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OPTICAL PHENOMENA IN SEMICONDUCTORS

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Abstract:
The detailed characteristics of the basic galvanic and thermal effects are given. The quantitative forms of thermoelectric emission current are determined by the fact that the current is relative to the temperature.

Keywords: Semiconductor, galvanic, thermomagnetic, electricity, magnet, deformation, heat, field, kinetic, current carriers, concentration, mobility, zonal structure, prohibited zone, effective mass.

Introduction

Galvanic and thermomagnetic phenomena in semiconductors are characterized by changes in the properties of the sample under the influence of external electric, magnetic, deformation and heat fields.
The practical significance of such kinetic phenomena is significant because they determine the concentration and mobility of the carriers, physical magnifications describing the swelling mechanisms, the parameters of the semiconductor zonation structure, for example, the width of the restricted zone, the effective mass of the current carriers.
Galvanic and thermal effects are widely used in techniques. Magnetic field detectors, detectors for Hall and magnetic effect, electric signal transducers, Nernst-Ettingsungen thermal energy sensors, and Ettingsungen-based refrigerators and thermostatic devices in several spheres of our life can be used.
Thus, extensive study of galvanic and thermomagnetic and such types of kinetic phenomena does not destroy the content of their mechanisms, taking into consideration the quantum areas or anthropology.
Therefore, we examine such phenomenologies in the beginning, and then at least, in the classical approximation.

External Magnetic Field Effect

A series of properties of semiconductors transforms the external magnetic field under the influence of which new phenomena, such as Hall effect, can occur.
Generally speaking, $\vec{\varepsilon} = (\varepsilon_x, \varepsilon_y, \varepsilon_z)$ the magnetic fields with strong electric $\vec{B} = (B_x, B_y, B_z)$ and induction magnetic fields are charged particles [1-3].

$$\vec{F} = -|e| \cdot \vec{\varepsilon} - \frac{|e|}{c}(\vec{V} \times \vec{B}) \quad (1)$$

Loren's effect with force. In this expression, e - the electron charge, c - the rate of distribution of the electromagnetic waves in the vacuum, $\vec{V}$ - the velocity of the charged particle.

In isotropic radiation, $\vec{B}$ the induction vector $\vec{H}=(H_x, H_y, H_z)$ is equal to the magnitude of the external magnetic field. In the case of magnetic properties, the reaction is appropriate. Here is a spontaneous (self-) magnetism vector of the environment.

Below, if not recorded separately, then we consider the environment as isotropic radiation. If there is no effect on the external electric field, $\vec{\varepsilon}=0$ or, in the case of the Lorens force, $\omega_c = |e|B/(m_0 c)$ the charged particle cyclic frequency is converted to the magnetic field induction vector. In this case, in certain directions, the electron energy is naturally unchanged, but in some directions, $\vec{B}$ the electrons in the plain where the direction is directed are electronized, ie the electrons are subdivided into the Landau levels. The equidistant energy intervals between the two Landau levels are $\hbar\omega_c$ equal to the magnitude of the interval. As a result, a number of physical quantities and magnetic fields in the electrons system are subdivided into the value of the induction vector. If the deposition of the diaphragm medium is considered as the product of Gaaz van Alpen, the shock absorption Shubnikov-de Gaaz effect and the in-line magnetic resonance are the result of magnetic perforation. These subcategories include the unknown physical quantities of semiconductors. In particular, the physical nature of fermi surfaces in metals is determined by the results.

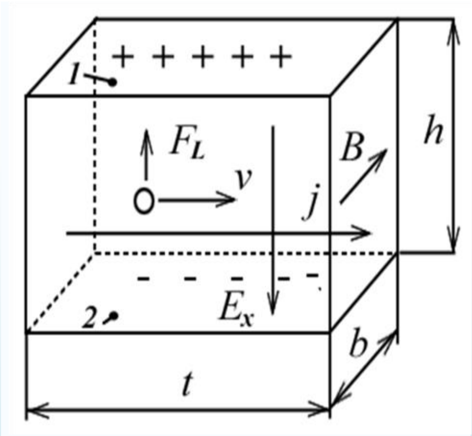

Figure 1. An absorption semiconductor of the surface charge and the electric field strength.

Hall effect in semiconductors

Let's look at the semi-conductor in the form of a straight-angle parallelepiped-shaped direction along which the magnetic induction vector is directed along the longitudinal side of the density stream (Figure 1).

