*NANOTECHNOLOGY AND NANOMATERIALS*

CdS and ZnO nanolayers use in InP based heterojunctions for detector applications

Koval A., Gorceac L., Botnariuc V.,Ketrush P., Cinic B., Raevski S., Rotaru C., Vatavu S.

Moldova State University, Research and Innovation Institute, Scientific Research

Laboratory “Physics of semiconductors and devices”, MD-2009 Chisinau, Moldova E-mail: [andrcoval@mail.ru](mailto:andrcoval@mail.ru)

This work is a continuation of the research presented in [1], with the aim of extending the study of heterojunctions (HJ) based on InP combinations with other semiconductor compounds (CdS, ZnO) for preparation of optoelectronic devices (photodetectors (PD), photovoltaic cells (PC)).

nCdS-pInP and nZnO-pInP HJ with and without intermediate iInP epitaxial layer were prepared by using gaseous phase epitaxy in chloride system (iInP), CSS in H2 ambience (nCdS) and spray pyrolysis (nZnO), PVD (In, Ag+5% Zn) and e-beam evaporation (SiO2). InP:Zn single crystal, (100) and (111) oriented, platelets (p=1-3⋅1018cm-3, density of dislocations - 2-4⋅1014cm-2) were used as substrates.

|  |  |
| --- | --- |
| C:\Users\Andrei\Documents\2021_03_17\IMG_0001.jpg  ***Fig.1.*** *nCdS-i-pInP HJ absolute*  *photosensitivity* *(1) and external*  *quantum efficiency (2) wavelength*  *dependence.* | The absolute photosensitivity (I/W) and the external quantum efficiency (EQE) of nCdS-i-pInP HJ as the characteristic parameters of a PD were investigated in the wavelength region of 500-950 nm (Fig.1). It was established that the maximum I/W values of 0,51A/W and of EQE of 80% at the wavelength of 850 nm (curve 1) and (curve 2) respectively correspond to the HJ having the charge carriers concentration of pi=6,5⋅1016 cm-3 in the intermediary layer.  The efficiency (η) of PC based on nCdS-pInP HJ with surface area of A= 3 cm2 is 12% (AM1). |

nZnO nanometric layers (300-400 nm thick), optically transparent (80-85%), having ρ=0,028-0,36 Ω⋅cm, n=2-9⋅1019 cm-3, μ=2-10 cm2V-1s-1 cm-3 were used in the preparation of nZnO-pInP HJ. nZnO-pInP HJ PC exhibit Uoc=650 mV, Isc=10 mA⋅cm-2 (AM1), the photosensitivity extends beyond 400-950 nm wavelength range.

The obtained results allow to conclude that nCdS-pInP and nZnO-pInP HJ can be successfully used both for detecting electromagnetic radiation in VIS as well as PC.

1. A.Koval, L.Gorceac, V.Botnariuc, S.Vatavu, P.Ketrush, B.Cinic, S.Raevski,

C.Rotaru,//Photovoltaic devices with InP. The International Conference

«Nanotechnology and nanomaterials» (NANO-2020), Lviv, Ukraine, 2020, -P.34.