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ESTIMATION OF PROSPECTS OF APPLICATION OF GAAS AND ALLOYS ON HIS BASIS AS MATERIALS FOR SUN ELEMENTS

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Results of analysis for major technological characteristics of gallium arsenide GaAs and alloys on his basis from the point of view of the use of the indicated materials in sun energy are considered. The estimation of prospects of such use is given.

Key words: arsenide of gallium, p-n transition, value of band gap, coefficient of efficiency for sun element, sun battery

As marked supra [1], among factors, taking into account financial viability for application of one or another connection as material for sun energy predominates it is prevalit him coefficient of efficiency for homogeneous *p-n* transitions. According [2], coefficient of efficiency for many perspective for photovoltaica of semiconductor materials is in certain dependence on a bandgap, which has a steady maximum for connections with a wide restricted zone E_g in the interval of 1.0-1.5 eV. From the most widespread and on-the-road semiconductor connections the arsenide of gallium *GaAs* possesses the indicated description, foremost.

Really, according [3], sun elements on the basis of arsenide of gallium provide most coefficient of efficiency (22-23 %). The analysis of cascade sun battery, executed from two or greater qoantity of photocells, consistently electric and optically constrained between hitself, showed possibility of achievement of coefficient of efficiency for transformation more, than 31 % for composition of *AlGaAs-GaInAs* [4]. The basic lack of elements from a arsenide of gallium is a subzero value of coefficient of collecting, while the values of coefficient of the use of difference of potentials of wide restricted zone and block coefficient are near to their maximally possible values. The coefficient of collecting substantially increases at introduction to the sun element on the basis of *GaAs* with *p-n* homojunction of layer of widthzone semiconductor, which reduces characteristic of elements from *GaAs* losses, related to superficial recombination. The high-rate of recombination on the surface of sun elements from a arsenide of gallium strongly influences on the coefficient of collecting, as in this semiconductor with direct interarea transitions basic part of photons for sun spectrum is taken in near-by a surface.

Coverage from a widthzone semiconductor, which reduces superficial recombination losses, can be used not only in elements with *p-n* transition but also in any other sun elements. Such coverage appears most effective for semiconductors with characteristic direct transitions, as in these materials light is taken in very close to a surface. A semiconductor with indirect transitions, which has the considerably more wide restricted area, than semiconductor material which an element is made from, gets out for creation of coverage. The chosen semiconductor is grown on the surface of element. In the case of $Al_xGa_{1-x}As$ such increase appears possible partly due to that two identical chemical elements enter in the complement of width zone semi-conductor and at case of *GaAs*. Chovell and Vuddal [5] mark that for dimi-nishing of losses, related to absorption of radiation in $Al_xGa_{1-x}As$, the thickness of layer of this material must make no more than a few thousand angstrom unit.

At the beginning of the eightieth years of XX century sun elements on the basis of arsenide of gallium with coefficient of efficiency, approximately equal 10 % were got. On the surface of element which consisted of arsenide of gallium, grew the very (about 30 angstrom unit) layer of oxide which was after covered by transparent tape for the receipt of structure «metal-dielectric-semiconductor» [5]. Such elements can be made by more cheap method as compared to ordinary diffusive elements, while them coefficient of efficiency is comparable on a size.

In spite of some defects (fragility, high closeness) a arsenide of gallium has undeniable advantages before silicon - traditional material for sun elements. From a large wide restricted zone ability of arsenide of gallium to transform a long-wave sun radiation is limited (a arsenide of gallium takes in a radiation with a wave-length меньше 0,9 mcm). However the same circumstance results in the substantially less values of reverse-current of satiation (10^{-9}-10^{-10} A/sm^2), while for sun elements from silicon a reverse current of satiation is 10^{-6}-10^{-7} A/sm^2 [6]. It, in turn, enables to get greater, than at silicon, values of tensions of idling (0.7-0.8 V) for p-n transition in homogeneous material and high enough coefficient of efficiency even for the series-produced elements (10-12 %) [7]. The same features of arsenide of gallium stipulate considerably more slow falling of coefficient of efficiency with the height of temperature (0.25 %/degree), while at silicic sun elements this size makes 0.45-0.46 %/degree.

However to date a arsenide of gallium is the most studied material and his application in photovoltaica in large part is forecast. Except for the almost ideal for unijunction sun elements wide restricted zone by 1.43 eV, this material possesses more some features, doing his unique material for application yet and. It is an enhanceable capacity for absorption of sun radiation (a layer with thick in only a few microns is required); high radiation firmness, that does this material extraordinarily attractive for the use in space apparatuses; relative insensitivity to heating of batteries; descriptions of alloys of *GaAs* with an aluminium, arsenic, phosphorus or indium complemente descriptions of arsenide of gallium, that extends possibilities at planning of sun elements. Main dignity of arsenide of gallium and alloys on his basis is a wide range of possibilities for the design of sun element. A photocell on the basis of *GaAs* can consist of a few layers of different composition. It allows with large exactness to manage the generation of charge carriers, that, for example, in silicic sun elements restrictedly by the possible level of alloying. A typical sun element on the basis of *GaAs* is included by the very layer of *AlGaAs* as a window.

A basic lack of *GaAs* is a high cost. For reduction of production prices it is suggested to form sun elements on cheap bottom layers, and also to grow the layers *GaAs* on deleted bottom layers or bottom layers of non-expendable [8]. Polycrystalline thin-films from a arsenide of gallium also are very perspective for sun energetics.

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