Abstract:

The purpose of this study was to develop fabrication conditions and characterization of multifunctional structures composed of p-type copper (I) oxide layers combined with other n-type semiconductors, among others, TiO_2, CeO_2, ZnO to form a functional photovoltaic cell. In order to determine the optimal deposition parameters and their impact on the efficiency of photovoltaic cells, viz. thickness, roughness, semiconductor layers (Cu_2O, ZnO, TiO_2, CeO_2, perovskite CH3NH3PbI3) were produced by various methods (electrodeposition, electrophoresis, passivation, spin coating) on various substrates (monocrystalline copper Cu(100) and Cu(011), polycrystalline copper, NiTi, FTO). As a result, Cu_2O/ZnO, Cu_2O/TiO_2 solar cells on NiTi substrate and a third-generation cell based on CH3NH3PbI3 perovskite, obtained by spin coating, were obtained and characterized. The paper also conducted theoretical research and proposed a two-diode model for measuring the efficiency of thin-film generation II cells. It was shown that it is possible to obtain photovoltaic cells based on copper (I) oxide: Copper (I) oxide layers deposited on a metallic Cu/Cu(100)/Cu(001) substrate form a Schottky diode. The possibility of using a cell with an inverted structure of the type: Cu2O/ TiO2 was demonstrated. The best values of efficiency parameters showed cells constructed on the basis of a material with a perovskite structure $CH_3NH_3PbI_3$ amounting to, respectively: 4.1% and 6.4%.