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A Small-Sized Photogenerator Based on the AFN Effect

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ABSTRACT: in this article, we consider ways to create a photogenerator with high photon stresses based on AFN films, light sensitivity and reliability of operation.

KEYWORDS: AFN-film, photovoltage, photogenerator, photosensitivity

I.INTRODUCTION

This work is devoted to the development of a new type of photogenerator based on the AFD film of cadmium telluride CdTe with the deposition of a reflective layer on the inner opposite surface at a temperature of 3000 C and a pressure of 1333.32 · 10-4 Pa of contacts on an anomalously photovoltage film.

AFN films (anomalous photovoltage) [1-4] are a functional converter that transforms the luminous flux of intensity ph_0 into an abnormally high photovoltage V_{AFN}. According to the accepted model [5-6], this transformation consists of three stages.

Firstly, the creation of the I_{ph0} photocurrent due to photogeneration and spatial separation of nonequilibrium carriers at each micro-p-n junction. Secondly, the appearance of elementary voltages at micro-p-n junctions as a result of the accumulation of space charges created by the photocurrent. Thirdly, the formation of an anomalously large photovoltage by summing elementary photovoltage at p-n junctions.

In this article, we examined the methods for creating a photogenerator with increased photovoltage based on AFS films, photosensitivity, and reliability.

The problem is solved in that the method of manufacturing a photogenerator involves sputtering by thermal evaporation at a temperature of 250-300^0 and a pressure of 133.32·10-5Pa on the outer surface of the substrate of an AFN film of cadmium telluride CdTe, applying a reflective layer on the inner opposite surface of the substrate at a temperature of 300^{0}C and pressure 1333.32·10^{-4}Pa, sputtering of contacts on an abnormally photo-stressed film.

The increased photovoltage, photosensitivity and reliability of the photogenerator are achieved by the fact that Ge is coated with an alloying layer of Ge, the reflective layer is made of Al aluminum, one end side of the substrate is truncated at an angle of 45^0, the contacts are made from above on one of the ends of the film, on all the ends apart from the truncated side of the photo generator, a light-tight layer is applied, as well as due to the fact that one of the end sides of the substrate is truncated at an angle of 45^0, the abnormally strained film is alloyed with Ge germanium, and at the same time, a reflective layer of aluminum Al is applied to the inner surface of the substrate, all the ends of the photo generator, in addition to the truncated one, are covered with an opaque layer.

In Fig. 1. a photogenerator is shown, which includes a glass substrate 1, on the outer surface of which an AFN film 2 of cadmium telluride CdTe is deposited, and on the inner reflective layer 3 and contacts 4. A doping layer 5 of Ge germanium is deposited on the film 2. The reflective layer 3 is made of aluminum Al. One end face 6 of the substrate is truncated at an angle of 45^0. Contacts 4 are made on top of one of the end sides of the film 2. A light-proof layer 7 is applied to all the end sides of the photogenerator, except for the truncated end side 6. To measure the photovoltage and short circuit current to the contacts 5 connected electrometer 8.

Cover all the end sides of the photo generator, except for the truncated end side 6, with an opaque layer 7.

The glass substrate 1 is positioned at an angle of 45^0 between the direction of the molecular beam and the normal to the substrate.

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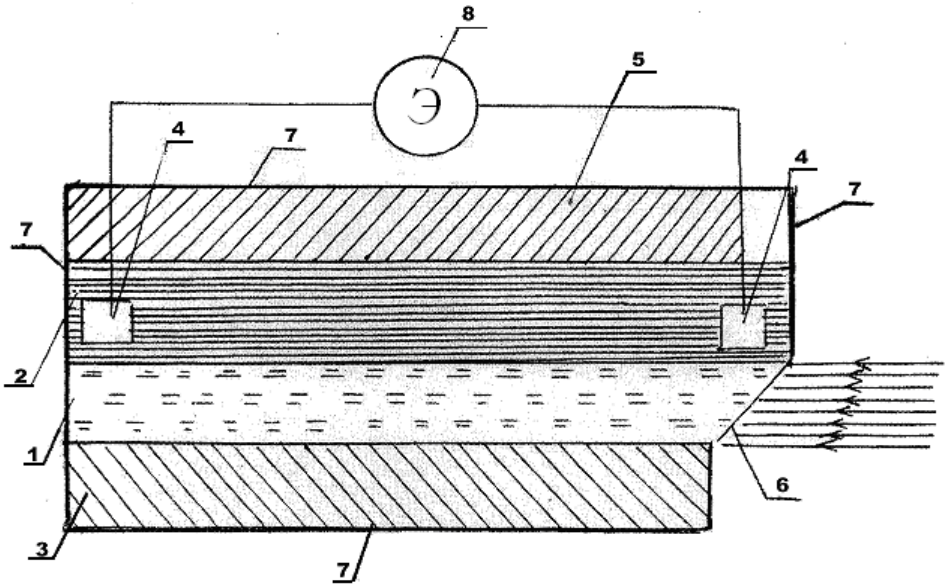

Fig. 1. Small-sized photogenerator devices.

The photo generator operates as follows. Through the end truncated side 6 of the substrate 1, which is a light-transmitting portion, a light flux of 10^4 lx illuminates the light-absorbing AFN film 2 of cadmium telluride, on which a doping layer 5 of Ge germanium is located. A part of the incident light flux with intensity I_o, passing through the end truncated side 6, gets a reflective layer 3 of aluminum Al and is reflected from it, enters the light-absorbing film 2 of cadmium telluride, as a result of which additional absorption of light occurs and the generated photovoltage increases. When a light stream enters the light-absorbing film 2 from cadmium telluride, the light stream is converted into electric voltage in it.

The increase in photovoltage occurs by reducing the loss of light flux. The sensitivity of the photogenerator increases with a deviation of the incident light beam of 0.2-0.5 mm. from its axis. The photo generator generates a photovoltage equal to 300-390V with an illumination of 10^4lk. The photosensitivity in mutually perpendicular is 50 V/mm when the light beam deviates by 0.2-0.5 mm from its axis.

The photosensitivity of the photo generator is determined in the short-circuit current mode under illumination with monochromatic light without connecting an adjustable voltage source. Short circuit current is measured by an electrometer 8.

The tightness of the opaque layer 7 increases the reliability and stability of the output characteristics of the photogenerator.

The reflective layer 3 of aluminum allows you to increase the photosensitivity of the photogenerator at low light intensities.

Photo generators obtained by this method can be widely used as a voltage source in optoelectronics, geodesy, laser technology, and also alignment of quantum generators in optical systems. Such photogenerators do not require power sources and, forgive me for their manufacture.

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