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Reaserch of highly sensitive deformation semiconductor sensors based on AFV

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Abstract. The main object of work is analyses of generation aspects of anomaly photovoltaic film and create of devices based under of anomaly photovoltaic film. The next goal of work is wide approach to the of anomaly photovoltaic film parameters and knowledges on deformations. The deformation changes the optical parameters semiconductor thin films. An optical elastic effects. Its physical basis of factors of deformation affects based of the zonal diagram. Many condition causes the appearance of various optical and other electronic phenomena of the semiconductor films. of anomaly photovoltaic film element is thin semiconductor wich have anisotropy.

Keywords: anomaly photovoltaic voltaic film, generation aspects, photo generation, radiation detector, deformation, deformation process, analyzer, photovoltaic potencial. pressure, mechanical tension, polarized light, concentrator.

Object: The main object of work is analyses of generation aspects of APS and create of devices based under of of anomaly photovoltaic film. The next goal of work is wide approach to the APS parameters and knowledges.

Introduction: The deformation changes the optical parameters (n, l, R, T and φ, s) of polycrystalline semiconductor thin films. An optical elastic effect was created. Its physical basis is that deformation affects the shape of the zonal diagram by changing the constants of the crystal lattice. This condition causes the appearance of various optical and other electronic phenomena in the thin film of the semiconductor. AFV(of anomaly photovoltaic voltaic film)-element thin semiconductor screens have anisotropy. At the same time, AFV element curtains are specially prepared and consist of a complex of periodic multi-layer (crystallites) liqs, not super-composite [1]. They are very sensitive to external influences (including, especially, mechanical influences) [2]. Because, AFV-elements are photobatteries consisting of N photoactive photodiffusion or photovoltaic (p-n) elemental photoelements separated by thin semiconductor screens with a high resistance layer (intermediate crystallites are located in adjacent areas). Any external mechanical impact. AFV-element produces changes in elementary photoelements. These changes are one of the most effective methods of information about the events occurring inside AFV-element is goal of the work. For this reason, the study of deformation in AFV-element thin semiconductor films is of great interest among researchers.

Literature Review: Known technical solutions of use AFV elements are wide propagated practice in the world. Many of them is exact steps to scientific problems [1-12]. And the scattered from elements heat can be additionally used to general schemes of electricity. Their use helps to increase the efficiency of photo generation by AFV elements. Scientists from Novosibirsk (NTSU) Russia constated that “many devices issued by AFV elements”. And authors of the theme “On the development of optoelectronic sensors for monitoring the physical and chemical parameters of substances and materials based on an APS receiver”. And Shamirzayev S.Kh, Rakhimov N.R., Alizhanov D.D. Otazhonov Sh.S of his work discusses about the technology for producing APS films. A technology for manufacturing an optical radiation detector based on APN films is proposed. It is also proposed to develop optoelectronic sensors for monitoring the physical and chemical parameters of substances and materials based on an APS receiver. By professor of FB TITU Polvonov B. Z. and Zokirov S.conducted works and oobtained a patent-certificate for the inventive work on the topic "Method of obtaining photovoltaic films". Can be continued researches of the literature analyses, because there are many famous works in the scientific world.

Materials and method: Internal vibrations that occurs due to deformation in a thin membrane as a result of an external mechanical effect. There are classical methods of extraction [4] For example, Stoney's formula [4-7,10,11] is widely used.

$$\delta = \frac{Ed^2}{\sigma r t},$$

where , δ is the tension in the thin film (mechanical E is the wool modulus for the base, d is the thickness of the base, t is the thickness of the thin film, r is the radius of curvature of the film due to external influence.

In calculations where more accurate results are required, the following formula,

$\delta = \frac{Ed^2}{\sigma(1-\gamma) r t},$ is used to calculate the voltage, the Poixe coefficient g for the base is used in the calculations, and an increase of approximately

$\frac{1}{\sigma(1-\gamma)} \approx 1.5$ time is taken into account.

