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SOLAR POWER

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ABSTRACT: Today, the concepts of solar cells, batteries and photovoltaic devices historically arose 40 years ago, and over the past 10-15 years they have entered the national economy and the lives of ordinary people. The essence of these devices is based on the absorption of solar radiation in semiconductor materials and the separation of the resulting charge pairs in a semiconductor potential barrier and transmitted to an external circuit.

KEYWORDS: giant, temperature, albedo, solar, energy, charge, coefficient.

I. INTRODUCTION

As a result of early research, the spectrum of solar radiation is completed. It has been found that absorption depends on the nature of the material. It was found that the absorption of absorbed radiation in the bulk of the material and the separation process depend on the potential barrier (r - p junction) and the properties of the material created in the semiconductor material. This allowed us to optimize the parameters of the solar cell.

Practical research focused on designing, manufacturing, optimizing QE structures with optimal parameters, developing QE, batteries and photovoltaic technologies, as well as developing electrical systems for various types of consumers with different capabilities.

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II. RELATED WORK

The current CS is made of different semiconductor materials, depending on the conditions in which it is used (space, Earth conditions, direct sunlight, intense sunlight, extreme conditions, etc.). Most of the QE, which is currently produced and used as an energy source for human needs, is made of silicon material. The main reason for this is silicon, which is the basis of microelectronic devices commonly used for the needs of the modern economy. Secondly, silicon is an elementary semiconductor that makes up about 30% of the Earth's surface, as well as advanced technologies.

Comparing the sun to a giant fusion reactor. perhaps It radiates energy at a temperature of 6000 ° C, like a dark black system. The source of this radiation is a fusion reaction. Approximately 6 10 "kg of hydrogen is converted to helium on the Sun. As a result, the mass defect is 4 103 kg, which is calculated by the equation E = C2, and the amount of energy is 4 1020 Joules. The total mass of the Sun is about 2200 kg, and it can last continuously for 10 billion years.

The earth moves in an elliptical orbit around the sun. The diameter of the sun is about 9 meters. Vir is an astronomical unit of energy perpendicular to an astronomical unit per unit distance perpendicular to the sun's rays (1 kb = 1.496 10 "m2 m2. Over the course of a year, the distance between the Sun and the Sun can lead to a change in the average CE value of ± 0.34.

Land of albedo

Ephedra albedo refers to the rate of return of radiation from its environment to the flow rate. The average Earth albedo calculated for diffuse return from the surface is 0.34.

If the mass of the Earth's atmosphere is 1, the spectrum of reflected light is considered to be exactly the same as the spectrum of solar radiation on the surface of the Earth.

The Earth's atmosphere, based on its optical properties, is a selective filter that converts solar radiation from space. If the radiation flux passes through the atmosphere and falls on the Earth's surface, then the optical distance traveled by the radiation is considered one atmospheric mass and is denoted as AM 1. If the radiation current does not change at atmospheric pressure, its optical mass in the atmosphere is zero and is set equal to AM 0 .

It is assumed that direct sunlight at sea level is ~ 100 mW / cm2 in the open air at noon. Isolation consists in the fact that the Earth's surface is the amount of solar radiation, which is insolation, in the Earth-Sun system it depends

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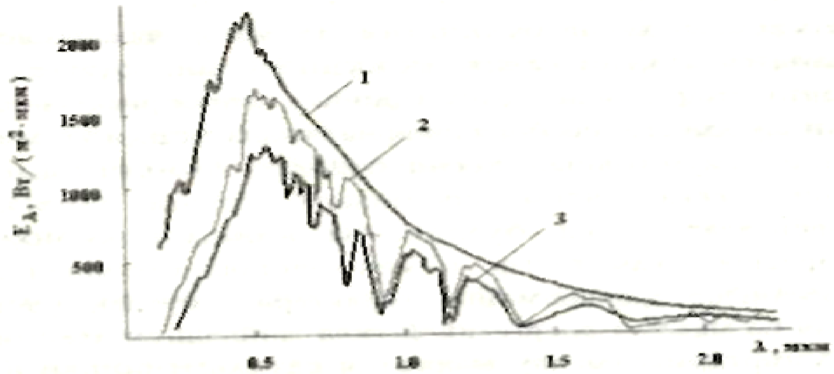
on seasonal variations in distance, geographical latitude, the environment and the mass of the atmosphere. Isolation is usually indicated by the average daily, monthly, and average annual values of solar radiation.

