufacture of components such as transistors, diodes and integrated circuits. They are also used as an adjunct or supplement to optical sensors, such as lasers for solids and some power devices for power transmission systems. Currently, this type of element is used in both domestic and industrial applications for technological developments in the field of telecommunications, control systems and signal processing..

2. PROPOSED WORK

This paper shows the variation of expansion procedure is explained later since each round needs its own key generated according to this procedureTypes .Semiconductor materials are divided into different types depending on the compounds they contain and their physical effects on various environmental stimuli.

3. IMPLEMENTATION OF ENCRYPTION

Internal semiconductors. They are elements whose molecular structure consists of atoms of the same type. These types of internal semiconductors include silicon and germanium. Each atom of the inner semiconductor has a 4-valent electron; that is, 4 electrons rotating in the outermost shell of each atom. In turn, each of these electrons forms a bond with neighboring electrons. In this way, each atom has 8 electrons in its superficial layer, thus forming a strong bond between the electrons and atoms that make up the crystal lattice. Because of this configuration, electrons do not move easily within the structure. Thus, under standard conditions, internal semiconductors act as insulators. However, the conductivity of the internal semiconductor increases as the temperature rises, as some valence electrons absorb heat energy and separate from the bonds. These electrons are converted into free electrons, and if they are directed correctly by the difference in electrical potential, they can contribute to the current flow in the crystal lattice. In this case, the free electrons jump into the conduction band and pass to the positivepole of the potential source (e.g., the battery). The motion of the valence electrons creates a vacuum in the molecular structure, which has an effect similar to that of a positive charge in the system, so they are considered as positive charge carriers. Then the opposite effect occurs because some electrons can fall from the conduction band to the valence shell, during which energy is released, which is called recombination.

External semiconductors. They are compatible by incorporating impurities into the internal conductors; that is, by adding three-valent or five-valent elements. This process is called doping and its purpose is to increase the permeability of materials, improving their physical and electrical properties. By replacing the inner semiconductor atom with an atom in another component, the following two types of semiconductors can be obtained.

P-type semiconductor. In this case, the impurity is a trivalent semiconductor element; that is, there are three (3) electrons in the valence shell. Intrusive elements in a structure are called doping elements. For P-type semiconductors, there are examples of these elements (B), gallium (Ga) or indium (In). In the absence of a valence electron to form the four covalent bonds of the inner semiconductor, the P-type semiconductor has a gap in the missing bond.

N-type semiconductor. The intrusive element in the configuration is given by the five-valent elements; that is, those with five (5) electrons in the valence band. In this case, the compounds that make up the internal semiconductor are elements such as phosphorus (P), antimony (Sb) or arsenic (As). Dopants have an additional valence electron, there is no covalent bond to bond with it, it automatically moves through the crystal lattice. Semiconductors are distinguished by two functionality, energy efficiency, variety of applications and low cost. The well-known properties of semiconductors are given below.

- Its reaction (conductive or insulating) can vary depending on the sensitivity of the element to ambient light, electric fields and magnetic fields.
- If a semiconductor is exposed to low temperatures, the electrons will remain united in the valence band and therefore no free electrons will appear for the circulation of the electric current.

On the other hand, if a semiconductor is exposed to high temperatures, thermal vibration can affect the strength of the covalent bonds of the element atoms and leave free electrons for electrical conductivity.

- The conductivity of semiconductors varies depending on the proportion of impurities or doping elements in the internal semiconductor.

For example, if 10 million atoms are added to a million silicon atoms, this ratio increases the conductivity of the compound by a thousand times relative to the conductivity of pure silicon.

4. CONCLUSION

The most widely used semiconductor in the electronics industry is silicon (Si). This material is present in the devices that make up integrated circuits that are part of our daily lives.

Silicon germanium alloys (SiGe) are used in high-speed integrated circuits for radars and amplifiers of electrical instruments such as electric guitars.

Another example of a semiconductor is gallium arsenide (GaAs), which is widely used in signal amplifiers, especially for signals with high gain and low noise level.

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