There are convenient ways to experimentally study deformation processes in thin films of AFV elements [3]. In order to generate mechanical stresses in the thin film, the film is transferred to polymer bases resistant to large and reversible deformations. The degree of adhesion between the thin curtain and the polymer base ensures the transfer of stress from the base to the layer and the implementation of one-way stretching deformation in the curtains. A special device is prepared for the experimental implementation of this new method [3,11]. As a result, the mechanical stress does not disappear due to the microscopic breaks in the membrane, and the deformation prevents the material from being partially limited by the strength limit.

Temperature-resistant polyethylene terephthalate tapes are used as a thin curtain. In order to study the dependence of the photo current on the deformation, a device is made that allows stretching the thin film (AFV) obtained on a polymer base with a special technology [1-12] using a micrometric screw and measuring the stretching deformation with high accuracy. short-circuit in curtains, relative curtain deflection $(\frac{\Delta l}{l})$ relationship is approximately linear. This law is also relevant for AFK. The long-wavelength part of the light passes through the AFV [1-11] element and the polymer substrate. Since the AFV-element thin film is an optically active material, it is possible to create an optoelectronic system that evaluates and measures various mechanical effects with high accuracy by optically recording the anisotropy created by artificial mechanical effects due to mechanical effects causing optical anisotropy in it. By applying polarized light to the system, the accuracy and level of measurement can be further increased. If the optical axes of the polarizer (or polaroid screen) and the analyzer are perpendicular to each other, the plane polarized light from the polarizer does not completely pass through the analyzer. Light intensity I=0. In intermediate situations, i.e., the intensity of the light passing through the analyzer changes proportionally to the angle between the optical axes

$(0<\alpha<\frac{\pi}{2})$, $0<I<I_0$. Now let's place a specially prepared AFV-element thin semiconductor n between the polarizer and the analyzer. The situation does not change.

i.e., polarized light does not pass through the analyzer device. If an external mechanical effect is applied to the screen, the mechanical deformation changes the refractive index of the sample screen. There is a certain difference between the refractive indices of ordinary and extraordinary rays, n0-ne, this difference causes the effect of birefringence of the light. The activity of the effect changes proportionally to the external mechanical stress, $n_0-n_e=\Delta n = k \quad \tau = \frac{F}{S}$. Using this phenomenon, parameters such as the strength and direction of various mechanical effects can be measured with high accuracy. (Fig. 1) the light also provides the necessary information about the optical difference in the semiconductor material of the AFV-element thin layer or the degree of birefringence of the light. For this, a PKS-15 polariscope is placed in the path of the beam passing through the analyzer [5, 10.

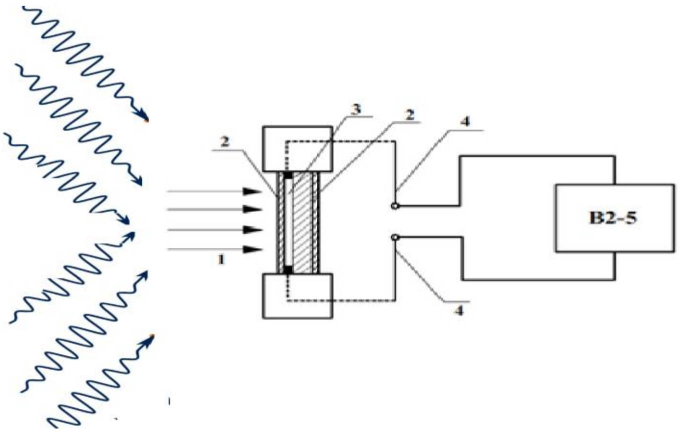

Fig. 1. Electrical scheme of the optoelectric device for determining the force of wind pressure.

1- wind direction ; 2- front, rear polymer base ; 3- AFV thin film element, 4 - connecting wires to B2-5 electrometric measuring device for measuring photovoltaic potencial.

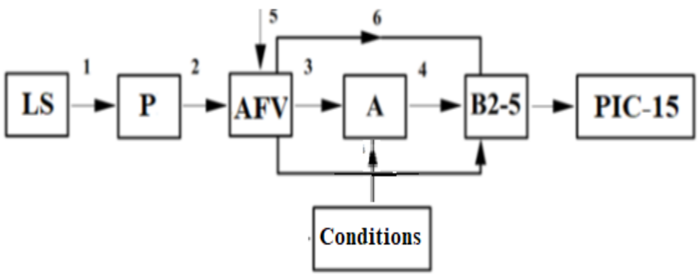

Fig. 2. A complete block diagram of the device.

