

**SEMICONDUCTORS: THE HISTORY OF FORMATION AS A SCIENCE. DEFECTS IN THE CRYSTAL STRUCTURE. ELECTRICAL CONDUCTIVITY AND CONTACT PHENOMENA**

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**Abstract:** This article mainly covers basic information about semiconductors, the history of the formation of semiconductor physics, crystal structure defects, their electrical conductivity, contact phenomena, semiconductor devices and research in this area, problems and shortcomings, as well as achievements. It is also reported that solar cells based on the internal photoelectric effect are called light-emitting diodes, and solar cells-semiconductor silicon solar cells that convert solar energy into electrical energy-are called solar cells. Again with the aim of developing the field of semiconductors Information about the strengthening of the activities of the Institute of Semiconductor Physics at the National University, that currently semiconductors occupy an important place in science and technology, as well as that semiconductor electronic devices are used in various sectors of the national economy is highlighted.

**Key words:** semiconductors, semiconductor physics, semiconductor electronic devices, electronics, microelectronics, diodes and transistors, radio engineering, telemechanics, solar cells, LEDs and solar cells, contact phenomena, n-type mixture, p-type mixture, integrated circuits, mixed semiconductors, etc. k

Semiconductors are substances that occupy an intermediate position between substances that conduct electricity well (mainly metals are conductors) and substances that conduct almost no electricity (dielectrics). Semiconductors are very widely used in electronics and microelectronics almost all modern electrical equipment-from computers to mobile phones-is based on semiconductor technology. The most widely used semiconductor substance is silicon, and other substances are also widely used.

*History of the formation of semiconductor physics*

The discovery of semiconductor diodes and transistors led to the development of a new stage in radio engineering. First with semiconductor physics mostly A. F. Under Joffe's leadership, a broad theoretical and experimental study of the properties of semiconductors began.

*Semiconductor tools*

Most semiconductor devices are designed based on the properties of the p-n junction. These are diodes, transistors, integrated circuits, etc. that can be manufactured for various purposes. Composite semiconductors The semiconductor tools currently used in engineering are composite semiconductors.

*Defects in the crystal structure of semiconductors*

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An ideal pure crystal is not found in nature at all. of course, it contains atoms of other elements that cause deviations from the ideal state, space in the crystal lattice, mismatch in the position of the atom, and vibrations of the atom around its own equilibrium. All this leads to a violation of the structure of the crystal lattice. For this reason, they are collectively referred to as defects in crystal lattices. Free electrons in crystals, as well as mobile holes, also cause the crystal to deviate from the ideal. Because an electron acting with its field on the lattice can significantly deform it.

*Electrical conductivity of semiconductors*

In semiconductors, electric current is generated by electrons and cycles. In this process, the total current is equal to the sum of the currents carried by electrons and the currents carried by holes, and in this process there is the concept of partial conductivity. in this case, the current carried by the electrons is equal to the amount of current carried by the holes.

*Contact events in semiconductors*

Practically most devices made of semiconductors are based on contact properties. In the 70s of the XIX century, it became known that when an electric current is passed through a metal contact with a semiconductor, the electrical conductivity of the contact is not the same in both directions. Crystal diodes (detectors) were manufactured on the basis of such a scheme of metal contact with a semiconductor and were widely used in the years of radio engineering development. solar cells based on the internal solar cell are light-emitting diodes and solar cells-semiconductor, converting solar energy into electrical energy, that is, silicon solar cells are widely used, and it is called a solar cell. the n-type mixture is coated with a p-type mixture 1-2 micrometers thick. As light falls on the surface of the element, the P-field electron pores in the N-field increase.

*p-n (electron beam) junctions*

a layered p-n junction (electron beam junction ) with an amazing property that forms at the interface between a p-type semiconductor and an n-type semiconductor is called a p-n junction (electron beam junction). The simplest of them is the p-n homojunction, in which this transition is formed inside a single semiconductor crystal at the junction (contact) of its p-and N-conducting fields.

In practice, one type of input in terms of volume, for example, donors, is made by introducing another type of input-acceptors into the part of the semiconductor where the donors are evenly distributed, and the acceptors in this part exceed the donors. In this case, the donors will have a multipheric N-conductivity, and the acceptors will have a multipheric P-conductivity, and a P-N transition layer will form at their boundary. For example: The aforementioned p-n transition occurs when boron atoms (acceptors) are introduced into the layer of a silicon crystal sample into which phosphorus (P) atoms (donors) were originally introduced.

*Scientific achievements*

Currently, semiconductors occupy an important place in science and technology. Semiconductor electronic devices are used in various branches of the national economy. From year to year, the properties of semiconductors that are still unknown to this day are

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revealed and more and more new devices are made from them. For this reason, interest in semiconductor physics is growing.

Semiconductor devices are now widely used in automation, radio engineering, and telemechanics. When determining soil moisture and accurately measuring temperature in agriculture, photovoltaic cells (solar panels), made on the most important conductors of plants and animals, allow you to convert the light energy of the sun directly into electrical energy, while thermoelements (thermoelements) help to generate electricity from thermal energy.

*Semiconductor innovations*

The activity of the Institute of Semiconductor Physics at the National University has been strengthened. The resolution of the Cabinet of Ministers development of alternative energy, electrical and microelectronic industries state support for improving the efficiency of scientific research in the field of semiconductor physics also defines measures to strengthen the activities of the National Research Institute of Semiconductor Physics and Microelectronics at the Mirzo Ulugbek National University.

*Industry research, challenges and shortcomings*

The automotive industry suffers from a shortage of semiconductors. It is reported that in the first half of this year, 2 million cars may be produced. The agency says that the shortage of microchips is becoming increasingly apparent thanks to the annual reports of the world's auto industry concerns.

Currently, chip manufacturers claim that the problem is difficult to solve earlier. On the other hand, engineering companies focus not only on reducing the number of products, but also on simplifying the component assembly process to spend less money.

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