The composition of solar radiation

The spectral composition of solar radiation consists of oscillations in the range from 0.1 micrometer to a wavelength of 30 meters. The main energy k of solar radiation is concentrated in the range 0.2–3 μm (Fig. 1). In this range, it is customary to divide and call radiation. These include an ultraviolet (UV) range of 0.1-0.38 μm, a visible portion of the spectrum of 0.38-0.78 μm, and an infrared (IR) spectrum of 0.78 μm and



Spectral distribution of solar radiation energy. 1- Outside the atmosphere 1360 W / m2 2-100 W / m2 2 below the Earth's surface 3-834.6 / m2 directly below the Earth for more than one wavelength. Visible radiation is divided into violet, blue, green, yellow and red rays. IR radiation is divided into near and far infrared rays. Ultraviolet radiation, despite its high intensity in the Universe, is absorbed by ozone present in the upper layers of the Earth's atmosphere, reaching only a small fraction of the Earth's surface with a wavelength of 0.3 microns.

Optical and electrical properties of semiconductor crystals

Solar cells (CS) are made mainly of semiconductor materials. Therefore, knowledge of the optical and photoelectric properties of CSs requires studying the structure of solar cells, differences in their properties from metals and dielectric materials, as well as properties directly related to solar cells.

We consider the formation of solids from the point of view of electron theory in the case of SE materials. During the formation of a solid, atoms move closer to each other, which leads to the generalization of electrons in the outer shell. Instead of individual single orbits of individual electrons, generalized orbits form in the atom, and the shells in the atom are connected with spheres and usually belong to a crystal. The behavior of electrons is completely changed, and electrons located in a certain atom and at a certain energy level can move to another neighboring atom on the same energy surface without changing their energy, and thus freely move electrons in the crystal.

All atoms in the isolated state of the crystal are filled with electrons. Only in the region where the valence electrons are located at some upper levels, the layers are not fully occupied. Conductivity, optics, and other properties of a crystal are determined mainly by the energy distance from the valence field to the filling surface and above it. Electrons can pass through the valence field and participate in the electric current through thermal and optical excitation. The displacement of electrons into vacant spaces in a valence field creates the movement of opposite charges, and are referred to as

The dielectric consists in the fact that the valence field is filled after that. substances with a relatively large energy distance to the permeability region.

The metals are different. The valence field is partially filled by them or is in contact with the next branching area.

III. EXPERIMENTAL RESULTS

If the valence band of a substance is not completely occupied, but the energy distance to the permeability region is relatively small (less than 2 eV), these substances are called SO. The properties of the op-amp, in particular, the electrical conductivity of an electron, depend on the external environment, especially on temperature. An increase in temperature (T) increases the number of electrons, exponentially increasing the conductivity of the currents when passing from the permissible sphere (EG) to the permeable region between the valency and the permeability region and**(σ)**

$$\sigma = A\exp(-E_g /2kT) \quad (1)$$

The reason for this change is that where k is the Boltzmann constant, and A is the invariant size characterizing the substance.

The electrical conductivity of metals is determined by the temperature dependence of electron mobility due to the fact that free electrons do not change as a result of convection.

The logarithm of the above equation is the following expression:

$$\ln\sigma = \ln A - E_g/2\kappa T \quad (2)$$

This equation can be graphically displayed in semi-logarithmic coordinates. The resulting line and its angular coefficient Burchak determine the width of the allowable region, which is the main parameter Eg = 2kTφ It should be noted. The slope of the curve, that is, the change in the logarithm of conductivity as a function of 1 / T, is only pure. This applies only to materials with intrinsic conductivity, free of charge.

In semiconductor semiconductors, the dependence of lns on 1 / T is complex, which can consist of two lines and connected through the horizontal part.

It is possible to determine the state of energy levels of the subsurface in a forbidden field using the slope of the linear curve obtained from the equation **lnσ=lnA- E/2kT**, obtained from measurement at low temperature. In the case of high temperatures, it is possible to determine the size of the forbidden material in EG, for example, Eg.

In the preparation of FEs, the interaction of solar radiation with EO material, the absorption and release of photon energy by electrons in the material is important.

In quantum mechanics, it is believed that elementary particles, including electrons, have wave properties. Therefore, when studying the behavior of elementary particles, along with the energy (E) and momentum (R) of their wavelength λ. Repetition n and wave vector K = P / h, (h-Planck constant) are also used. Here E = hv and P = h / λ.

The crystal structure of the crystal can be illustrated by E-K diagrams. Here, the energy is shown in the electron-volt (eV) wave vector K, the constants of the crystal network. The K axis shows the orientation of the crystal lattice by means of Diagram E - K. In the PL material, it is possible to determine the nature of interbranch transitions, including whether the transitions are "regular" or "irregular".

The value of EE, determined by measuring optical absorption, often depends on the concentration of free charge carriers in the material, temperature, and the presence of energy levels in the input region. If the conditions in the lower part of the conducting field and above the valence field are filled with charge carriers, then the input voltage may be greater than the value of the pure patented material. If the region created by the inputs merges with the nearest admissible boundary region (for example, when a large number of inputs are entered), then EG decreases. This decrease in Eg affects the main absorption limit.