The effect of Hall is characterized by the difference between the potential and the potential difference between the upper and lower edges of the sample. Here's an explanation of this effect. Let's first look at the acceptor semiconductor. $\vec{j}$ with density and pitch - bound by the drift velocity $\vec{v}_h$ of a free electron motion. Moving to the magnetic field e, the electrodynamics are known to affect $\vec{F}_L$ Lorens' power (Figure 1 upward):

$$\vec{F}_L = e[\vec{v}_h \times \vec{B}]$$

$\vec{F}_L$ the pits begin to move upwards and force negative charge on the upper side of the sample, and the negative currents at the bottom begin to accumulate, and on each side there are generated excess gear motors that are noticeable with a charge sign. These charges $\vec{E}_x$ cause the electrostatic field to become stronger $e\vec{E}_x$ and it forces them to move up the pit. This accumulation of charging forces $e\vec{E}_x$ the Lorens forces to be the same in quantity $\vec{F}_L = e\vec{E}_x = e[\vec{v}_h \times \vec{B}]$ when there is a certain $\vec{v}_h$ va $\vec{B}$ value of electric field $\vec{E}_x$ due to the magnitude. $\vec{v}_h$, we will have a relationship $\vec{j}$ that makes it easier to analyze the results

$$\vec{E}_x = \frac{[\vec{j} \times \vec{B}]}{en_h} = R[\vec{j} \times \vec{B}]$$

It is possible to measure all the dimensions referred to in this statement. R magnitude is called constant hool. The same can be done for a donor semiconductor. Note that the magnitude of the signal corresponds to the charging gear [4-8].

(1) The relationship between the semiconductor and the crankcase concentration and the charge point (see exercise 4).

To do this, a sensor-like pattern is constructed on a semiconductor as depicted in figure 1. and sizes are measured; then the size of the sample is determined. $\vec{E}_x$ va $\vec{j}$ and sizes are measured; then the size of R and $\vec{B}$ the sample is determined.

Note the effect of halfway conductor Hall, which has a similar concentration of electrons and pellets. In the semiconductor transmitter, similar to the right-angled parallelepiped (Figure 1), the semiconductor n_e and n_h, the concentration of electrons and poplars, corresponds to the equilibrium of the electrons and ponds, μ_e va μ_h are equal. It is also oriented $\vec{E}_l$ along the direction of the density of the $\vec{j}$ and l under the influence of the electromagnetic field and is expressed as

$$\vec{j} = (n_e\mu_e + n_h\mu_h)e\vec{E}_l \qquad \textbf{(1)}$$

$\vec{B}$ the direction of the magnetic induction vector b is directed to us by the power of Lorens, which acts on the electrons and hollows, and upward; under the influence of which electrons and pits move upstream and start to recombine here. For example, if pits on the upper surface are too much for the electrons, then excessive electrons will

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accumulate on the surface and excessive electrons on the substrate. As a result, $\vec{E}_x$ the downside direction of the hollow electric field appears. This area prevents the piles from moving upward and helps the electrons move upward [9-12]. After some time, such an intensity area $\vec{E}_x$ is established that $\vec{j}_{e\uparrow}$ the electrons and the pithead currents flow to the density of the currents $\vec{j}_{h\uparrow}$ and increase the accumulation of excessive gravity currents. The vertical motion of the mast currents can be recorded as follows

$$n_h\mu_h F_L - n_h\mu_h E_x = n_e\mu_e F_L + n_e\mu_e E_x.$$

As a result, we take the following approach:

$$n_h\mu_h(E_l\mu_h)Be - n_h\mu_h E_x e = n_e\mu_e(E_l\mu_e)Be + n_e\mu_e E_x e.$$

From this, E_x / E_l

$$E_x / E_l = B(n_h\mu_h^2 - n_e\mu_e^2) / (n_h\mu_h + n_e\mu_e). \qquad \textbf{(2)}$$

Taking into account the aforesaid statements, the following expression is $R = E_x / jB$ taken for the magnitude of the last relationship:

$$R = (n_h\mu_h^2 - n_e\mu_e^2) / \{(n_h\mu_h + n_e\mu_e)^2 e\}. \qquad \textbf{(3)}$$

If semiconductor input is absent, then (2) and (3) are in the relationship and $n_h = n_e$ they appear to be simple:

$$E_x / E_l = B(\mu_h - \mu_e) \qquad \textbf{(4)}$$

It has been established that, in particular, it is possible to detect the difference between the electrons and pit shears according to the formula (4) without semiconductor.

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