**"Nanotechnology and nanomaterials"**

**Investigation of InP photovoltaic cells with nanolayers.**

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

*Moldova State University, Department of Physics and Inginery,MD-2009 Chisinau, Moldova*

 *E-mail:* *andrcoval@mail.ru*

Indium phosphide (InP) as well as its combinations with other compounds such as ITO, CdS, ZnO, TiO2 remain relevant in the development of effective photovoltaic cells (PVC) with increased resistance to the action of corpuscular radiation [1].

This work, being a continuation of the research presented in [2], includes the results of the study of the thickness influence of the SiO2 antireflective layer on the InP PVC parameters and on the external quantum efficiency (EQE) spectral dependence for different PVC types.

The influence of the thickness of the SiO2 antireflective layer deposited at 300 K on the frontal surface of the n+CdS-po-p+InP type CF by the electron beam evaporation method on the short-circuit current (Isc) value is shown in Table 1.

Table 1. Isc value dependence on the thickness

 of SiO2 antireflective layer.

|  |  |
| --- | --- |
| Thickness of SiO2 antireflective layer, nm  | Short circuit current values, mA |
| PVC1 | PVC2 | PVC3 |
| 0 | 15,5 | 16,0 | 27,0 |
| 40 | 16,0 | 17,0 | 27,5 |
| 80 | 18,0 | 19,0 | 30,5 |
| 106 | 17,5 | 18,5 | 32,5 |
| 132 | 16,5 | 17,0 | 30,0 |
| 160 | 16,0 | 16,0 | 29,0 |
| ${∆I}/{Isc}$**, %** | **16** | **19** | **20** |

 Fig.1. External quantum efficiency (EQE) spectral

 dependence: 1 – n+-po-p+InP homojunction;

 2 – the same with n+CdS frontal

 layer (n+CdS-n+-po-p+InP);

 3 – n+CdS-po-p+InP heterojunction.

The analysis of Isc=*f*(d), dependence shows that the optimal thickness of the antireflective layer is about 80...106 nm and the increase of short circuit current is about 16 ... 20% (18% on average).

The external quantum efficiency spectral dependence of n+-po-p+InP type PVC and of the same with n+CdS frontal layer (n+CdS-n+-po-p+InP structure) as well as of n+CdS-po-p+InP type PVC were studied.

It can be seen (Fig.1) that external quantum efficiency constitutes about 75% in the wavelength range λ from 600 to 900 nm for PCV with n+CdS-po-p+InP heterojunction, about 70% for λ = 850 nm for PCV with n+-po-p+InP homojunction with n+CdS frontal layer and a low efficiency of 40% for λ=900 nm for PCV with n+-po-p+InP homojunction without front layer n+CdS. This confirms the priority of PCV made from InP with heterojunction, regarding the more efficient use of the incident light which is also evident at the comparison of the photosensitivity of n+CdS-po-p+InP type PCV and n+-po-p+InP type with and without n+CdS front layer.

# 1.[*Xingtian Yin*](https://www.ncbi.nlm.nih.gov/pubmed/?term=Yin%20X%5BAuthor%5D&cauthor=true&cauthor_uid=25679010)*,*[*Corsin Battaglia*](https://www.ncbi.nlm.nih.gov/pubmed/?term=Battaglia%20C%5BAuthor%5D&cauthor=true&cauthor_uid=25679010)*,*[*Yongjing Lin*](https://www.ncbi.nlm.nih.gov/pubmed/?term=Lin%20Y%5BAuthor%5D&cauthor=true&cauthor_uid=25679010)*,*[*Kevin Chen*](https://www.ncbi.nlm.nih.gov/pubmed/?term=Chen%20K%5BAuthor%5D&cauthor=true&cauthor_uid=25679010)*,*[*Mark Hettick*](https://www.ncbi.nlm.nih.gov/pubmed/?term=Hettick%20M%5BAuthor%5D&cauthor=true&cauthor_uid=25679010)*,*[*Maxwell Zheng*](https://www.ncbi.nlm.nih.gov/pubmed/?term=Zheng%20M%5BAuthor%5D&cauthor=true&cauthor_uid=25679010)*,*[*Cheng-Ying en*](https://www.ncbi.nlm.nih.gov/pubmed/?term=Chen%20CY%5BAuthor%5D&cauthor=true&cauthor_uid=25679010)*,*[*Daisuke Kiriya*](https://www.ncbi.nlm.nih.gov/pubmed/?term=Kiriya%20D%5BAuthor%5D&cauthor=true&cauthor_uid=25679010)*, and*[*Ali Javey*](https://www.ncbi.nlm.nih.gov/pubmed/?term=Javey%20A%5BAuthor%5D&cauthor=true&cauthor_uid=25679010)*.//*19.2% Efficient InP Heterojunction Solar Cell with Electron-Selective TiO2 Contact. [ACS Photonics](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4311942/). 2014 Dec 17; 1(12): -P.1245–1250.

**2. *A.Coval, L.Gorceac, V.Botnariuc, P.Ketrush, B.Cinic, S.Raevski, L.Gagara, C.Rotaru.//* InP photovoltaic cells with optimized nanometric layers.** The International Conference «Nanotechnology and nanomaterials» (NANO-2018.