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Synthesis Technology for CdSe/CdTe Heterojunctions and Characterization of Their Photoelectric Properties

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Abstract

This paper presents the results of studying the photoelectric properties of CdSe/CdTe heterojunctions synthesized by the hot-wall epitaxy method. The CdSe/CdTe heterojunctions were manufactured by consecutive growth of CdSe and CdTe layers on a conductive ITO/glass substrate purchased from Solaronix Swiss. As ohmic contact for CdTe, Ni was deposited by thermal evaporation. The CdSe layer thickness (1–3 μm) was controlled according to the time of deposition of the layer. The temperature of the substrate and the source for CdTe growing were 400 °C and 520 °C, respectively and reached the thickness 15 μm. The synthesis process for heterojunctions with CdTe layers includes the treatment of the entire structure in a CdCl2 solution, followed by annealing in air at a temperature of 450 °C for 30 min. Upon the deposition of CdTe layer, due to the diffusion of Se into the growing CdTe film, a transition layer of the $CdSexTe_{1-x}$ solid solution is formed at the interface, evidenced by the spectral dependence of the photocurrent. The investigation of the current-voltage characteristics at different intensity of illuminations shown that nonideality factor n has a value of 1.7–2.0, which indicate a generation-recombination mechanism of current in the CdSe/CdTe heterojunctions. The best photovoltaic parameters for CdSe/CdTe heterojunctions were achieved for structures with thicker CdSe layer and are as follows: J_{SC} = 24.6 mA/cm², U_{OC} = 730 mV, FF = 0.5, η = 7.6%.

Keywords: heterojunctions, solar cells, photovoltaic parameters

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