Nanocomposites and nanomaterials

**Studies of Cadmium Sulphide as a “buffer layer”**

**for thin films solar cells**

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Cadmium sulfide acts as an "optical window" in combination with the CdTe absorption layer in heterostructure. Due to the appropriate band gap and high absorption coefficient for solar radiation, the real efficiency of solar cells based on the n-CdS / p-CdTe heterojunction in the superstrate structure is currently ~ 16%. Despite the mismatch of the lattice constants (~ 10%) of CdS and CdTe, they form a perfect heterojunction, which is confirmed by high fill factors up to FF = 0.75 [1]. The question of the influence of the conditions of deposition of the "window layer" on the topology and optical properties of the heterostructure remains open.

Despite numerous studies of thin films and heterostructures based on compounds II-VI, there are still many open questions about the processes of their formation, which significantly depend on the technological conditions of deposition and are crucial for improving the values of optical characteristics (absorption, reflection, transmission, optical band gap, extinction coefficient) and a set of photoelectric properties. The theoretical studies of CdTe solar cells were simulated using programme SCAPS (Solar Cell Capacitance Simulator). This is simulation programme, developed with LabWindows/CVI of National Instruments, by professor Marc Burgelman from ELIS-University of Gent [2]. SCAPS has among the studied simulation programs the largest number of electrical measurements than can be simulated: J(V), C(V), C(f) and spectral response. Each measurement can be calculated for light or dark conditions and as a function of temperature. The structure with two set of graphics J-V and Q(λ) used for characterize. J-V characterization is the most commonly used tool for characterize of solar cell devices [3].

[1] *Green M.A., Hishikawa Y., Warta W., et al. Solar cell efficiency tables (version 55). Progr Photovolt Res Appl. 2020. Vol. 28, No. 1. P. 3-15.*

[2] *Burgelman M., Verschraegen J., Degrave S., Nollet P. Modeling thin‐film PV devices. Prog. Photovoltaics Res. Appl. 2004. Vol. 12, No. 2. P. 143–153.*

[3] *Yavorskyi R., Nykyruy L., Wisz G., Potera P., Adamiak S., Górny S. Structural and optical properties of cadmium telluride obtained by physical vapor deposition technique. Applied Nanoscience. 2019. Vol. 9, No. 5. P. 715–724.*