The absorption coefficient in the XPS material is usually determined by the electron reduction of the wavelength 1 / and is in N═N0 exp(-άℓ) N is the density of photons flowing into the depth ℓ in the material, N0 is the density of the photon flux crossing the material surface.

Figure 2 shows the change in energy from some materials for the production of solar cells. As can be seen from the figure, the spectral absorption characteristics α are very different from those for the presented materials, and this difference is mainly due to their spatial structure and the nature of the optical transitions. GaAs, InP, and CdTe OOs materials contain direct field specific optical transitions, which rapidly increase to 10^4–10^5 cm – 1 with the appearance of photons with energies exceeding EH in the emission spectrum.

In a silicon material, absorption begins at 1.1 eV. This is due to irregular energy transitions and a quantum of light and a quantum-phonon network. Consequently, the absorption rate gradually increases. Only the photon energy of 2.5 eV. Once this is achieved, the branch transitions are direct and the absorption of the rock begins. The spectral characteristic of the absorption coefficient is such that it shows that using silicon material can turn most of the solar spectrum into electricity. For example, for non-atmospheric solar radiation (AM O) this is 74%. Whereas if GaAs is used as material, only 63% of solar radiation can be converted to electricity. However, since the value of l at the base absorption threshold of irregular optical transitions is small, the thickness of a silicon FE to absorb the entire spectrum of the Sun should be at least 250 μm. However, under the same conditions, the thickness of the GaAs material is only 2-5 μm. Therefore, it is always important to consider that these spectral characteristics are important for the development of high-performance thin-layer CSs.

If the photons penetrating the EE surface are too small and cannot absorb electrons from the valence field due to absorption, they can pass through the electron crystal to unauthorized areas. For this condition, the spectral characteristic of the absorption can be felt in the long wavelength range outside the main absorption limit. This absorption is called absorption of free charge carriers, and this process depends on the concentration of such charge carriers. Since free charge carriers depend on the concentration of inputs that can be easily ionized, absorption is also directly related to this. Eps so long in the material

A study of the features of wave absorption showed that there are several types of absorption. In particular, absorption in a spatial network of vibrations, absorption at the inputs, absorption in excitons. An exciton is a pair of electron – hole pairs that does not change the concentration of charge carriers. This is because a crystal is not a single electron or aperture, but a bound state.

Absorption spectra provide useful and comprehensive information on the structure of the crystal, including the degree of contamination, the activation energy of the subsoil, and their energy levels in the forbidden field. For example, the absorption spectra can be used to determine the absence of oxygen in silicon (9 μm). The reflection coefficient R in the wavelength range of the spectrum increases sharply with an increase in such inputs.

The commonly used silicon-based QEs are formed by a combination of r- and n-material. The transition region (boundary region) between the R- and Type-type in the EO material is called the electron-hole or pn transition. In thermodynamic equilibrium, the electrons and holes of the Fermi surface, which determine the equilibrium state, must be the same in the material. This condition creates a double charge layer in the region of the p junction, which is called the space charge layer, and the associated electrostatic potential appears.

Optical radiation incident on the surface of the p-structure creates electron-hole pairs, the concentration of which decreases perpendicular to the surface of the material depending on the material. If the distance from the surface to the passage through p is less than the beam inlet (l / á), electron-hole pairs form inside the p-passage. If the p-junction is less than or equal to the diffusion length from the point of pair formation, the charges can be separated by an electric field, reaching p-n as a result of the diffusion process. Electrons move to the p-section of the electronic transition (n-part), p-part - to the holes.

An electrode (contact) connecting the external r-n and n-spheres is formed by the separation of potentials, which leads to electric current through the resistance of the conjugated load.

The unscattered primary charge carriers in the Pn junction are divided into two parts due to the potential barrier. The excess generated (separated by a barrier) and accumulated by n-electrons and holes in the r-field compensates the current charge by p-p, which is an electric field opposite to the existing electric field. Due to the illumination, there is a change in the existing potential barrier in unlit pn together with the potential separation of the external electrodes. As a result, photo-EUC reduces the potential of existing potential.

IV. CONCLUSION

Solar energy is becoming cheaper and more popular today. The state-of-the-art solar power plant in California has launched the latest solar technology. Wind and light are receiving power. Solar energy is the energy of the future But environmentalists say. Asia, Europe, North and South America There are about 300 renewable energy sources in the world, such as solar energy, wind energy, biomass, and water supply.

Asian solar energy Efficient use of roof space, solar energy, solar energy effective. The use of solar panels and auxiliary power in their facilities is very important. development of solar energy use along with activities in the field. International Solar Energy Much work is being done on the construction of pilot testing facilities of the Institute. Solar batteries are supplied to their comrades by electricity.

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