

Nanooptics and nanophotonics

Photo-properties of p-i-n heterostructures with nanoobjects

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Research of structure with nanoobjects is very important to develop new optoelectronic devices. Studied low-dimensional heterostructures shows perspectives for design a novel solar cells, photodetectors and transistors.

Spectral dependencies [1] and kinetics photovoltage and photocurrent in p-i-n heterostructures with quantum wires embedded in the i-region were research in the temperature range from 77 K to 290 K.

We were investigated form the spectrum of photovoltage for the structure with nanoobjects compared with the structure without the nanoobjects.

In the experiments we used two samples: standard p-n-junction based on GaAs and p-i-n heterostructure InGaAs / GaAs with nanowires [1,2].

The appearance of photo-voltage generation in the heterostructures is caused by spatial separation of photo-excited electron-hole pairs by the built-in electric field of the GaAs p-i-n structure.

As a result, it was shown that the structure with quantum objects have higher sensitivity as compare with the structure without the quantum nanoobjects in the spectral region of 1.25-1.37 eV [1].

Nanowires in the heterostructures also cause to a decrease in the lifetime of nonequilibrium charge carriers. It was elucidated influence quantum wires on the mechanism of recombination of photogenerated charge carriers.

1. *Kovalova M. S., Kondratenko S. V., Furrow S., Kunets V. P., Ware M. E. and Salamo G. J. Photo-voltage in InGaAs/GaAs Heterostructures with One-Dimensional nanostructures // Proc. SPIE 9126, Nanophotonics V, 91262H (May 2, 2014);*
2. *Kunets V., Furrow C., Morgan T., Hirono Y., Ware M., Dorogan V., Mazur Yu., Kunets V. and Salamo G. InGaAs quantum wire intermediate band solar cell // J. Appl. Phys. Lett. – 2012. -101, 041106.*