Figure 2. The block diagram of the optoelectronic device for measuring the mechanical effect of the wind.

There are, LS-light source (natural or artificial source), P-polarizer or thin-film polaroid

AFE –AFV-element, A-analyser, B2-5-electrometric measuring instrument

PKC-15-polariscope. 1. Simple light beam, 2. Flat polarized light Light flux after 3-optical activation [7-9].

Light flux sent from the analyzer to the polariscope (PKC-15) for analysis 4 and 5-mechanical effect.

The technical possibility of the proposed device and increase the accuracy of measuring the result, the possibility of compactification of the project and the technical possibility of switching to the microelectronic version; switching to a natural light source, as a result of operation, the device achieves high energy efficiency and autonomy. Each element can be sketched in the form of a thin veil[1,2,3,11].

The usage of the expected light in the measurement and information transmission system expands the functional capabilities of the device, that is, it carries with it information about the nature of the mechanical effect (pressure, mechanical tension and other parameters) and due to the birefringence of the light generated in the thin film of the AFV-element under optical inspection, in the material of the film conveys some information about the nature of the change and phenomena to the output of the device for measurement and control (B2-PKC-15). It allows to determine the optical activity and the change in the refractive power of the light (Δn, double photoeffect of the light) as a result of the mechanical effect. As a result, the metrological capabilities of the device are more extensive, providing information about the degree of polarization state change, anisotropic nature of the curtain material, determining the extent of the absorption coefficient in the formation of photo voltages in the elements for the photoelectric current, and what part of the total current it is. This situation greatly increases the technical capabilities among the prototypes of the optoelectronic device [1-6] Prototypes of the presented device [7,8] do not have the possibility of compacting the project, switching to the mode of energy-saving autonomous operation.

Reacearch and Achivements**:** The principle of operation of the device shows. According to the block diagram (Fig. 2), the normal light stream (1) from a natural or artificial light source falls into the polarizing system (a polarizer nicol prism or celluloid with thin-film herapatite dichroism) P and turns into a plane polarized light stream (2) Polarized light (2) falls on an optical fiber (AFE) semiconductor. In the anomalous photovoltaic element (AFE), an anomalous high photovoltage is generated through the circuit (6) of an electrostatic type microelectrometric measuring device (B2-5). It returns high voltage. This condition is observed only when an external mechanical deformation effect(5) occurs on the AFE element. As a result of the mechanical effect (5), the optically active (AFE)-isotropic element goes into an anisotropic state and the plane of polarization of the polarized light turns to an angle corresponding to the mechanical effect. After that, the polarized light (3) passes through the anisotropic state with a new state (4). The light passing through the analyzer carries with it the information corresponding to the nature of the mechanical effect (4) to the polariscope (P) unit. Therefore, the anomalous photovoltaic signal (6) of the optically active semiconductor AFE sample is returned to B2-5 through the electrical circuit, mechanical effect Information about (4) is returned in the PKS block through an optical channel. It is also possible to carry data in an optical channel using a thin-film optical transmission line (or fiber optic). This situation increases the accuracy of measurement and control [4-11].

Conclusions: The formula for the potency of the invention exact and it applied. The device presented for the invention belongs to the field of optoelectronic instrumentation and is used for metrological and process control purposes. The device includes a concentrator that creates a parallel beam from natural light, a polarizer that transforms natural ordinary light into flat polarized light (Nikol prism or a thin film with celluoid dichroism properties containing herapotite crystals), entering a photoelastic state as a result of various mechanical effects and changing its optical parameters (n,æ, It consists of a photovoltaic element (AFE) that can change , a polarizer working as an analyzer, an electrometric electrostatic voltmeter that returns anomalous photovoltaic voltage, and a PKS-15 polariscope with a monad level for determining the degree and nature of polarization of polarized light. There is a hybrid system of 2,3,4 chains, electric (6) chains with electronic connection, all of which are housed in a plastic case protected from external influences [10, 11].

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