МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
СУМСЬКИЙ ДЕРЖАВНИЙ УНІВЕРСИТЕТ

ФІЗИКА, ЕЛЕКТРОНІКА, ЕЛЕКТРОТЕХНІКА

ФЕЕ: 2016

МАТЕРІАЛИ
та програма

НАУКОВО-ТЕХНІЧНОЇ КОНФЕРЕНЦІЇ

(Суми, 18–22 квітня 2016 року)

Суми
Сумський державний університет
2016

Diode temperature sensors with tunable sensitivity

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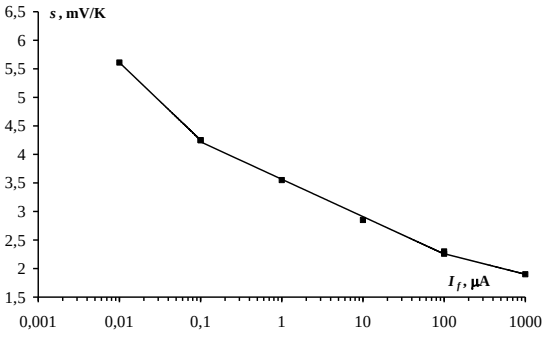
We investigated the possibility of using of AlGaInP heterostructures with *p-n* junction as diode temperature sensors having quasi-linear dependence of the forward voltage drop on the ambient temperature at the fixed direct current. Thus we measured the current-voltage characteristics of the p-n structures in the temperature range 293-550 K. Using the data obtained we calculated the differential current thermal sensitivity of the structures mentioned. A semilogarithmic plot of the thermal sensitivity vs. forward current dependence is presented in the figure. As one can see from the graph plotted the dependence has a characteristic property: there are three distinct sections in it having different slopes. This means that there are different current transport mechanisms that predominate in each section. At the lowest current ($\sim 10^{-8}$-10^{-7} A) the current transport is dominated by tunneling, then one can observe mixed tunnel-recombination current transport mode ($\sim 10^{-7}$-10^{-4} A) and at further current rise ($\geq 10^{-4}$ A) the diode gradually passes into recombination mode with appreciable influence of the series resistance at $I \geq 10^{-3}$ A.



All of this allows to conclude that it is possible to design temperature sensor based on the AlGaInP p-n heterostructures with tunable thermal sensitivity [1] by changing the magnitude of the forward current through the diode.

1. Yu. M. Shwarts, *Physical fundamentals of the semiconductor devices of extreme electronics*. (Dr. of Sci. Thesis, Kyiv: V. Lashkaryov ISP NASU: 2004).