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PHOTODETECTOR BASED ON N/SI – N/CDS STRUCTURE

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Abstract. In this paper, we consider and discuss the amplification of the photocurrent of an n/Si – n/CdS structure at a low illumination level. It is shown that these structures have a high spectral and integral sensitivity at a low illumination level.

Keywords: spectral range, industrial photo receivers, photocurrent.

The spectral range is stable in the long-wave region Δl=450-1200 nm. The maximum in the short-wave region corresponds to cadmium sulfide, and the maximum in the long-wave region is related to silicon (Fig. 1).

Studying the voltammetric characteristic in direct and closed directions shows that photocurrent amplification occurs. Odnako znacheniya phototoka and temnovogo toka sharply otlichayutsya. For comparison, the photo current and the dark current are taken at the same voltage (V=10 V). The results are presented in table I. The value of photocurrent, integral sensitivity (Sint) and spectral sensitivity at different levels of laser illumination (P, μW) are also shown in this table. Iz dannyx tabl.1 sleduet, chto integralnaya chuvstvitelnost imeet vysokoe znachene. At that time, the mother has the maximum value at osveshchennosti E = 3·10-2 lk, at which Sint=21 A/lm, and then the value increases. For comparison, the best industrial photoreceivers FD-7, FD-11 have Sint=(4-5) mA/lm [1].

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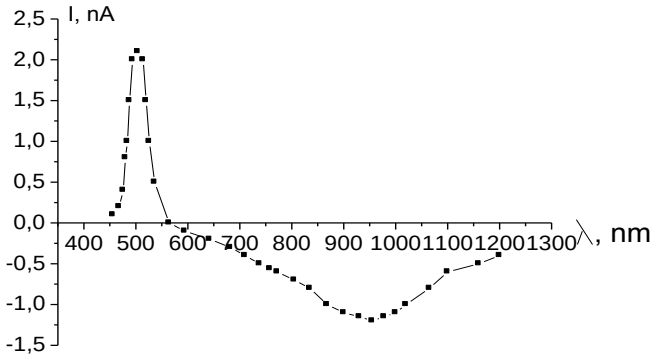

Fig.1. Spectral distribution of photosensitivity

Table I.

Dependences of photocurrent (If), integral sensitivity (Sint), spectral sensitivity (Sλ) on illumination (Elx), laser irradiation power (P) and bias voltage (U).

White light $E = 3 \cdot 10^{-2}$ lux				Laser irradiation $W = 0.75 \frac{mW}{cm^2}$		Laser irradiation $W = 1.2 \frac{mkW}{cm^2}$	
U, V	$I_f, \frac{mkA}{cm^2}$	$S_I, \frac{A}{lm}$	$S_I, \frac{A}{W}$	$I_f, \frac{mkA}{cm^2}$	$S_I, \frac{A}{W}$	$I_f, \frac{mkA}{cm^2}$	$S_I, \frac{A}{W}$
5	712	7.12	783.2	2260	2.9	790	658
10	2100	21	2310	4500	6	2450	2042

However, the value of current sensitivity remains high even with laser illumination with a wavelength and power of 1.2 μW/cm2, amounting to ~2042 A/W. It follows that the photocurrent is

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enhanced in this structure. A clear confirmation of this is the fact that the current sensitivity of such a structure is ~2042 A/W, while an ideal photodetector at this wavelength has a current sensitivity of 0.5 A/W [2].

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